

### Structured abstract (249/250 words)

**Background:** Suicide rates between 1999 and 2016 have been on the rise in the United States (U.S.). Examining state-level trends in, and contributing circumstances to, suicide, can inform movement towards the goal of comprehensive state suicide prevention.

**Methods:** Trends in age-adjusted suicide rates, overall and by sex and state, among people aged  $\geq 10$ , were calculated using data from the National Vital Statistics System. Changes in rates and state rankings were assessed across six consecutive three-year periods (1999-2001, 2002-2004, 2005-2007, 2008-2010, 2011-2013, 2014-2016). Data from the 2015 National Violent Death Reporting System, across 27 states, were analyzed to compare circumstances between suicide decedents with and without known mental health problems.

**Results:** Average annual percentage change in suicide rates across the period, increased significantly in the U.S. overall (25.4%) and in 44 states, ranging from 5.9% in Delaware to 57.6% in North Dakota. People with (46%) and without (54%) known mental health problems, experienced a range of multiple contributing circumstances to their suicides, including substance use, relationship problems, and recent crises.

**Conclusions:** Suicide rates have risen significantly in the U.S. and across most states from 1999-2016. Numerous factors contribute to suicide among people with and without known mental health problems.

**Implications for Public Health Practice:** To reverse upward trends in suicide, a population-based public health approach inclusive of evidence-based strategies across multiple levels (individual, family/relationship, community, societal), focused on preventing risk before it starts, identifying and supporting people already at risk, preventing-re-attempts, and caring for survivors after a suicide, is needed.

### INTRODUCTION ((263/250 words)

In 2016, nearly 45,000 suicides (13.4/100,000) occurred in the United States (U.S.).<sup>1</sup> While overall rates have been on the decline globally,<sup>2</sup> rates of suicide in the U.S. have increased between 1999 and 2016 across most age groups, among males and females, across racial/ethnic groups, and across urbanization levels.<sup>3</sup> Rates of nonfatal attempts have also been on the rise, with emergency department visits for self-harm injury having increased more than 40% between 2001 and 2015.<sup>5</sup> In 2015, the economic toll of suicides and self-harm injuries totaled more than \$69 billion in direct medical and work loss costs. Suicide is rarely caused by one thing; rather, the risk factors for suicide are numerous and occur at multiple levels (individual, family/relationship, community, and societal).<sup>6</sup> However, the focus tends to point towards mental illnesses, such as depression and bipolar disorder, as the cause. Other factors associated with suicide include lack of social connectedness, downturns in the economy, access to lethal means (e.g. substances, firearms) among people at risk, lack of access to quality evidence-based treatment, irresponsible media reporting, lack of coping/problem-solving skills, stigma associated with help-seeking, and a prior suicide attempt, among others. While the Surgeon General called for a comprehensive public health approach to suicide prevention in 1999, to date, the U.S. continues to struggle to make this a reality due to a lack of funding for implementation of evidence-based prevention strategies, misperceptions about suicide preventability, and a prevention focus primarily downstream, at the individual level.

**Comment [SD()]:** Does this seem too abrupt or unclear as in, "why look at suicide within those two groups?"

**Comment [SD()]:** Could also say, no single factor alone contributes to suicide.

**Comment [SD()]:** If NCHS data brief has urbanization we can take this reference out if we need space for others.

**Comment [SD()]:** This needs updating for 2016 but ED data is still for 2015.

**Comment [SD()]:** Need idea for reference here.

**Comment [SD()]:** Do we want to say opioids as an example here instead so that we can tie this in??

<sup>1</sup> Wisqars

<sup>2</sup> World report

<sup>3</sup> NCHS Data brief 2018

<sup>4</sup> Kegler et al 2017

<sup>5</sup> WISQARS Nonfatal injury reports

<sup>6</sup> National Strategy for Suicide Prevention



## METHODS (179/250 words)

Suicide rate estimates and trend analyses exclude data for persons <10 years old. Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases 10<sup>th</sup> Revision* [ICD-10] underlying-cause-of death codes X60-X84, Y87.0, \*U03). Age-specific population estimates were obtained from U.S. Census Bureau / National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods covering years 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Data from the 2015 National Violent Death Reporting System (NVDRS), from 27 states, were used to compare the characteristics, including precipitating circumstances, of suicide decedents with and without known mental health problems. NVDRS compiles data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports.

## RESULTS (166/600 words)

The most recent overall suicide rates (representing 2014-2016) ranged from 6.9 (District of Columbia [D.C.]) to 29.2 (Montana) per 100,000 persons per year, a four-fold difference (Table 1). Across the entire study period, rates increased in all but one state (Nevada), with increases ranging from +0.2 (Delaware) to +8.1 (Wyoming). Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with percentage increases of at least 25% observed in over half of all states (30), as well as nationally. Geographically, many states showing the largest percentage increases are in the upper Great Plains and the upper Intermountain West (Map).

Modeled suicide rates trends were found to be significantly increasing for 44 states, as well as for the U.S. overall (Table 1). By sex, rate trends were found to be significantly increasing in 34 states for males and in 43 states for females. Nationally, the model-estimated AAPC for overall suicide rates was +1.5%. By sex, the national AAPC was +1.1% for males and +2.6% for females.

INSERT KATIE'S RESULTS HERE

## DISCUSSION (920/700 words)

The current study highlights state-specific trends in suicide among people  $\geq 10$  years, over time by state and by sex. It also provides a snapshot of circumstances of suicide among people with and without known mental health problems to provide insight into the growing suicide problem in the US. Findings that national suicide rates increased significantly, overall (+25.4%), and among both males and females, aligns with past studies reporting on rate increases over time and across demographic subgroups.<sup>3,4,7</sup> To extend this information, novel state-specific trend analyses identified overall suicide rate increases in 44 states. Five remaining states and D.C. reported non-significant rate increases and Nevada, showed an overall decline in suicide rates.

The geographic distribution of rate increases suggests that many regions already known to have the highest rates of suicide in the country (e.g. mountain west), also experienced some of the largest percent increases in suicide rates. Conversely, regions that once seemed more protected from suicide (e.g. northeast, midwest) also saw large percent rate increases. Explanations for these increases may relate, in part, to the opioid overdose

**Comment [SD():** We need to consider changing this as I don't have space to include in the abstract, intro, and it hasn't been included in the methods—basically not incorporated at all.

**Comment [SD():** We also have some additional data that is forthcoming on the types of recent crises, FYI so that may be added as well.

**Comment [SD():** Thinking to put something in here about the overlap in suicide rates and opioid overdose deaths.

<sup>7</sup> Asha's paper



epidemic that occurred over the same time period,<sup>8</sup> and the downturn in the economy in the period 2007-2009.<sup>9</sup>

Some studies also suggest a negative impact of social media, particularly among youth.<sup>10</sup>

Related to gender, female suicide rates increased in more states (43) than did male suicide rates (34). This may hint at a narrowing of the suicide gender gap, as has been found related to suicide in other demographic groupings (e.g. by urbanization level).<sup>4,7</sup> It also aligns with reports of large increase in middle aged female suicides between 1999-2014.<sup>11</sup> This may signal an increases in risk factors more common among females (e.g., intimate partner violence) or may reflect a differential impact of common suicide risk factors (e.g., substance abuse) by sex. More research on this topic is needed.

Mental illness is an import risk factor for suicide. Unlike other studies,<sup>12</sup> the current study found that more than half of people (54%) did *not* have a known mental health problem. Among people who did, just over half were known to be in treatment at the time of their deaths, about one-third were reported to never have received any mental health treatment, and between about 30-40% had a history of ideation and/or suicide attempts. This points to the need for increased identification of, and improved responses to, people at risk, and highlights the need for better access to care that is evidence-based (e.g. collaborative), affordable, and sustained in order to prevent suicide attempts, re-attempts, and suicide.

While there is a tendency to focus primary attention to the risk fact of mental illness, risk factors for suicide are manifold. Stratifying analyses by suicides among people with and without known mental health problems allowed for the examination of other contributing risk factors within these groups. Results suggest many differences in the prevalence of circumstances, for example people without mental health problems were more likely to have criminal-legal problems, eviction/loss of home, and recent crises. However, some circumstances such as intimate partner problems, arguments/conflicts, recent crises, and physical health problems are common across groups. Whether the two groups are viewed as more similar or more unique, results are clear that multiple challenging life circumstances impacted both.

Both state trends and circumstance findings point to the same solution—the need for a comprehensive public health approach to suicide, inclusive of multiple and multi-level evidence-based strategies and approaches that: i) prevent suicide risk before it occurs, e.g., by strengthening economic supports, strengthening access to, and coverage of, care that is safe and effective; creating protective environments (e.g. reducing access to lethal means among people at risk); promoting connectedness, and teaching coping and problem-solving skills; ii) identify and support people already at risk, e.g. through gatekeeper training, crisis intervention, referral to effective treatments, and prevention of re-attempts; and iii) lessen harms after a suicide (e.g., supporting survivors and promoting responsible media reporting to avoid suicide contagion).<sup>13</sup> As of yet, no state has been able to implement such a comprehensive approach.

#### Limitations

The findings provided of this report are subject to at least two limitations. Data for state level analyses extend to 2016, the date for which the most recent mortality data is available, and data from NVDRS come from 2015 and cover only 27 states. Abstractors of NVDRS data are limited to data included in the investigative reports they

Comment [SD(): May take this out.

Comment [SD(): Is this too pointed or strong?

Comment [SD(): This is a slightly different way to present this info. What do you think?

Comment [SD(): Is it nationally representative at this point? Or no?

<sup>8</sup> <https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6450a3.htm> Rudd et al MMWR 2016

<sup>9</sup> Need ref here

<sup>10</sup> Need ref

<sup>11</sup> <https://www.cdc.gov/nchs/data/databriefs/db241.pdf>

<sup>12</sup>

<sup>13</sup> Stone DM, Holland KM, Bartholow BN, Crosby AE, Jack SPD, Wilkins N. Preventing suicide: a technical package of policies, programs and practices. Atlanta, GA: US Department of Health and Human Services, CDC; 2017.



receive. For example, medical and mental health information are not captured directly from medical records but from coroner/medical examiner reports and the decedent's family members and friends. Therefore, the completeness and accuracy of this information are limited by the knowledge of the informant. This may explain some of the discrepancy between the prevalence of mental health disorders reported here (54%) and the 90% statistic frequently cited in other studies.<sup>14</sup>

## Conclusions

Suicide is a growing public health problem with states experiencing large increases in rates between 1999 and 2016. Mental illness is an important risk factor for suicide and it is one of many factors. Comprehensive suicide prevention strategies are needed in states that encompass risk factors at multiple levels and that work to prevent suicide risk before it occurs, to identify and successfully support people at-risk, and that lessens future harms.

Corresponding author

References

Tables and figures

---

<sup>14</sup> Need ref here



### Structured abstract (249/250 words)

**Background:** Suicide rates between 1999 and 2016 have been on the rise in the United States (U.S.). Examining state-level trends in, and contributing circumstances to, suicide, can inform movement towards the goal of comprehensive state suicide prevention.

**Methods:** Trends in age-adjusted suicide rates, overall and by sex and state, among people aged  $\geq 10$ , were calculated using data from the National Vital Statistics System. Changes in rates and state rankings were assessed across six consecutive three-year periods (1999-2001, 2002-2004, 2005-2007, 2008-2010, 2011-2013, 2014-2016). Data from the 2015 National Violent Death Reporting System, across 27 states, were analyzed to compare circumstances between suicide decedents with and without known mental health problems.

**Results:** Average annual percentage change in suicide rates across the period, increased significantly in the U.S. overall (25.4%) and in 44 states, ranging from 5.9% in Delaware to 57.6% in North Dakota. People with (46%) and without (54%) known mental health problems, experienced a range of multiple contributing circumstances to their suicides, including substance use, relationship problems, and recent crises.

**Conclusions:** Suicide rates have risen significantly in the U.S. and across most states from 1999-2016. Numerous factors contribute to suicide among people with and without known mental health problems.

**Implications for Public Health Practice:** To reverse upward trends in suicide, a population-based public health approach inclusive of evidence-based strategies across multiple levels (individual, family/relationship, community, societal), focused on preventing risk before it starts, identifying and supporting people already at risk, preventing-re-attempts, and caring for survivors after a suicide, is needed.

### INTRODUCTION ((283/250 words)

In 2016, nearly 45,000 suicides (13.4/100,000) occurred in the United States (U.S.).<sup>1</sup> While overall rates have been on the decline globally,<sup>2</sup> rates of suicide in the U.S. have increased between 1999 and 2016 across most age groups, among males and females, across racial/ethnic groups, and across urbanization levels.<sup>3</sup> Rates of nonfatal attempts have also been on the rise, with emergency department visits for self-harm injury having increased more than 40% between 2001 and 2015.<sup>5</sup> In 2015, the economic toll of suicides and self-harm injuries totaled more than \$69 billion in direct medical and work loss costs. Suicide is rarely caused by one thing; rather, the risk factors for suicide are numerous and occur at multiple levels (individual, family/relationship, community, and societal).<sup>6</sup> However, the focus tends to point towards mental illnesses, such as depression and bipolar disorder, as the cause. Other factors associated with suicide include lack of social connectedness, downturns in the economy, access to lethal means (e.g. substances, firearms) among people at risk, lack of access to quality evidence-based treatment, irresponsible media reporting, lack of coping/problem-solving skills, stigma associated with help-seeking, and a prior suicide attempt, among others. While the Surgeon General called for a comprehensive public health approach to suicide prevention in 1999, to date, the U.S. continues to struggle to make this a reality due to a lack of funding for implementation of evidence-based prevention strategies, misperceptions about suicide preventability, and a prevention focus primarily downstream. The

**Comment [SD()]:** Does this seem too abrupt or unclear as in, "why look at suicide within those two groups?"

**Comment [SD()]:** Could also say, no single factor alone contributes to suicide.

**Comment [SD()]:** If NCHS data brief has urbanization we can take this reference out if we need space for others.

**Comment [SD()]:** This needs updating for 2016 but ED data is still for 2015.

**Comment [SD()]:** Need idea for reference here.

**Comment [SD()]:** Do we want to say opioids as an example here instead so that we can tie this in??

<sup>1</sup> Wisqars

<sup>2</sup> World report

<sup>3</sup> NCHS Data brief 2018

<sup>4</sup> Kegler et al 2017

<sup>5</sup> WISQARS Nonfatal injury reports

<sup>6</sup> National Strategy for Suicide Prevention



current study examines increases in state suicide rates over time and circumstances contributing to suicide among people with and without mental health problems.

#### **METHODS (179/250 words)**

Suicide rate estimates and trend analyses exclude data for persons <10 years old. Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases 10<sup>th</sup> Revision* [ICD-10] underlying-cause-of death codes X60-X84, Y87.0, \*U03). Age-specific population estimates were obtained from U.S. Census Bureau / National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods covering years 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Data from the 2015 National Violent Death Reporting System (NVDRS), from 27 states, were used to compare the characteristics, including precipitating circumstances, of suicide decedents with and without known mental health problems. NVDRS compiles data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports.

#### **RESULTS (756/600 words)**

The most recent overall suicide rates (representing 2014-2016) ranged from 6.9 (District of Columbia [D.C.]) to 29.2 (Montana) per 100,000 persons per year, a four-fold difference (Table 1). Across the entire study period, rates increased in all but one state (Nevada), with increases ranging from +0.2 (Delaware) to +8.1 (Wyoming). Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with percentage increases of at least 25% observed in over half of all states (30), as well as nationally. Geographically, many states showing the largest percentage increases are in the upper Great Plains and the upper Intermountain West (Map).

Modeled suicide rates trends were found to be significantly increasing for 44 states, as well as for the U.S. overall (Table 1). By sex, rate trends were found to be significantly increasing in 34 states for males and in 43 states for females. Nationally, the model-estimated AAPC for overall suicide rates was +1.5%. By sex, the national AAPC was +1.1% for males and +2.6% for females.

Suicide decedents with (N=9,407) and without (N=11,039) known mental health (MH) problems were compared. Both groups were predominately male and predominately non-Hispanic white. Fifteen percent of those with known mental health problems and 20% without had ever served in the U.S. military.

Suicide decedents without known MH problems had 2.3 greater odds of being male (95% confidence interval [CI] = 2.2-2.5), and significantly greater odds of race/ethnicity other than non-Hispanic white (odds ratio [OR] range: 1.0-2.1; 95% CI range [1.0-1.3] – [1.6-2.0]). They had significantly greater odds of dying by suicide after committing homicide(s) (adjusted odds ratio [aOR] = 2.9, 95% CI = 2.2-3.8), of firearm suicide (aOR = 1.6, 95% CI = 1.5-1.7), and of positive toxicology results for alcohol (aOR = 1.2, 95% CI = 1.1-1.3).

Although firearms were the most common injury mechanism for both groups, suicide decedents with known MH problems more often died by poisoning than those without MH problems (19.8% vs. 10.4%), most frequently due to overdose of over-the-counter/otherwise unclassified drugs (35.8%), opioids (32.7%), antidepressants (34.6%) or benzodiazepines (25.1%).

**Comment [SD]:** Need to decide on decedent or victims. Both are used here. I prefer decedent.

**Comment [SD]:** We need to consider changing this as I don't have space to include in the abstract, intro, and it hasn't been included in the methods—basically not incorporated at all.



All suicide decedents with known MH problems (N=9,407) and approximately 85% without known MH problems (N=9,357) had known precipitating circumstances. Decedents without known MH problems had significantly greater odds of any type of relationship problem or loss (aOR = 1.3, 95% CI = 1.2-1.4), intimate partner problems specifically (aOR = 1.4, 95% CI = 1.3-1.5), an argument or conflict (aOR = 1.4, 95% CI = 1.3-1.5), and having been a recent perpetrator of interpersonal violence (aOR = 2.0, 95% CI = 1.6-2.4) noted as a factor precipitating suicide. Decedents with known MH problems more frequently had a history of mental health or substance abuse treatment (67.2% vs. 4.2%), and co-occurring substance abuse problems (31.6% vs. 25%,  $p \leq .01$ ),

Suicide decedents without known MH problems had significantly greater odds of other life stressors as precipitating circumstances, including recent/impending criminal legal problems (aOR = 1.7, 95% CI = 1.5-1.9), and eviction/loss of home (aOR = 1.4, 95% CI 1.2-1.6). They had significantly lower odds of recent release from an institution of any kind, but when this was indicated, significantly greater odds of recent release from a correctional facility (aOR = 4.5, 95% CI = 3.2-6.3), or hospital (aOR = 1.3, 95% CI = 1.1-1.7). Of those decedents with known MH problems who were recently released from an institution, 42.8% had been recently released from a psychiatric institution. Those with known MH problems also more frequently had job or financial problems (16.8% vs. 15.6%;  $p \leq .05$ ).

Decedents without known MH problems had significantly greater odds of a recent/impending crisis (aOR = 1.4, 95% CI = 1.3-1.5). When the type of crisis was known, it was most frequently a problem related to an intimate partner (36.2%), physical health (13.8%), criminal legal issues (13.6%), a family relationship (7.1%), or a job (5.3%). Over one-fourth of decedents with a known MH problem also had recent or impending crises, most frequently related to problems with an intimate partner (34.9%), physical health (12.9%), or a family relationship (8.7%). Decedents without known MH problems had significantly greater odds of criminal legal (aOR = 1.6, 95% CI = 1.3-1.9), and significantly lesser odds of job-related (aOR = 0.7, 95% CI = 0.5-0.8) crises.

Suicide decedents without known MH problems had significantly greater odds of leaving a suicide note (aOR = 1.2, 95% CI = 1.1-1.2), while decedents with known MH problems more often had a history of suicidal ideation (40.8% vs. 23.0%,  $p \leq .01$ ) and attempts (29.4% vs. 10.3%,  $p \leq .01$ ).

## DISCUSSION (920/700 words)

The current study highlights state-specific trends in suicide among people  $\geq 10$  years, over time by state and by sex. It also provides a snapshot of circumstances of suicide among people with and without known mental health problems to provide insight into the growing suicide problem in the US. Findings that national suicide rates increased significantly, overall (+25.4%), and among both males and females, aligns with past studies reporting on rate increases over time and across demographic subgroups.<sup>3,4,7</sup> To extend this information, novel state-specific trend analyses identified overall suicide rate increases in 44 states. Five remaining states and D.C. reported non-significant rate increases and Nevada, showed an overall decline in suicide rates.

The geographic distribution of rate increases suggests that many regions already known to have the highest rates of suicide in the country (e.g. mountain west), also experienced some of the largest percent increases in suicide rates. Conversely, regions that once seemed more protected from suicide (e.g. northeast, midwest) also saw large percent rate increases. Explanations for these increases may relate, in part, to the opioid overdose epidemic that occurred over the same time period,<sup>8</sup> and the downturn in the economy in the period 2007-2009.<sup>9</sup> Some studies also suggest a negative impact of social media, particularly among youth.<sup>10</sup>

**Comment [SD()]:** We also have some additional data that is forthcoming on the types of recent crises, FYI so that may be added as well.

**Comment [SD()]:** Thinking to put something in here about the overlap in suicide rates and opioid overdose deaths.

**Comment [SD()]:** May take this out.

<sup>7</sup> Asha's paper

<sup>8</sup> <https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6450a3.htm> Rudd et al MMWR 2016



Related to gender, female suicide rates increased in more states (43) than did male suicide rates (34). This may hint at a narrowing of the suicide gender gap, as has been found related to suicide in other demographic groupings (e.g. by urbanization level).<sup>4,7</sup> It also aligns with reports of large increase in middle aged female suicides between 1999-2014.<sup>11</sup> This may signal an increases in risk factors more common among females (e.g., intimate partner violence) or may reflect a differential impact of common suicide risk factors (e.g., substance abuse) by sex. More research on this topic is needed.

Mental illness is an import risk factor for suicide. Unlike other studies,<sup>12</sup> the current study found that more than half of people (54%) did *not* have a known mental health problem. Among people who did, just over half were known to be in treatment at the time of their deaths, about one-third were reported to never have received any mental health treatment, and between about 30-40% had a history of ideation and/or suicide attempts. This points to the need for increased identification of, and improved responses to, people at risk, and highlights the need for better access to care that is evidence-based (e.g. collaborative), affordable, and sustained in order to prevent suicide attempts, re-attempts, and suicide.

While there is a tendency to focus primary attention to the risk fact of mental illness, risk factors for suicide are manifold. Stratifying analyses by suicides among people with and without known mental health problems allowed for the examination of other contributing risk factors within these groups. Results suggest many differences in the prevalence of circumstances, for example people without mental health problems were more likely to have criminal-legal problems, eviction/loss of home, and recent crises. However, some circumstances such as intimate partner problems, arguments/conflicts, recent crises, and physical health problems are common across groups. Whether the two groups are viewed as more similar or more unique, results are clear that multiple challenging life circumstances impacted both.

Both state trends and circumstance findings point to the same solution—the need for a comprehensive public health approach to suicide, inclusive of multiple and multi-level evidence-based strategies and approaches that: i) prevent suicide risk before it occurs, e.g., by strengthening economic supports, strengthening access to, and coverage of, care that is safe and effective; creating protective environments (e.g. reducing access to lethal means among people at risk); promoting connectedness, and teaching coping and problem-solving skills; ii) identify and support people already at risk, e.g. through gatekeeper training, crisis intervention, referral to effective treatments, and prevention of re-attempts; and iii) lessen harms after a suicide (e.g., supporting survivors and promoting responsible media reporting to avoid suicide contagion).<sup>13</sup> As of yet, no state has been able to implement such a comprehensive approach.

#### Limitations

The findings provided of this report are subject to at least two limitations. Data for state level analyses extend to 2016, the date for which the most recent mortality data is available, and data from NVDRS come from 2015 and cover only 27 states. Abstractors of NVDRS data are limited to data included in the investigative reports they receive. For example, medical and mental health information are not captured directly from medical records but from coroner/medical examiner reports and the decedent's family members and friends. Therefore, the completeness and accuracy of this information are limited by the knowledge of the informant. This may explain

**Comment [SD()]:** Is this too pointed or strong?

**Comment [SD()]:** This is a slightly different way to present this info. What do you think?

**Comment [SD()]:** Is it nationally representative at this point? Or no?

<sup>9</sup> Need ref here

<sup>10</sup> Need ref

<sup>11</sup> <https://www.cdc.gov/nchs/data/databriefs/db241.pdf>

<sup>12</sup>

<sup>13</sup> Stone DM, Holland KM, Bartholow BN, Crosby AE, Jack SPD, Wilkins N. Preventing suicide: a technical package of policies, programs and practices. Atlanta, GA: US Department of Health and Human Services, CDC; 2017.



some of the discrepancy between the prevalence of mental health disorders reported here (54%) and the 90% statistic frequently cited in other studies.<sup>14</sup>

## Conclusions

Suicide is a growing public health problem with states experiencing large increases in rates between 1999 and 2016. Mental illness is an important risk factor for suicide and it is one of many factors. Comprehensive suicide prevention strategies are needed in states that encompass risk factors at multiple levels and that work to prevent suicide risk before it occurs, to identify and successfully support people at-risk, and that lessens future harms.

**Corresponding author:** Deborah M. Stone, Division of Violence Prevention, National Center for Injury Prevention and Control, CDC. Telephone: 770-488-3942; E-mail: [zaf9@cdc.gov](mailto:zaf9@cdc.gov)

## References

## Tables and figures

---

<sup>14</sup> Need ref here

## Structured abstract (241/250 words)

**Background:** Suicide rates have been ~~risking-rising~~ in the United States (U.S.). Examining state-level trends in, and contributing circumstances to, suicide, can inform comprehensive state suicide prevention planning.

**Methods:** Trends in age-adjusted suicide rates, ~~overall and by sex and state, by state and sex~~, among people aged ≥10 years, were ~~calculated~~ ~~evaluated~~ using data from the National Vital Statistics System. Changes in rates and state rankings were assessed across six consecutive three-year periods (1999-2001, 2002-2004, 2005-2007, 2008-2010, 2011-2013, 2014-2016). Data from the 2015 National Violent Death Reporting System, across 27 states, were analyzed to compare circumstances between suicide decedents with and without known mental health problems.

**Results:** ~~(Average annual percentage change in suicide rates increased significantly in the U.S. overall (25.4%) and in 44 states, with relative increases ranging from 5.9% in Delaware to 57.6% in North Dakota). Statistically significant upward rate trends were identified for 44 states. (For the U.S. overall and for 30 states individually, empirical rates increased by at least 25% over the study period.)~~ People with (46%) and without (54%) known mental health problems experienced a range of contributing circumstances to their suicides, including recent crises and problems related to substance use, relationships, job/financial issues, criminal-legal matters and recent.

**Conclusions:** Suicide rates have risen significantly in the U.S. and across most states from 1999-2016. No single factor alone contributes to suicide.

**Implications for Public Health Practice:** To reverse upward trends in suicide, states can use a population-based public health approach inclusive of evidence-based strategies across multiple levels (individual, family/relationship, community, societal), focused on preventing risk before it starts, identifying and supporting people already at risk, preventing-re-attempts, and caring for survivors after a suicide.

## INTRODUCTION

### BACKGROUND AND PURPOSE (210/250 words) TOTAL COUNT=1900/1800

In 2016, nearly 45,000 suicides (13.4/100,000) occurred in the United States (U.S.).<sup>1</sup> While overall rates have been declining globally,<sup>2</sup> rates of suicide in the U.S. have increased between 1999 and 2016, among males and females, across racial/ethnic groups, and across urbanization levels.<sup>3,4</sup> Emergency department visits for nonfatal self-harm injuries increased by more than 40% between 2001 and 2015.<sup>5</sup> In 2015, suicides and self-harm injuries cost the nation more than \$69 billion in direct medical and work loss costs.<sup>1</sup> Suicide is rarely caused by one factor, rather, the risks are often numerous and occur at multiple levels--individual, family/relationship, community, and societal.<sup>6</sup> Despite this, ~~prevention primarily centers on mental illness,~~ (e.g., depression bipolar disorder). Other factors associated with suicide include social isolation, economic downturns, access to lethal means (e.g. ~~substances~~, firearms) among people at risk, childhood adversity, lack of coping and problem-solving skills, loss of a friend or family member to suicide, a prior suicide attempt, and unsafe media portrayals, among others.<sup>6</sup> While the Surgeon General called for a comprehensive public health approach to suicide prevention in 1999, to date, most states struggle to make this a reality.<sup>7</sup> To better assist states, this study analyzes trends in state suicide rates, assesses the multiple factors associated with suicide, and provides prevention recommendations.

### METHODS (259/250 words)

Comment [snk6]:

This is the key stratification in my view.

Comment [snk6]:

The word "assessed" would also be fine here.

Comment [snk6]:

Probably shouldn't mix the inferential findings with the descriptive findings in the same sentence. Also, we might not be able to afford the word space in the Abstract to talk about individual states.

Comment [snk6]:

And for 29 of these 30 states, the modeled rate trends were also statistically significant. So these two sentences together, while keeping the inferential and descriptive findings separate, provide a scientifically accurate summary.

Comment [SD()]: Need to update

Comment [SD()]: Need reference here.

Comment [SD()]: Do we want to say opioids as an example here instead so that we can tie this in??



Suicide rate estimates and trend analyses exclude data for persons <10 years old. Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases 10<sup>th</sup> Revision* [ICD-10] underlying-cause-of death codes X60-X84, Y87.0, \*U03).<sup>8</sup> Age-specific population estimates were obtained from U.S. Census Bureau / National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods covering years 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Data from 2015 from the 27 states with complete data participating in the National Violent Death Reporting System (NVDRS) were used to compare the characteristics, including precipitating circumstances, of deaths by suicide among decedents with and without known current mental health problems (MHP). Mental health problems are defined in NVDRS as disorders and syndromes listed in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5),<sup>9</sup> with the exception of alcohol and other substance dependence (captured in separate variables). NVDRS compiles data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known MHP were compared using Chi-square tests; logistic regression was used to estimate adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and race/ethnicity.

## **RESULTS (696/600 words)**

The most recent overall suicide rates (representing 2014-2016) ranged from 6.9 (District of Columbia [D.C.]) to 29.2 (Montana) per 100,000 persons per year, a four-fold difference (Table 1). Across the entire study period, rates increased in all but one state (Nevada), with increases ranging from +0.2 (Delaware) to +8.1 (Wyoming). Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with percentage increases of at least 25% observed in over half of all states (30), as well as nationally.

Modeled suicide rates trends were found to be significantly increasing for 44 states, as well as for the U.S. overall (Table 1). By sex, rate trends were found to be significantly increasing in 34 states for males and in 43 states for females. Nationally, the model-estimated AAPC for overall suicide rates was +1.5%. By sex, the national AAPC was +1.1% for males and +2.6% for females.

Suicide decedents with (N=9,407) and without (N=11,039) known mental health problems (MHP) were compared. While both groups were predominately male and non-Hispanic white, suicide decedents without known MHP had 2.3 greater odds of being male (95% confidence interval [CI] = 2.2-2.5), and significantly greater odds of being racial/ethnic minorities (odds ratio [OR] range: 1.0-2.1; 95% CI range [1.0-1.3] – [1.6-2.0]). They also had significantly greater odds of perpetrating homicide-suicide (adjusted odds ratio [aOR] = 2.9, 95% CI = 2.2-3.8), of firearm suicide (aOR = 1.6, 95% CI = 1.5-1.7), and of positive toxicology results for alcohol (aOR = 1.2, 95% CI = 1.1-1.3). Fifteen percent of those with known MHP and 20% without ever served in the U.S. military.

Although firearms were used most often in both groups, decedents with known MHP died by poisoning more than those without MHP (19.8% vs. 10.4%), most frequently by over-the-counter/otherwise unclassified drugs (35.8%), opioids (32.7%), antidepressants (34.6%) or benzodiazepines (25.1%).

All suicide decedents with known MHP (N=9,407) and approximately 85% without known MHP (N=9,357) had known precipitating circumstances. Decedents without known MHP had significantly greater odds of any type of relationship problem (aOR = 1.3, 95% CI = 1.2-1.4), and specifically of intimate partner problems (aOR = 1.4, 95%

CI = 1.3-1.5), arguments or conflicts (aOR = 1.4, 95% CI = 1.3-1.5), and having recently perpetrator interpersonal violence (aOR = 2.0, 95% CI = 1.6-2.4). Two-thirds of decedents with known MHP had a history of MH or substance abuse treatment (67.2%), and were more likely to have any substance abuse problems (31.6% vs. 25%,  $p \leq .01$ ).

Suicide decedents without known MHP had significantly greater odds of other life stressors, such as a criminal legal problems (aOR = 1.7, 95% CI = 1.5-1.9), or eviction/loss of home (aOR = 1.4, 95% CI = 1.2-1.6). They had significantly lower odds of recent release from any institution, but when a release was indicated, they were significantly more likely to be released from a correctional facility (aOR = 4.5, 95% CI = 3.2-6.3), or hospital (aOR = 1.3, 95% CI = 1.1-1.7). Among decedents with known MHP who were recently released from an institution, 42.8% release was from a psychiatric institution. Those with known MHP also more frequently had job and/or financial problems (16.8% vs. 15.6%;  $p \leq .05$ ).

Decedents without known MHP had significantly greater odds of a recent/impending crisis (aOR = 1.4, 95% CI = 1.3-1.5). When the type of crisis was known, it was most frequently a problem related to an intimate partner (36.2%), physical health (13.8%), criminal legal issues (13.6%), a family relationship (7.1%), or a job (5.3%). Over one-fourth of decedents with a known MH problem also had recent or impending crises, most frequently related to problems with an intimate partner (34.9%), physical health (12.9%), or a family relationship (8.7%). Decedents without known MHP had significantly greater odds of criminal legal problems (aOR = 1.6, 95% CI = 1.3-1.9), and significantly lowered odds of job-related (aOR = 0.7, 95% CI = 0.5-0.8) crises.

Suicide decedents without known MHP had significantly greater odds of leaving a suicide note (aOR = 1.2, 95% CI = 1.1-1.2), while decedents with known MHP more often had a history of suicidal ideation (40.8% vs. 23.0%,  $p \leq .01$ ) and attempts (29.4% vs. 10.3%,  $p \leq .01$ ).

### Conclusions and Comments (735/700 words)

During the time period 1999-2016, age-adjusted suicide rates among people  $\geq 10$  years increased 25.4% overall. Forty-four states saw significant rate increases and one (Nevada) state saw a significant decline. Suicide rates increased by more than 25% in 30 states and upwards of 50% in some.

Among females, rates increased in 43 states and rates among males increased in 34. This signal of increasing vulnerability of females towards suicide aligns with recent reports that identified a 63% increase in middle-aged female suicide rates between 1999-2014 and an annual increase of 18.8% per year in emergency department visits for self-inflicted injuries among young females, aged of 10 and 14, in the period 2009-2015.<sup>3,10</sup> These increases may hint at a narrowing of the suicide gender gap, historically weighted towards males by a ratio of 4-5:1.<sup>11</sup> More research into this troubling trend is needed.

One important factor associated with suicide is mental health problems. Nearly half of people in this study had a known mental health problem. This group was challenged by comorbid substance abuse problems (31.6%) and histories of suicide ideation (40.8%) and attempts (29.4%). While two-thirds of people with MHP had a history of mental health and/or substance abuse treatment and over half were currently in treatment at the time of their deaths, much more support for this vulnerable population is needed. This includes the need for broader implementation of affordable and evidence-based treatments, such as doctor-patient collaborative care models and cognitive-behavioral therapy.<sup>12</sup> Additionally, greater access to behavioral health providers, especially in underserved areas is needed, as is healthcare systems change that supports suicide prevention and patient safety.<sup>12</sup>

**Comment [SD]:** We also have some additional data that is forthcoming on the types of recent crises, FYI so that may be added as well.



While MHP are a significant contributor to suicide, 54% of suicide decedents in the current study did *not* have a known MPH. This group suffered more life stressors, especially related to relationships (e.g. intimate partner problems, arguments or conflicts, recent perpetration of intimate partner violence), but also related to other life stressors such as criminal-legal matters, eviction/loss of home, and recent or impending crises (often related to the abovementioned factors). People with known MHP also experienced life and other stressors apart from their MPH. This group was more likely to experience job and/or financial problems. Also common were intimate partner problems (24.1%), physical health problems (21.4%), and recent or impending crises (26%).

These results point to the need for comprehensive suicide prevention that goes beyond a focus on MH treatment alone. These strategies may include: strengthening economic supports (e.g. housing stabilization policies, household financial support), teaching coping and problem-solving skills and other pro-social norms, especially early in life to manage everyday stressors and to prevent future relationship problems; and promoting social connectedness to increase a sense of belongingness and access to informational, tangible, emotional, and social support, as needed. Other strategies indicated by these results include creating protective environments (e.g., reducing access to lethal means among people at risk, and creating organizational and workplace policies to promote help-seeking and positive social norms), and supporting people after a suicide has taken place to prevent survivors' risk and to assure safe reporting by the media in order to prevent suicide contagion.<sup>12</sup>

The findings provided of this report are subject to at least three limitations. In four states, Maryland (MD), Utah (UT), Massachusetts (MA), and Rhode Island (RI), state rankings might have been impacted by large proportions of deaths of undetermined intent (MD), or by decreased percentages of undetermined deaths over time (UT, MA, RI). Second, data for state level analyses extend from 1999 to 2016, however, data on circumstances of suicide come from a single year (2015) and encompass only 27 states. Third, abstractors of NVDRS data are limited to data included in the investigative reports they receive. For example, medical and mental health information are not captured directly from medical records but from coroner/medical examiner reports and the decedent's family members and friends. Therefore, knowledge of the informant impacts completeness and accuracy of the information reported. This may explain some of the discrepancy between the prevalence of mental health disorders reported here (54%) and the 90% statistic frequently cited in other studies.<sup>13</sup>

Suicide is a growing public health problem and mental illness is an important risk factor for suicide, but is just one of many associated factors. Resources such as CDC's *Preventing Suicide: a Technical Package of Policies, Programs, and Practices*<sup>12</sup> and the National Violent Death Reporting System can help states and communities prioritize comprehensive suicide prevention.

## References

- 1 Wisqars fatal injury reports
- 2 World report
- 3 NCHS Data brief 2014
- 4 Kegler et al 2017
- 5 WISQARS Nonfatal injury reports
- 6 National Strategy for Suicide Prevention
- 7 Davidson, L., Potter, L., and Ross, V. (1999) Surgeon General's Call to Action to Prevent Suicide. Public Health Service (DHHS), Rockville, MD.
- 8 ICD-10
- 9 DSM-5
- 10 Melissa's paper
- 11 Need ref
- 12 Technical package

Comment [SD()]: Is it nationally representative at this point? Or no?

Comment [SD()]: Keep this?

**Acknowledgments**

Comms and Policy

**Conflict of Interest** None

**Corresponding author** D Stone

**Tables and Figures**



## Structured abstract (241/250 words)

**Background:** Suicide rates have been rising in the United States (U.S.). Examining state-level trends in, and contributing circumstances to, suicide, can inform comprehensive state suicide prevention planning.

**Methods:** Trends in age-adjusted suicide rates, overall and by sex and state, among people aged ≥10 years, were calculated using data from the National Vital Statistics System. Changes in rates and state rankings were assessed across six consecutive three-year periods (1999-2001, 2002-2004, 2005-2007, 2008-2010, 2011-2013, 2014-2016). Data from the 2015 National Violent Death Reporting System, across 27 states, were analyzed to compare circumstances between suicide decedents with and without known mental health problems.

**Results:** Average annual percentage change in suicide rates increased significantly in the U.S. overall (25.4%) and in 44 states, with relative increases ranging from 5.9% in Delaware to 57.6% in North Dakota. People with (46%) and without (54%) known mental health problems experienced a range of contributing circumstances to their suicides, including recent crises and problems related to substance use, relationships, job/financial issues, criminal-legal matters and recent.

**Conclusions:** Suicide rates have risen significantly in the U.S. and across most states from 1999-2016. No single factor alone contributes to suicide.

**Implications for Public Health Practice:** To reverse upward trends in suicide, states can use a population-based public health approach inclusive of evidence-based strategies across multiple levels (individual, family/relationship, community, societal), focused on preventing risk before it starts, identifying and supporting people already at risk, preventing-reattempts, and caring for survivors after a suicide.

## INTRODUCTION

### BACKGROUND AND PURPOSE (210/250 words) TOTAL COUNT=1900/1800

In 2016, nearly 45,000 suicides (13.4/100,000) occurred in the United States (U.S.).<sup>1</sup> While overall rates have been declining globally,<sup>2</sup> rates of suicide in the U.S. have increased between 1999 and 2016, among males and females, across racial/ethnic groups, and across urbanization levels.<sup>3,4</sup> Emergency department visits for nonfatal self-harm injuries increased by more than 40% between 2001 and 2015.<sup>5</sup> In 2015, suicides and self-harm injuries cost the nation more than \$69 billion in direct medical and work loss costs.<sup>1</sup> Suicide is rarely caused by one factor, rather, the risks are often numerous and occur at multiple levels--individual, family/relationship, community, and societal.<sup>6</sup> Despite this, prevention primarily centers on mental illness, (e.g., depression bipolar disorder). Other factors associated with suicide include social isolation, economic downturns, access to lethal means (e.g. substances, firearms) among people at risk, childhood adversity, lack of coping and problem-solving skills, loss of a friend or family member to suicide, a prior suicide attempt, and unsafe media portrayals, among others.<sup>6</sup> While the Surgeon General called for a comprehensive public health approach to suicide prevention in 1999, to date, most states struggle to make this a reality.<sup>7</sup> To better assist states, this study analyzes trends in state suicide rates, assesses the multiple factors associated with suicide, and provides prevention recommendations.

### METHODS (259/250 words)

Suicide rate estimates and trend analyses exclude data for persons <10 years old. Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases 10<sup>th</sup> Revision* [ICD-10] underlying-cause-of death codes X60-X84, Y87.0, \*U03).<sup>8</sup> Age-specific population

Comment [SD]: Need to update

Comment [SD]: Need reference here.

Comment [SD]: Do we want to say opioids as an example here instead so that we can tie this in??

estimates were obtained from U.S. Census Bureau / National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods covering years 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Data from 2015 from the 27 states with complete data participating in the National Violent Death Reporting System (NVDRS) were used to compare the characteristics, including precipitating circumstances, of deaths by suicide among decedents with and without known current mental health problems (MHP). Mental health problems are defined in NVDRS as disorders and syndromes listed in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5),<sup>9</sup> with the exception of alcohol and other substance dependence (captured in separate variables). NVDRS compiles data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known MHP were compared using Chi-square tests; logistic regression was used to estimate adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and race/ethnicity.

## **RESULTS (696/600 words)**

The most recent overall suicide rates (representing 2014-2016) ranged from 6.9 (District of Columbia [D.C.]) to 29.2 (Montana) per 100,000 persons per year, a four-fold difference (Table 1). Across the entire study period, rates increased in all but one state (Nevada), with increases ranging from +0.2 (Delaware) to +8.1 (Wyoming). Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with percentage increases of at least 25% observed in over half of all states (30), as well as nationally.

Modeled suicide rates trends were found to be significantly increasing for 44 states, as well as for the U.S. overall (Table 1). By sex, rate trends were found to be significantly increasing in 34 states for males and in 43 states for females. Nationally, the model-estimated AAPC for overall suicide rates was +1.5%. By sex, the national AAPC was +1.1% for males and +2.6% for females.

Suicide decedents with (N=9,407) and without (N=11,039) known mental health problems (MHP) were compared. While both groups were predominately male and non-Hispanic white, suicide decedents without known MHP had 2.3 greater odds of being male (95% confidence interval [CI] = 2.2-2.5), and significantly greater odds of being racial/ethnic minorities (odds ratio [OR] range: 1.0-2.1; 95% CI range [1.0-1.3] – [1.6-2.0]). They also had significantly greater odds of perpetrating homicide-suicide (adjusted odds ratio [aOR] = 2.9, 95% CI = 2.2-3.8), of firearm suicide (aOR = 1.6, 95% CI = 1.5-1.7), and of positive toxicology results for alcohol (aOR = 1.2, 95% CI = 1.1-1.3). Fifteen percent of those with known MHP and 20% without ever served in the U.S. military.

Although firearms were used most often in both groups, decedents with known MHP died by poisoning more than those without MHP (19.8% vs. 10.4%), most frequently by over-the-counter/otherwise unclassified drugs (35.8%), opioids (32.7%), antidepressants (34.6%) or benzodiazepines (25.1%).

All suicide decedents with known MHP (N=9,407) and approximately 85% without known MHP (N=9,357) had known precipitating circumstances. Decedents without known MHP had significantly greater odds of any type of relationship problem (aOR = 1.3, 95% CI = 1.2-1.4), and specifically of intimate partner problems (aOR = 1.4, 95% CI = 1.3-1.5), arguments or conflicts (aOR = 1.4, 95% CI = 1.3-1.5), and having recently perpetrator interpersonal violence (aOR = 2.0, 95% CI = 1.6-2.4). Two-thirds of decedents with known MHP had a history of MH or



substance abuse treatment (67.2% ), and were more likely to have any substance abuse problems (31.6% vs. 25%,  $p \leq .01$ ),

Suicide decedents without known MHP had significantly greater odds of other life stressors, such as a criminal legal problems (aOR = 1.7, 95% CI = 1.5-1.9), or eviction/loss of home (aOR = 1.4, 95% CI 1.2-1.6). They had significantly lower odds of recent release from any institution, but when a release was indicated, they were significantly more likely to be released from a correctional facility (aOR = 4.5, 95% CI = 3.2-6.3), or hospital (aOR = 1.3, 95% CI = 1.1-1.7). Among decedents with known MHP who were recently released from an institution, 42.8% release was from a psychiatric institution. Those with known MHP also more frequently had job and/or financial problems (16.8% vs. 15.6%;  $p \leq .05$ ).

Decedents without known MHP had significantly greater odds of a recent/impending crisis (aOR = 1.4, 95% CI = 1.3-1.5). When the type of crisis was known, it was most frequently a problem related to an intimate partner (36.2%), physical health (13.8%), criminal legal issues (13.6%), a family relationship (7.1%), or a job (5.3%). Over one-fourth of decedents with a known MH problem also had recent or impending crises, most frequently related to problems with an intimate partner (34.9%), physical health (12.9%), or a family relationship (8.7%). Decedents without known MHP had significantly greater odds of criminal legal problems (aOR = 1.6, 95% CI = 1.3-1.9), and significantly lowered odds of job-related (aOR = 0.7, 95% CI = 0.5-0.8) crises.

Suicide decedents without known MHP had significantly greater odds of leaving a suicide note (aOR = 1.2, 95% CI = 1.1-1.2), while decedents with known MHP more often had a history of suicidal ideation (40.8% vs. 23.0%,  $p \leq .01$ ) and attempts (29.4% vs. 10.3%,  $p \leq .01$ ).

### **Conclusions and Comments (735/700 words)**

During the time period 1999-2016, age-adjusted suicide rates among people  $\geq 10$  years increased 25.4% overall. Forty-four states saw significant rate increases and one (Nevada) state saw a significant decline. Suicide rates increased by more than 25% in 30 states and upwards of 50% in some.

Among females, rates increased in 43 states and rates among males increased in 34. This signal of increasing vulnerability of females towards suicide aligns with recent reports that identified a 63% increase in middle-aged female suicide rates between 1999-2014 and an annual increase of 18.8% per year in emergency department visits for self-inflicted injuries among young females, aged of 10 and 14, in the period 2009-2015.<sup>3,10</sup> These increases may hint at a narrowing of the suicide gender gap, historically weighted towards males by a ratio of 4-5:1.<sup>11</sup> More research into this troubling trend is needed.

One important factor associated with suicide is mental health problems. Nearly half of people in this study had a known mental health problem. This group was challenged by comorbid substance abuse problems (31.6%) and histories of suicide ideation (40.8%) and attempts (29.4%). While two-thirds of people with MHP had a history of mental health and/or substance abuse treatment and over half were currently in treatment at the time of their deaths, much more support for this vulnerable population is needed. This includes the need for broader implementation of affordable and evidence-based treatments, such as doctor-patient collaborative care models and cognitive-behavioral therapy.<sup>12</sup> Additionally, greater access to behavioral health providers, especially in underserved areas is needed, as is healthcare systems change that supports suicide prevention and patient safety.<sup>12</sup>

While MHP are a significant contributor to suicide, 54% of suicide decedents in the current study did *not* have a known MPH. This group suffered more life stressors, especially related to relationships (e.g. intimate partner problems, arguments or conflicts, recent perpetration of intimate partner violence), but also related to other

life stressors such as criminal-legal matters, eviction/loss of home, and recent or impending crises (often related to the abovementioned factors). People with known MHP also experienced life and other stressors apart from their MPH. This group was more likely to experience job and/or financial problems. Also common were intimate partner problems (24.1%), physical health problems (21.4%), and recent or impending crises (26%).

These results point to the need for comprehensive suicide prevention that goes beyond a focus on MH treatment alone. These strategies may include: strengthening economic supports (e.g. housing stabilization policies, household financial support), teaching coping and problem-solving skills and other pro-social norms, especially early in life to manage everyday stressors and to prevent future relationship problems; and promoting social connectedness to increase a sense of belongingness and access to informational, tangible, emotional, and social support, as needed. Other strategies indicated by these results include creating protective environments (e.g., reducing access to lethal means among people at risk, and creating organizational and workplace policies to promote help-seeking and positive social norms), and supporting people after a suicide has taken place to prevent survivors' risk and to assure safe reporting by the media in order to prevent suicide contagion.<sup>12</sup>

The findings provided of this report are subject to at least three limitations. In four states, Maryland (MD), Utah (UT), Massachusetts (MA), and Rhode Island (RI), state rankings might have been impacted by large proportions of deaths of undetermined intent (MD), or by decreased percentages of undetermined deaths over time (UT, MA, RI). Second, data for state level analyses extend from 1999 to 2016, however, data on circumstances of suicide come from a single year (2015) and encompass only 27 states. Third, abstractors of NVDRS data are limited to data included in the investigative reports they receive. For example, medical and mental health information are not captured directly from medical records but from coroner/medical examiner reports and the decedent's family members and friends. Therefore, knowledge of the informant impacts completeness and accuracy of the information reported. This may explain some of the discrepancy between the prevalence of mental health disorders reported here (54%) and the 90% statistic frequently cited in other studies.<sup>13</sup>

Suicide is a growing public health problem and mental illness is an important risk factor for suicide, but is just one of many associated factors. Resources such as CDC's *Preventing Suicide: a Technical Package of Policies, Programs, and Practices*<sup>12</sup> and the National Violent Death Reporting System can help states and communities prioritize comprehensive suicide prevention.

#### References (TO BE UPDATED)

- 1 Wisqars fatal injury reports
- 2 World report
- 3 NCHS Data brief 2014
- 4 Kegler et al 2017
- 5 WISQARS Nonfatal injury reports
- 6 National Strategy for Suicide Prevention
- 7 Davidson, L., Potter, L., and Ross, V. (1999) Surgeon General's Call to Action to Prevent Suicide. Public Health Service (DHHS), Rockville, MD.
- 8 ICD-10
- 9 DSM-5
- 10 Melissa's paper
- 11 Need ref
- 12 Technical package

#### Acknowledgments

Conflict of Interest None

Corresponding author D Stone

#### Tables and Figures

Comment [SD]: Is it nationally representative at this point? Or no?



### Structured abstract (241/250 words)

**Background:** Suicide rates have been rising in the United States (U.S.). Examining state-level trends in, and contributing circumstances to, suicide, can inform comprehensive state suicide prevention planning.

**Methods:** Trends in age-adjusted suicide rates, overall and by sex and state, among people aged ≥10 years, were calculated using data from the National Vital Statistics System. Changes in rates and state rankings were assessed across six consecutive three-year periods (1999-2001, 2002-2004, 2005-2007, 2008-2010, 2011-2013, 2014-2016). Data from the 2015 from the National Violent Death Reporting System, across 27 states, were analyzed to compare precipitating circumstances between suicide decedents with and without known mental health problems.

**Results:** Average annual percentage change in suicide rates increased significantly in the U.S. overall (25.4%) and in 44 states, with relative increases ranging from 5.9% in Delaware to 57.6% in North Dakota. People with (46%) and without (54%) known mental health problems experienced a range of contributing circumstances contributing to their suicides, including recent crises and problems related to substance use, relationships, job/financial issues, and criminal-legal matters and recent.

**Conclusions:** Suicide rates have risen significantly in the U.S. and across most states from 1999-2016. No single factor alone contributes to suicide. Differing circumstances contribute to suicides among those with and without mental health problems.

**Implications for Public Health Practice:** To reverse upward trends in suicide, states can use a population-based public health approach inclusive of evidence-based strategies across multiple levels (individual, family/relationship, community, societal), focused on preventing risk before it starts, identifying and supporting people already at risk, preventing-re-attempts, and caring for survivors after a suicide.

### INTRODUCTION

#### BACKGROUND AND PURPOSE (210/250 words) TOTAL COUNT=1900/1800

In 2016, nearly 45,000 suicides (13.4/100,000) occurred in the United States (U.S.).<sup>1</sup> While overall rates have been declining globally,<sup>2</sup> rates of suicide in the U.S. have increased between 1999 and 2016, among males and females, across racial/ethnic groups, and across urbanization levels.<sup>3,4</sup> Emergency department visits for nonfatal self-harm injuries increased by more than 40% between 2001 and 2015.<sup>5</sup> In 2015, suicides and self-harm injuries cost the nation more than \$69 billion in direct medical and work loss costs.<sup>1</sup> Suicide is rarely caused by one factor; rather, the risks are often numerous and occur at multiple levels—individual, family/relationship, community, and societal.<sup>6</sup> Despite this, prevention primarily centers on mental illness, (e.g., depression, bipolar disorder). Other factors associated with suicide include social isolation, economic downturns, access to lethal means (e.g., substances, firearms) among people at risk, childhood adversity, lack of coping and problem-solving skills, loss of a friend or family member to suicide, a prior suicide attempt, and unsafe media portrayals, among others.<sup>6</sup> While the Surgeon General called for a comprehensive public health approach to suicide prevention in 1999, to date, most states struggle to make this a reality.<sup>7</sup> To better assist states, this study analyzes trends in state suicide rates, assesses the multiple factors associated with suicide, and provides prevention recommendations.

#### METHODS (259/250 words)

Suicide rate estimates and trend analyses exclude data for persons <10 years old. Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of*

**Comment [FKA():]** Should we say anything about the time periods we're referring to here?

**Comment [FKA():]** If we have another few words, might want to say that some common and some differing circumstances contribute to suicides of those with and without known mental health problems, since that's a big focus for us. I know we're tight on words, just a suggestion if possible

**Comment [vid5]:** Could we shorten to "primary prevention"?

**Comment [FKA():]** I think a lot of people not familiar with this area think of survivors as people who themselves survived a suicide attempt. Can we clarify with something like (e.g., friends and family of suicide decedents), or something more plain language?

**Comment [SD():]** Need to update

**Comment [SD():]** Need reference here.

**Comment [FKA():]** Probably could cut these examples of diagnoses as long as the reference gets into defining mental illness sufficiently.

**Comment [SD():]** Do we want to say opioids as an example here instead so that we can tie this in??

**Comment [FKA():]** I'd vote to leave it broad, or just consistent with the National Strategy which we reference here.



*Diseases 10<sup>th</sup> Revision* [ICD-10] underlying-cause-of death codes X60-X84, Y87.0, \*U03).<sup>8</sup> Age-specific population estimates were obtained from U.S. Census Bureau / National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods covering years 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Data from 2015 from the 27 states with complete data participating in the National Violent Death Reporting System (NVDRS) were used to compare the characteristics, including precipitating circumstances, of deaths by suicide among decedents with and without known current mental health problems (MHP). Mental health problems are defined in NVDRS as disorders and syndromes listed in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5),<sup>9</sup> with the exception of alcohol and other substance dependence (captured ~~in separate variables~~). NVDRS ~~compiles aggregates~~ data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known MHP were compared using Chi-square tests; logistic regression was used to estimate adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and race/ethnicity.

## RESULTS (696/600 words)

The most recent overall suicide rates (representing 2014-2016) ranged from 6.9 (District of Columbia [D.C.]) to 29.2 (Montana) per 100,000 persons per year, a four-fold difference (Table 1). Across the entire study period, rates increased in all but one state (Nevada), with increases ranging from +0.2 (Delaware) to +8.1 (Wyoming). Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with percentage increases of at least 25% observed in over half of all states (30), as well as nationally.

Modeled suicide rates trends ~~were found to be significantly increasing~~ ~~increased significantly~~ for 44 states, as well as for the U.S. overall (Table 1). By sex, rate trends ~~increased significantly~~ ~~were found to be significantly increasing~~ in 34 states for males and in 43 states for females. Nationally, the model-estimated AAPC for overall suicide rates was +1.5%. By sex, the national AAPC was +1.1% for males and +2.6% for females.

Suicide decedents with (N=9,407) and without (N=11,039) known mental health problems (MHP) were compared. While both groups were predominately male and non-Hispanic white, suicide decedents without known MHP had 2.3 greater odds of being male (95% confidence interval [CI] = 2.2-2.5), and significantly greater odds of being racial/ethnic minorities (odds ratio [OR] range: 1.0-2.1; 95% CI range [1.0-1.3] – [1.6-2.0]). They also had significantly greater odds of perpetrating homicide-suicide (adjusted odds ratio [aOR] = 2.9, 95% CI = 2.2-3.8), of firearm suicide (aOR = 1.6, 95% CI = 1.5-1.7), and of positive toxicology results for alcohol (aOR = 1.2, 95% CI = 1.1-1.3). Fifteen percent of those with known MHP and 20% without ever served in the U.S. military.

Although firearms were used most often in both groups, decedents with known MHP died by poisoning more than those without MHP (19.8% vs. 10.4%), most frequently by over-the-counter/otherwise unclassified drugs (35.8%), opioids (32.7%), antidepressants (34.6%) or benzodiazepines (25.1%).

All suicide decedents with known MHP (N=9,407) and approximately 85% without ~~known MHP~~ (N=9,357) had known precipitating circumstances. Decedents without known MHP had significantly greater odds of any type of relationship problem (aOR = 1.3, 95% CI = 1.2-1.4), ~~and specifically of intimate partner problems~~ (aOR = 1.4, 95% CI = 1.3-1.5), arguments ~~or~~ conflicts (aOR = 1.4, 95% CI = 1.3-1.5), and ~~having recently perpetrated~~ ~~danger~~



interpersonal violence (aOR = 2.0, 95% CI = 1.6-2.4). Two-thirds of decedents with known MHP had a history of MH or substance abuse treatment (67.2%), and were more likely to have any substance abuse problems (31.6% vs. 25%,  $p \leq .01$ ),

Suicide decedents without known MHP had significantly greater odds of other life stressors, such as a criminal legal problems (aOR = 1.7, 95% CI = 1.5-1.9), or eviction/loss of home (aOR = 1.4, 95% CI 1.2-1.6). They had significantly lower odds of recent release from any institution, but when a release was indicated, they were significantly more likely to be released from a correctional facility (aOR = 4.5, 95% CI = 3.2-6.3), or hospital (aOR = 1.3, 95% CI = 1.1-1.7). Among decedents with known MHP who were recently released from an institution, 42.8% ~~release was were~~ from a psychiatric institutions. Those with known MHP also more frequently had job and/or financial problems (16.8% vs. 15.6%;  $p \leq .05$ ).

Decedents without known MHP had significantly greater odds of a recent/impending crisis (aOR = 1.4, 95% CI = 1.3-1.5). When the type of crisis was known, it was most frequently ~~a problem~~ related to an intimate partner (36.2%), physical health (13.8%), criminal legal issues (13.6%), ~~a family relationships~~ (7.1%), or a job (5.3%). Over one-fourth of decedents with a known ~~MHP~~ ~~problem~~ MHP also had recent or impending crises, most frequently related to ~~problems with~~ an intimate partner (34.9%), physical health (12.9%), or ~~a family relationships~~ (8.7%). ~~Decedents without known MHP had significantly greater odds of criminal legal problems crises (aOR = 1.6, 95% CI = 1.3-1.9), and significantly lowered odds of job-related crises (aOR = 0.7, 95% CI = 0.5-0.8) crises.~~

Suicide decedents without known MHP had significantly greater odds of leaving a suicide note (aOR = 1.2, 95% CI = 1.1-1.2), while decedents with known MHP more often had a history of suicidal ideation (40.8% vs. 23.0%,  $p \leq .01$ ) and attempts (29.4% vs. 10.3%,  $p \leq .01$ ).

#### Conclusions and Comments (735/700 words)

~~During the time period~~ From 1999-2016, age-adjusted suicide rates among people  $\geq 10$  years increased 25.4% overall. Forty-four states saw significant rate increases and one (Nevada) state saw a significant decline. Suicide rates increased by more than 25% in 30 states and upwards of 50% ~~in some~~.

Among females, rates increased in 43 states and rates among males increased in 34. This signal of increasing vulnerability of females towards suicide aligns with recent reports that identified a 63% increase in middle-aged female suicide rates between 1999-2014 and an annual increase of 18.8% per year in emergency department visits for self-inflicted injuries among young females, aged of 10 and 14, in the period 2009-2015.<sup>3,10</sup> These increases may hint at a narrowing of the suicide gender gap, historically weighted towards males by a ratio of 4-5:1.<sup>11</sup> More research into this troubling trend is needed.

One important factor associated with suicide is mental health problems. Nearly half of people in this study had a known mental health problem. This group was challenged by comorbid substance abuse problems (31.6%) and histories of suicide ideation (40.8%) and attempts (29.4%). While two-thirds of people with MHP had a history of mental health and/or substance abuse treatment and over half were currently in treatment at the time of their deaths, much more support for this vulnerable population is needed. This includes the need for broader implementation of affordable and evidence-based treatments, such as doctor-patient collaborative care models and cognitive-behavioral therapy.<sup>12</sup> Additionally, greater access to behavioral health providers, especially in underserved areas is needed, as is healthcare systems change that supports suicide prevention and patient safety.<sup>12</sup>

While MHP are a significant contributor to suicide, 54% of suicide decedents in the current study did *not* have a known MHP. This group suffered more life stressors, especially related to relationships (e.g. intimate partner

**Comment [vid5]:** Could probably cut this if we need to for space

**Comment [vid5]:** Maybe we should be more precise



problems, arguments or conflicts, recent perpetration of intimate partner violence), but also related to other life stressors such as criminal-legal matters, eviction/loss of home, and recent or impending crises (often related to the abovementioned factors). People with known MHP also experienced life and other stressors apart from their MHP. This group was more likely to experience job and/or financial problems. Also common were intimate partner problems (24.1%), physical health problems (21.4%), and recent or impending crises (26%).

These results point to the need for comprehensive suicide prevention that goes beyond a focus on MH treatment alone. These strategies may include: strengthening economic supports (e.g. housing stabilization policies, household financial support), teaching coping and problem-solving skills and other pro-social norms, especially early in life to manage everyday stressors and to prevent future relationship problems; and promoting social connectedness to increase a sense of belongingness and access to informational, tangible, emotional, and social support, as needed. Other strategies indicated by these results include creating protective environments (e.g., reducing access to lethal means among people at risk, and creating organizational and workplace policies to promote help-seeking and positive social norms), and supporting people after a suicide has taken place to prevent survivors' risk and to assure safe reporting by the media in order to prevent suicide contagion.<sup>12</sup>

These findings provided of this report are subject to have at least three limitations. In four states, Maryland (MD), Utah (UT), Massachusetts (MA), and Rhode Island (RI), state rankings might have been impacted by large proportions of deaths of undetermined intent (MD), which often represent cases where a suicide determination was judged not to be conclusive, or by decreased percentages of undetermined deaths over time (UT, MA, RI). Second, NVDRS is not yet nationally representative. Currently, 40 states, the District of Columbia, and Puerto Rico participate in NVDRS, but the most recent available data year includes 27 states as others joined the system later data for state level analyses extend from 1999 to 2016, however, data on circumstances of suicide come from a single year (2015) and encompass only 27 states. Third, abstractors of NVDRS data are limited to data included in the investigative reports they receive. For example, medical and mental health information are not captured directly from medical records but from informants (e.g., family, friends) via coroner/medical examiner reports and the decedent's family members and friends. Therefore, knowledge of the informant impacts completeness and accuracy of the information reported. This may explain some of the discrepancy between the prevalence of mental health disorders reported here (54%) and the 90% statistic frequently cited in other studies.<sup>13</sup>

Suicide is a growing public health problem and mental illness is an important risk factor for suicide, but is just one of many associated factors. Resources such as CDC's *Preventing Suicide: a Technical Package of Policies, Programs, and Practices*<sup>12</sup> and the National Violent Death Reporting System can help states and communities prioritize comprehensive suicide prevention.

#### References (TO BE UPDATED)

- 1 Wisqars fatal injury reports
- 2 World report
- 3 NCHS Data brief 2014
- 4 Kegler et al 2017
- 5 WISQARS Nonfatal injury reports
- 6 National Strategy for Suicide Prevention
- 7 Davidson, L., Potter, L., and Ross, V. (1999) Surgeon General's Call to Action to Prevent Suicide. Public Health Service (DHHS), Rockville, MD.
- 8 ICD-10
- 9 DSM-5
- 10 Melissa's paper
- 11 Need ref

**Comment [vid5]:** Wondering if instead of recapping results, we could comment on the profound and not often discussed impact that life stressors, especially those that rise to the level of a crisis, can have. The research that shows the time amount of deliberation (which is often very low) may also be helpful to cite here, as these types of stressors/crises can represent short-term problems (vs. longer term problems such as chronic mental illness)

**Comment [vid5]:** Similarly, wondering if we could condense this instead of reiterating some of these results and instead comment on the concept of "functional impairment," as a reason why people with mental health problems might have more job/financial problems (e.g., they often have more inconsistent work histories as a result of trying to cope)

**Comment [vid5]:** I know we don't want to really be adding words – but I thought this is one thing that may not be obvious to everyone (why deaths of undetermined intent would affect suicide counts/rates). See what you think, and if we can't get the text in, maybe we could sneak a footnote in ☺

**Comment [SD]:** Is it nationally representative at this point? Or no?

**Comment [vid5]:** Some suggested rephrasing here, because I don't want to trigger questions about why we would only use one data year of NVDRS data. We have good reasons – more states, and for the state level analyses we were looking at trends and therefore needed more years. However, wondering if we could simplify this to just be about NVDRS

**Comment [vid5]:** Just to give our data enough credit, though, I am wondering if the 90% estimates could also be driven up by small or very selective samples. Was going to look into this but not sure what the reference is. Little wary of making it sound like theirs is the gold standard.



12      Technical package

**Acknowledgments**

**Conflict of Interest** None

**Corresponding author** D Stone

**Tables and Figures**

DRAFT

## Structured abstract (241/250 words)

**Background:** Suicide rates have been rising in the United States (U.S.). Examining state-level trends in, and contributing circumstances to, suicide, can inform comprehensive state suicide prevention planning.

**Methods:** Trends in age-adjusted suicide rates, overall and by sex and state, among people aged ≥10 years, were calculated (evaluated) using data from the National Vital Statistics System. Changes in rates and state rankings were assessed across six consecutive three-year periods (1999-2001, 2002-2004, 2005-2007, 2008-2010, 2011-2013, 2014-2016). Data from the 2015 from the National Violent Death Reporting System, across 27 states, were analyzed to compare precipitating circumstances between suicide decedents with and without known mental health problems.

**Results:** Statistically significant upward rate trends were identified for 44 states. (For the U.S. overall and for 30 states individually, empirical rates increased by at least 25% over the study period.) Average annual percentage change in suicide rates (increased significantly) in the U.S. overall (25.4%) and in 44 states, with relative increases ranging from 5.9% in Delaware to 57.6% in North Dakota. People with (46%) and without (54%) known mental health problems experienced a range of contributing circumstances contributing to their suicides, including recent crises and problems related to substance use, relationships, job/financial issues, and criminal-legal matters and recent.

**Conclusions:** Suicide rates have risen significantly in the U.S. and across most states from 1999-2016. (No single factor alone contributes to suicide.) Differing circumstances contribute to suicides among those with and without mental health problems.

**Implications for Public Health Practice:** To reverse upward trends in suicide, states can use a population-based public health approach inclusive of evidence-based strategies across multiple levels (individual, family/relationship, community, societal), focused on (preventing risk before it starts), identifying and supporting people already at risk, preventing-re-attempts, and caring for (survivors) after a suicide.

## INTRODUCTION

### BACKGROUND AND PURPOSE (210/250 words) TOTAL COUNT=1900/1800

In 2016, nearly 45,000 suicides (13.4/100,000) occurred in the United States (U.S.).<sup>1</sup> While overall rates have been declining globally,<sup>2</sup> rates of suicide in the U.S. have increased between 1999 and 2016, among males and females, across racial/ethnic groups, and across urbanization levels.<sup>3,4</sup> Emergency department visits for nonfatal self-harm injuries increased by more than 40% between 2001 and 2015.<sup>5</sup> In 2015, suicides and self-harm injuries cost the nation more than (\$69 billion) in direct medical and work loss costs.<sup>1</sup> Suicide is rarely caused by one factor; rather, the risks are often numerous and occur at multiple levels--individual, family/relationship, community, and societal.<sup>6</sup> Despite this, (prevention primarily centers on mental illness.) (e.g., depression, bipolar disorder). Other factors associated with suicide include social isolation, economic downturns, access to lethal means (e.g. substances, firearms) among people at risk, childhood adversity, lack of coping and problem-solving skills, loss of a friend or family member to suicide, a prior suicide attempt, and unsafe media portrayals, among others.<sup>6</sup> While the Surgeon General called for a comprehensive public health approach to suicide prevention in 1999, to date, most states struggle to make this a reality.<sup>7</sup> To better assist states, this study analyzes trends in state suicide rates, assesses the multiple factors associated with suicide, and provides prevention recommendations.

### METHODS (259/250 words)

**Comment [SD():** Scott's comment: This is the key stratification in my view.

**Comment [SD():** Scott's comment: The word assessed would also be fine here.

**Comment [snk6]:** And for 29 of these 30 states, the modeled rate trends were also statistically significant. So these two sentences together, while keeping the inferential and descriptive findings separate, provide a scientifically accurate summary.

**Comment [FKA():** Should we say anything about the time periods we're referring to here?

**Comment [SD():** Scott's comment: Probably shouldn't mix the inferential findings with the descriptive findings in the same sentence. Also, we might not be able to afford the word space in the Abstract to talk about individual states.

**Comment [FKA():** If we have another few words, might want to say that some common and some differing

**Comment [vid5]:** Could we shorten to "primary prevention"?

**Comment [CA]:** I like "primary prevention"

**Comment [FKA():** I think a lot of people not familiar with this area think of survivors as people who themselves

**Comment [SD():** Need to update

**Comment [SD():** Need reference here.

**Comment [CA]:** Options: -Rosenman SJ. Preventing suicide: What will work and what will not. MJA.

**Comment [FKA():** Probably could cut these examples of diagnoses as long as the reference gets into defining mental

**Comment [SD():** Do we want to say opioids as an example here instead so that we can tie this in??

**Comment [FKA():** I'd vote to leave it broad, or just consistent with the National Strategy which we reference here.



Suicide rate estimates and trend analyses exclude data for persons <10 years old. Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases 10<sup>th</sup> Revision* [ICD-10] underlying-cause-of-death codes X60-X84, Y87.0, \*U03).<sup>8</sup> Age-specific population estimates were obtained from U.S. Census Bureau / National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods covering years 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Data from 2015 from the 27 states with complete data participating in the National Violent Death Reporting System (NVDRS) were used to compare the characteristics, including precipitating circumstances, of deaths by suicide among decedents with and without known current mental health problems (MHP). Mental health problems are defined in NVDRS as disorders and syndromes listed in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5),<sup>9</sup> with the exception of alcohol and other substance dependence (captured ~~in separate variables~~). NVDRS ~~compiles aggregates~~ data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known MHP were compared using Chi-square tests; logistic regression was used to estimate adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and race/ethnicity.

## RESULTS (696/600 words)

The most recent overall suicide rates (representing 2014-2016) ranged from 6.9 (District of Columbia [D.C.]) to 29.2 (Montana) per 100,000 persons per year, a four-fold difference (Table 1). Across the entire study period, rates increased in all but one state (Nevada), with increases ranging from +0.2 (Delaware) to +8.1 (Wyoming). Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with percentage increases of at least 25% observed in over half of all states (30), as well as nationally.

Modeled suicide rates trends ~~were found to be significantly increasing~~ increased significantly for 44 states, as well as for the U.S. overall (Table 1). By sex, rate trends ~~increased significantly were found to be significantly increasing~~ in 34 states for males and in 43 states for females. Nationally, the model-estimated AAPC for overall suicide rates was +1.5%. By sex, the national AAPC was +1.1% for males and +2.6% for females.

Suicide decedents with (N=9,407) and without (N=11,039) known mental health problems (MHP) were compared. While both groups were predominately male and non-Hispanic white, suicide decedents without known MHP had 2.3 greater odds of being male (95% confidence interval [CI] = 2.2-2.5), and significantly greater odds of being racial/ethnic minorities (odds ratio [OR] range: 1.0-2.1; 95% CI range [1.0-1.3] – [1.6-2.0]). They also had significantly greater odds of perpetrating homicide-suicide (adjusted odds ratio [aOR] = 2.9, 95% CI = 2.2-3.8), of firearm suicide (aOR = 1.6, 95% CI = 1.5-1.7), and of positive toxicology results for alcohol (aOR = 1.2, 95% CI = 1.1-1.3). Fifteen percent of those with known MHP and 20% without ever served in the U.S. military.

Although firearms were used most often in both groups, decedents with known MHP died by poisoning more than those without MHP (19.8% vs. 10.4%), most frequently by over-the-counter/otherwise unclassified drugs (35.8%), opioids (32.7%), antidepressants (34.6%) or benzodiazepines (25.1%).

All suicide decedents with known MHP (N=9,407) and approximately 85% without ~~known MHP~~ (N=9,357) had known precipitating circumstances. Decedents without known MHP had significantly greater odds of any type of



relationship problem (aOR = 1.3, 95% CI = 1.2-1.4), and specifically of intimate partner problems (aOR = 1.4, 95% CI = 1.3-1.5), arguments/~~of~~ conflicts (aOR = 1.4, 95% CI = 1.3-1.5), and ~~having recently perpetrated~~ ~~ing~~ ~~of~~ interpersonal violence (aOR = 2.0, 95% CI = 1.6-2.4). Two-thirds of decedents with known MHP had a history of MH or substance abuse treatment (67.2%), and were more likely to have any substance abuse problems (31.6% vs. 25%,  $p \leq .01$ ),

Suicide decedents without known MHP had significantly greater odds of other life stressors, such as a criminal legal problems (aOR = 1.7, 95% CI = 1.5-1.9), or eviction/loss of home (aOR = 1.4, 95% CI 1.2-1.6). They had significantly lower odds of recent release from any institution, but when a release was indicated, they were significantly more likely to be released from a correctional facility (aOR = 4.5, 95% CI = 3.2-6.3), or hospital (aOR = 1.3, 95% CI = 1.1-1.7). Among decedents with known MHP who were recently released from an institution, 42.8% ~~release was~~ ~~were~~ from a psychiatric institutions. Those with known MHP also more frequently had job and/or financial problems (16.8% vs. 15.6%;  $p \leq .05$ ).

Decedents without known MHP had significantly greater odds of a recent/impending crisis (aOR = 1.4, 95% CI = 1.3-1.5). When the type of crisis was known, it was most frequently a ~~problem~~-related to an intimate partner (36.2%), physical health (13.8%), criminal legal issues (13.6%), a family relationships (7.1%), or a job (5.3%). Over one-fourth of decedents with a known ~~MHP~~ ~~problem~~ ~~MHP~~ also had recent or impending crises, most frequently related to ~~problems with~~ an intimate partner (34.9%), physical health (12.9%), or a family relationships (8.7%). Decedents without known MHP had significantly greater odds of criminal legal ~~problems~~ ~~crises~~ (aOR = 1.6, 95% CI = 1.3-1.9), and significantly lowered odds of job-related ~~crises~~ (aOR = 0.7, 95% CI = 0.5-0.8) ~~crises~~.

Suicide decedents without known MHP had significantly greater odds of leaving a suicide note (aOR = 1.2, 95% CI = 1.1-1.2), while decedents with known MHP more often had a history of suicidal ideation (40.8% vs. 23.0%,  $p \leq .01$ ) and attempts (29.4% vs. 10.3%,  $p \leq .01$ ).

#### Conclusions and Comments (735/700 words)

~~During the time period~~From 1999-2016, age-adjusted suicide rates among people  $\geq 10$  years increased 25.4% overall. Forty-four states saw significant rate increases and one (Nevada) state saw a significant decline. Suicide rates increased by more than 25% in 30 states and upwards of 50% ~~(in some)~~.

Among females, rates increased in 43 states and rates among males increased in 34. This signal of increasing vulnerability of females towards suicide aligns with recent reports that identified a 63% increase in middle-aged female suicide rates between 1999-2014 and an annual increase of 18.8% per year in emergency department visits for self-inflicted injuries among young females, aged of 10 and 14, in the period 2009-2015.<sup>3,10</sup> These increases may hint at a narrowing of the suicide gender gap, historically weighted towards males ~~by a ratio of 4-5:1~~.<sup>11</sup> More research into this troubling trend is needed.

One important factor associated with suicide is mental health problems. Nearly half of people in this study had a known mental health problem. This group was challenged by comorbid substance abuse problems (31.6%) and histories of suicide ideation (40.8%) and attempts (29.4%). While two-thirds of people with MHP had a history of mental health and/or substance abuse treatment and over half were currently in treatment at the time of their deaths, much more support for this vulnerable population is needed. This includes the need for broader implementation of affordable and evidence-based treatments, such as doctor-patient collaborative care models and cognitive-behavioral therapy.<sup>12</sup> Additionally, greater access to behavioral health providers, especially in underserved areas is needed, as is healthcare systems change that supports suicide prevention and patient safety.<sup>12</sup>

Comment [vid5]: Could probably cut this if we need to for space

Comment [vid5]: Maybe we should be more precise

Comment [CA]: Maybe could leave out ratio to save space.



While MHP are a significant contributor to suicide, 54% of suicide decedents in the current study did *not* have a known MHP. This group suffered more life stressors, especially related to relationships (e.g. intimate partner problems, arguments or conflicts, recent perpetration of intimate partner violence), but also related to other life stressors such as criminal-legal matters, eviction/loss of home, and recent or impending crises (often related to the abovementioned factors). People with known MHP also experienced life and other stressors apart from their MHP. This group was more likely to experience job and/or financial problems. Also common were intimate partner problems (24.1%), physical health problems (21.4%), and recent or impending crises (26%).

These results point to the need for comprehensive suicide prevention that goes beyond a focus on MH treatment alone. These strategies may include: strengthening economic supports (e.g. housing stabilization policies, household financial support), teaching coping and problem-solving skills and other pro-social norms, especially early in life to manage everyday stressors and to prevent future relationship problems; and promoting social connectedness to increase a sense of belongingness and access to informational, tangible, emotional, and social support, as needed. Other strategies indicated by these results include creating protective environments (e.g., reducing access to lethal means among people at risk, and creating organizational and workplace policies to promote help-seeking and positive social norms), and supporting people after a suicide has taken place to prevent survivors' risk and to assure safe reporting by the media in order to prevent suicide contagion.<sup>12</sup>

These findings provided of this report are subject to have at least three limitations. In four states, Maryland (MD), Utah (UT), Massachusetts (MA), and Rhode Island (RI), state rankings might have been impacted by large proportions of deaths of undetermined intent (MD), which often represent cases where a suicide determination was judged not to be conclusive, or by decreased percentages of undetermined deaths over time (UT, MA, RI). Second, NVDRS is not yet nationally representative. Currently, 40 states, the District of Columbia, and Puerto Rico participate in NVDRS, but the most recent available data year includes 27 states as others joined the system later data for state level analyses extend from 1999 to 2016, however, data on circumstances of suicide come from a single year (2015) and encompass only 27 states. Third, abstractors of NVDRS data are limited to data included in the investigative reports they receive. For example, medical and mental health information are not captured directly from medical records but from informants (e.g., family, friends) via coroner/medical examiner reports and the decedent's family members and friends. Therefore, knowledge of the informant impacts completeness and accuracy of the information reported. This may explain some of the discrepancy between the prevalence of mental health disorders reported here (54%) and the 90% statistic frequently cited in other studies.<sup>13</sup>

Suicide is a growing public health problem and mental illness is an important risk factor for suicide, but is just one of many associated factors. Resources such as CDC's *Preventing Suicide: a Technical Package of Policies, Programs, and Practices*<sup>12</sup> and the National Violent Death Reporting System can help states and communities prioritize comprehensive suicide prevention.

#### References (TO BE UPDATED)

- 1 Wisqars fatal injury reports
- 2 World report
- 3 NCHS Data brief 2014
- 4 Kegler et al 2017
- 5 WISQARS Nonfatal injury reports
- 6 National Strategy for Suicide Prevention
- 7 Davidson, L., Potter, L., and Ross, V. (1999) Surgeon General's Call to Action to Prevent Suicide. Public Health Service (DHHS), Rockville, MD.
- 8 ICD-10

**Comment [vid5]:** Wondering if instead of recapping results, we could comment on the profound and not often discussed impact that life stressors, especially those that rise to the level of a crisis, can have. The research that shows the time amount of deliberation (which is often very low) may also be helpful to cite here, as these types of stressors/crises can represent short-term problems (vs. longer term problems such as chronic mental illness)

**Comment [vid5]:** Similarly, wondering if we could condense this instead of reiterating some of these results and instead comment on the concept of "functional impairment," as a reason why people with mental health problems might have more job/financial problems (e.g., they often have more inconsistent work histories as a result of trying to cope)

**Comment [vid5]:** I know we don't want to really be adding words – but I thought this is one thing that may not be obvious to everyone (why deaths of undetermined intent would affect suicide counts/rates). See what you think, and if we can't get the text in, maybe we could sneak a footnote in ☺

**Comment [SD]:** Is it nationally representative at this point? Or no?

**Comment [vid5]:** Some suggested rephrasing here, because I don't want to trigger questions about why we would only use one data year of NVDRS data. We have good reasons – more states, and for the state level analyses we were looking at trends and therefore needed more years. However, wondering if we could simplify this to just be about NVDRS

**Comment [vid5]:** Just to give our data enough credit, though, I am wondering if the 90% estimates could also be driven up by small or very selective samples. Was going to look into this but not sure what the reference is. Little wary of making it sound like theirs is the gold standard.



9 DSM-5  
10 Melissa's paper  
11 Need ref  
12 Technical package

**Acknowledgments**

**Conflict of Interest** None

**Corresponding author** D Stone

**Tables and Figures**

**Options for ref 11**

- :Hawton K, van Heeringen K. Suicide. Lancet. 2009;373: 1372-81. [Doi.org/10.1016/S0140-6736\(06\)6032-X](https://doi.org/10.1016/S0140-6736(06)6032-X)

- , Canetto SS, Sakinofsky I. The Gender Paradox in Suicide. *Suicide & Life-Threatening Behavior*. 1998; 28:1-23.

**From Katie:**

I went through the latest draft w/Alex's comments, comparing the results and discussion. Most lined up, although there were a few places where I noticed some mismatch (" " is from the draft, bold are my comments):

"From 1999-2016, age-adjusted suicide rates among people  $\geq 10$  years increased 25.4% overall." **We give the national (overall) number only in the abstract, not in the results.**

"Suicide rates increased by more than 25% in 30 states and upwards of 50% in some". **We only mention one (North Dakota) that is over 50% in the results (rather than "some").**

"While two-thirds of people with MHP had a history of mental health and/or substance abuse treatment and over half were currently in treatment at the time of their deaths, much more support for this vulnerable population is needed." **The highlighted point is only in the table right now– could add to results text.**

"While MHP are a significant contributor to suicide, 54% of suicide decedents in the current study did *not* have a known MHP. This group suffered more life stressors, especially related to relationships (e.g. intimate partner problems, arguments or conflicts, recent perpetration of intimate partner violence)..." **Didn't notice this the first time around, but the highlighted portion should read "recent perpetration of *interpersonal* violence" – that variable is not specific to IPV.**

"People with known MHP also experienced life and other stressors apart from their MHP. This group was more likely to experience job and/or financial problems. Also common were intimate partner problems (24.1%), physical health problems (21.4%), and recent or impending crises (26%)." **The numbers in the highlighted portion are in the table, but not specifically cited in the results (because we report odds ratios instead).**



## Structured abstract (241/250 words)

**Background:** Suicide rates have been rising in the United States (U.S.). Examining state-level trends in, and contributing circumstances to, suicide, can inform comprehensive state suicide prevention planning.

**Methods:** Trends in age-adjusted suicide rates, overall and by state and sex and state, among people aged ≥10 years, were calculated/evaluated using data from the National Vital Statistics System. Changes in rates and state rankings were assessed across six consecutive three-year periods (1999-2001, 2002-2004, 2005-2007, 2008-2010, 2011-2013, 2014-2016). Data from the 2015 from the National Violent Death Reporting System, across 27 states, were analyzed to compare precipitating circumstances between suicide decedents with and without known mental health problems.

**Results:** Statistically significant upward rate trends were identified for 44 states. (For the U.S. overall and for 30 states individually, empirical rates increased by at least 25% over the study period.) Average annual percentage change in suicide rates (increased significantly) in the U.S. overall (25.4%) and in 44 states, with relative increases ranging from 5.9% in Delaware to 57.6% in North Dakota. People with (46%) and without (54%) known mental health problems experienced a range of contributing circumstances contributing to their suicides, including recent crises and problems related to substance use, relationships, job/financial issues, and criminal-legal matters and recent.

**Conclusions:** Suicide rates have risen significantly in the U.S. and across most states from 1999-2016. (No single factor alone contributes to suicide.) Differing circumstances contributing to suicides differ among those with and without known health problems.

**Implications for Public Health Practice:** To reverse upward trends in suicide, states can use a population-based public health approach inclusive of evidence-based strategies across multiple levels (individual, family/relationship, community, societal), focused on preventing risk before it starts, identifying and supporting people already at risk, preventing-re-attempts, and caring for/supporting survivors after a suicide decedents' surviving loved ones.

## INTRODUCTION

### BACKGROUND AND PURPOSE (210/250 words) TOTAL COUNT=1900/1800

In 2016, nearly 45,000 suicides (13.4/100,000) occurred in the United States (U.S.).<sup>1</sup> While overall rates have been declining globally,<sup>2</sup> rates of suicide in the U.S. have increased between 1999 and 2016, among males and females, across racial/ethnic groups, and across urbanization levels.<sup>3,4</sup> Emergency department visits for nonfatal self-harm injuries increased by more than 40% between 2001 and 2015.<sup>1</sup> In 2015, suicides and self-harm injuries cost the nation more than \$69 billion in direct medical and work loss costs.<sup>1</sup> Suicide is rarely caused by one factor; rather, the risks are often numerous and occur at multiple levels--individual, family/relationship, community, and societal.<sup>5</sup> Despite this, prevention primarily centers on mental illness (e.g., depression, bipolar disorder). Other factors associated with suicide include social isolation, economic downturns, access to lethal means (e.g. substances, firearms) among people at risk, childhood adversity, lack of poor coping and problem-solving skills, loss of a friend or family member loved one to suicide, a prior suicide attempt, and unsafe media portrayals, among others.<sup>5</sup> While Although the Surgeon General called for a comprehensive public health approach to suicide prevention in 1999, to date, most states struggle to make this a reality.<sup>6</sup> To better assist states, this study analyzes trends in state suicide rates, assesses the multiple factors associated with suicide, and provides prevention recommendations.

### METHODS (259/250 words)

**Comment [SD():** Scott's comment: This is the key stratification in my view.

**Comment [SD():** Scott's comment: The word assessed would also be fine here.

**Comment [snk6]:** And for 29 of these 30 states, the modeled rate trends were also statistically significant. So these two sentences together, while keeping the inferential and descriptive findings separate, provide a scientifically accurate summary.

**Comment [FKA():** Should we say anything about the time periods we're referring to here?

**Comment [SD():** Scott's comment: Probably shouldn't mix the inferential findings with the descriptive findings in

**Comment [FKA():** If we have another few words, might want to say that some common and some differing

**Comment [vid5]:** Could we shorten to "primary prevention"?

**Comment [CA]:** I like "primary prevention"

**Comment [FKA():** I think a lot of people not familiar with this area think of survivors as people who themselves

**Comment [HK():** I pose a solution to Katie's question here.

**Comment [SD():** Need to update

**Comment [HK():** Should we add "treating" before mental illness?

**Comment [SD():** Need reference here.

**Comment [CA]:** Options: -Rosenman SJ. Preventing suicide: What will work and what will not. MIA

**Comment [FKA():** Probably could cut these examples of diagnoses as long as the reference gets into defining mental

**Comment [SD():** Do we want to say opioids as an example here instead so that we can tie this in??

**Comment [FKA():** I'd vote to leave it broad, or just consistent with the National Strategy which we reference here



Suicide rate estimates and trend analyses exclude data for persons <10 years old. Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases 10<sup>th</sup> Revision* [ICD-10] underlying-cause-of death codes X60-X84, Y87.0, \*U03). Age-specific population estimates were obtained from U.S. Census Bureau / National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods covering years from 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Data from 2015 from the 27 states with complete data participating in the National Violent Death Reporting System (NVDRS) were used to compare the characteristics including precipitating circumstances, of deaths by suicide among decedents with and without known current mental health problems (MHP). Mental health problems MHP are defined in NVDRS as disorders and syndromes listed in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5),<sup>7</sup> with the exception of alcohol and other substance dependence (captured in separate variables). NVDRS compiles aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known MHP were compared using Chi-square tests; logistic regression was used to estimate adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and race/ethnicity.

#### RESULTS (696/600 words)

The most recent overall suicide rates (representing 2014-2016) ranged from 6.9 (District of Columbia [D.C.]) to 29.2 (Montana) per 100,000 persons per year, a four-fold difference (Table 1). Across the entire study period, rates increased in all but one state (Nevada), with increases ranging from +0.2 (Delaware) to +8.1 (Wyoming). Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with percentage increases of at least 25% observed in over half of all states (30), as well as nationally.

Modeled suicide rate trends indicate increased significantly significant increases for 44 states, as well as for the U.S. overall (Table 1). By sex, modeled rate trends increased-indicate by increases in 34 states for males and in 43 states for females. Nationally, the model-estimated AAPC for overall suicide rates was +1.5%. By sex, the national AAPC was +1.1% for males and +2.6% for females.

Suicide decedents with (N=9,407) and without (N=11,039) known mental health problems (MHP) were compared. While both groups were predominately male and non-Hispanic white, suicide decedents without known MHP had 2.3 greater odds of being male (95% confidence interval [CI] = 2.2-2.5), and significantly greater odds of being racial/ethnic minorities (odds ratio [OR] range: 1.0-2.1; 95% CI range [1.0-1.3] – [1.6-2.0]). They also had significantly greater odds of perpetrating homicide-suicide (adjusted odds ratio [aOR] = 2.9, 95% CI = 2.2-3.8), of firearm suicide (aOR = 1.6, 95% CI = 1.5-1.7), and of positive toxicology results for alcohol (aOR = 1.2, 95% CI = 1.1-1.3). Fifteen percent of those with known MHP and 20% without ever served in the U.S. military.

Although firearms were used most often in both groups, decedents with known MHP died by poisoning more than those without MHP (19.8% vs. 10.4%), most frequently by over-the-counter/otherwise unclassified drugs (35.8%), opioids (32.7%), antidepressants (34.6%) or benzodiazepines (25.1%).

Comment [HK]: I think you can delete this



All suicide decedents with known MHP (N=9,407) and approximately 85% without MHP (N=9,357) had known precipitating circumstances. Decedents without known MHP had significantly greater odds of any type of relationship problem (aOR = 1.3, 95% CI = 1.2-1.4), ~~specifically intimate partner problems~~ (aOR = 1.4, 95% CI = 1.3-1.5), arguments ~~conflicts~~ (aOR = 1.4, 95% CI = 1.3-1.5), and ~~recently perpetrated~~ or interpersonal violence (aOR = 2.0, 95% CI = 1.6-2.4). Two-thirds of decedents with known MHP had a history of MH or substance abuse treatment (67.2%); and were more likely to have any substance abuse problems (31.6% vs. 25%,  $p \leq .01$ ),

Suicide decedents without known MHP had significantly greater odds of other life stressors, such as a criminal legal problems (aOR = 1.7, 95% CI = 1.5-1.9); or eviction/loss of home (aOR = 1.4, 95% CI 1.2-1.6). They had significantly lower odds of recent release from any institution, but when a release was indicated, they were significantly more likely to be released from a correctional facility (aOR = 4.5, 95% CI = 3.2-6.3), or hospital (aOR = 1.3, 95% CI = 1.1-1.7). Among decedents with known MHP who were recently released from an institution, 42.8% ~~from~~ from psychiatric institution. Those with known MHP also more frequently had job and/or financial problems (16.8% vs. 15.6%;  $p \leq .05$ ).

Decedents without known MHP had significantly greater odds of a recent/impending crisis (aOR = 1.4, 95% CI = 1.3-1.5). When the type of crisis was known, it was most frequently ~~related~~ related to an intimate partner (36.2%), physical health (13.8%), criminal legal ~~issues~~ (13.6%), family relationships (7.1%), or a job (5.3%) ~~problem~~. Over one-fourth of decedents with a known ~~intimate partner~~ also had recent or impending crises, most frequently related to ~~an intimate partner~~ an intimate partner (34.9%), physical health (12.9%), or a family relationship (8.7%). Decedents without known MHP had significantly greater odds of criminal legal ~~problems~~ (aOR = 1.6, 95% CI = 1.3-1.9), and significantly lowered odds of job-related ~~problems~~ (aOR = 0.7, 95% CI = 0.5-0.8).

Suicide decedents without known MHP had significantly greater odds of leaving a suicide note (aOR = 1.2, 95% CI = 1.1-1.2), while decedents with known MHP more often had a history of suicidal ideation (40.8% vs. 23.0%,  $p \leq .01$ ) and attempts (29.4% vs. 10.3%,  $p \leq .01$ ).

#### Conclusions and Comments (735/700 words)

~~From 1999-2016~~ 1999-2016, age-adjusted suicide rates among people  $\geq 10$  years increased 25.4% overall. Forty-four states saw significant rate increases, and one (Nevada) state saw a significant decline. Suicide rates increased by more than 25% in 30 states and upwards of 50% ~~in some~~.

~~Among females, rates increased in 43 states among females and rates among males increased in 34 states among males.~~ This signal of increasing vulnerability to suicide among females towards suicide aligns with recent reports ~~that identified indicating~~ a 63% increase in middle-aged female suicide rates between 1999-2014 and an annual increase of 18.8% per year in emergency department visits for self-inflicted injuries among young females, aged ~~of 10 and 14, in the period from~~ 2009-2015.<sup>3,8</sup> These increases may hint at a narrowing of the suicide gender gap, historically weighted towards males ~~by a ratio of 4-5:1~~.<sup>9</sup> More research into this troubling trend is needed.

One important factor associated with suicide is ~~mental health problems~~ MHP. Nearly half of people in this study had a known ~~mental health problem~~ MHP. This group was challenged by comorbid substance abuse problems (31.6%) and histories of suicide ideation (40.8%) and attempts (29.4%). While two-thirds of people with MHP had a history of ~~mental health~~ MH and/or substance abuse treatment and over half were currently in treatment at the time of their deaths, much more support for this vulnerable population is needed. This includes the need for broader implementation of affordable and evidence-based treatments, such as doctor-patient collaborative

**Comment [HK]:** Can you say this? Wouldn't saying this imply that if IPP is checked as a precipitating factor, then relationship problems also has to be checked? Is that how NVDRS coding of IPP works? I thought these two categories were mutually exclusive in that IPP could be checked without relationship problems being checked.

This could be easily changed by just removing "specifically"

**Comment [vid5]:** Could probably cut this if we need to for space

**Comment [vid5]:** Maybe we should be more precise

**Comment [CA]:** Maybe could leave out ratio to save space.



care models and cognitive-behavioral therapy.<sup>10</sup> Additionally, greater access to behavioral health providers, especially in underserved areas is needed, as is healthcare systems change that supports suicide prevention and patient safety.<sup>10</sup>

While MHP are a significant contributor to suicide, 54% of suicide decedents in ~~the current~~ this study did not have a known MHP. This group suffered more life stressors, especially related to relationships (e.g. intimate partner problems, arguments or conflicts, recent perpetration of intimate partner violence), but also related to other life stressors such as criminal-legal matters, eviction/loss of home, and recent or impending crises (often related to the abovementioned factors). People with known MHP also experienced life and other stressors apart from their MHP. This group was more likely to experience job and/or financial problems. Also common were intimate partner problems (24.1%), physical health problems (21.4%), and recent or impending crises (26%).

These results point to the need for comprehensive suicide prevention that goes beyond a focus on MH treatment alone. ~~These Prevention~~ strategies may include: strengthening economic supports (e.g. housing stabilization policies, household financial support), teaching coping and problem-solving skills and other pro-social norms, especially early in life to manage everyday stressors and ~~to~~ prevent future relationship problems; and promoting social connectedness to increase a sense of belongingness and access to informational, tangible, emotional, and social support, as needed. Other strategies indicated by these results include creating protective environments (e.g., reducing access to lethal means among people at risk, and creating organizational and workplace policies to promote help-seeking and positive social norms), and supporting people after a suicide has taken place to prevent survivors' risk and to assure safe reporting by the media in order to prevent suicide contagion.<sup>10</sup>

The ~~35~~ findings ~~provided of this report are subject to~~ at least three limitations. In four states, Maryland (MD), Utah (UT), Massachusetts (MA), and Rhode Island (RI), state rankings might have been impacted by large proportions of deaths of undetermined intent (~~MD~~), ~~or by decreased percentages of undetermined deaths over time (UT, MA, RI).~~ Second, ~~NVDRS is not yet nationally representative. Currently, 40 states, the District of Columbia, and Puerto Rico participate in NVDRS, but the most recent available data year includes 27 states as others joined the system later data for state-level analyses covered from 2009 to 2015, however, data on circumstances of suicide come from a single year (2015) and are missing only 17 states.~~ Third, abstractors of NVDRS data are limited to data included in the investigative reports ~~they receive~~. For example, medical and ~~mental health~~ MH information are not captured directly from medical records but from informants (e.g. family, friends) via coroner/medical examiner reports ~~and the decedent's family members and friends~~. Therefore, knowledge of the informant impacts completeness and accuracy of the information reported. This may explain some of the discrepancy between the prevalence of mental health disorders reported here (54%) and the 90% statistic frequently cited in other studies.<sup>(11)</sup>

Suicide is a growing public health problem and mental illness is an important risk factor for suicide, but is just one of many ~~associated factors~~. Resources such as CDC's Preventing Suicide: a Technical Package of Policies, Programs, and Practices<sup>11</sup> and ~~data from the National Violent Death Reporting System~~ NVDRS can help states and communities prioritize comprehensive suicide prevention.

**Comment [vid5]:** Wondering if instead of recapping results, we could comment on the profound and not often discussed impact that life stressors, especially those that rise to the level of a crisis, can have. The research that shows the time amount of deliberation (which is often very low) may also be helpful to cite here, as these types of stressors/crises can represent short-term problems (vs. longer term problems such as chronic mental illness)

**Comment [vid5]:** Similarly, wondering if we could condense this instead of reiterating some of these results and instead comment on the concept of "functional impairment," as a reason why people with mental health problems might have more job/financial problems (e.g., they often have more inconsistent work histories as a result of trying to cope)

**Comment [vid5]:** I know we don't want to really be adding words – but I thought this is one thing that may not be obvious to everyone (why deaths of undetermined intent would affect suicide counts/rates). See what you think, and if we can't get the text in, maybe we could sneak a footnote in ☺

**Comment [SD]:** Is it nationally representative at this point? Or no?

**Comment [vid5]:** Some suggested rephrasing here, because I don't want to trigger questions about why we would only use one data year of NVDRS data. We have good reasons – more states, and for the state level analyses we were looking at trends and therefore needed more years. However, wondering if we could simplify this to just be about NVDRS

**Comment [vid5]:** Just to give our data enough credit, though, I am wondering if the 90% estimates could also be driven up by small or very selective samples. Was going to look into this but not sure what the reference is. Little wary of making it sound like theirs is the gold standard.



## References (TO BE UPDATED)

- 1 CDC. Web-based Injury Statistics Query and Reporting System (WISQARS). Atlanta, GA: US Department of Health and Human Services, CDC; 2016. <https://www.cdc.gov/injury/wisqars/index.html>
- 2 World Health Organization. Preventing Suicide: A Global Imperative. Geneva, Switzerland: World Health Organization; 2014.
- 3 Curtin, S.C., Warner, M., and Hedegaard, H.. "Increase in suicide in the United States, 1999-2014." (2016).
- 4 Kegler SR, Stone DM, Holland KM. Trends in Suicide by Level of Urbanization - United States, 1999-2015. *MMWR Morb Mortal Wkly Rep* 2017;66(10):270-273.
- 5 National Action Alliance for Suicide Prevention, Office of the Surgeon General. 2012 National Strategy for Suicide Prevention: Goals and Objectives for Action. Washington, DC: US Department of Health and Human Services, Office of the Surgeon General; 2012.
- 6 Davidson, L., Potter, L., and Ross, V. Surgeon General's Call to Action to Prevent Suicide. Public Health Service (DHHS), Rockville, MD. 1999.
- 7 American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders (DSM-5®): American Psychiatric Association; Arlington, VA. 2013.
- 8 Mercado MC, Holland K, Leemis RW, Stone DM, Wang J. Trends in emergency department visits for nonfatal self-inflicted injuries among youth aged 10 to 24 years in the united states, 2001-2015. *JAMA* 2017;318(19):1931-1933.
- 9 Canetto, S.S., and Sakinofsky. I. "The gender paradox in suicide." *Suicide and life-threatening behavior* 28(1): 1998: 1-23.
- 10 Stone DM, Holland KM, Bartholow BN, Crosby AE, Jack SPD, Wilkins N. Preventing suicide: a technical package of policies, programs and practices. Atlanta, GA: US Department of Health and Human Services, CDC; 2017.
- 11 Isometsä E. Psychological autopsy studies—a review. *European psychiatry* 2001;16(7):379-385.

## Acknowledgments

**Conflict of Interest** None

**Corresponding author** D Stone

## Tables and Figures

### Options for ref 11

- :Hawton K, van Heeringen K. Suicide. *Lancet*. 2009;373: 1372-81. [Doi.org/10.1016/S0140-6736\(06\)6032-X](https://doi.org/10.1016/S0140-6736(06)6032-X)

- . Canetto SS, Sakinofsky I. The Gender Paradox in Suicide. *Suicide & Life-Threatening Behavior*. 1998; 28:1-23.

### **From Katie:**

I went through the latest draft w/Alex's comments, comparing the results and discussion. Most lined up, although there were a few places where I noticed some mismatch ("" is from the draft, bold are my comments):

"From 1999-2016, age-adjusted suicide rates among people  $\geq 10$  years increased 25.4% overall." **We give the national (overall) number only in the abstract, not in the results.**

“Suicide rates increased by more than 25% in 30 states and upwards of 50% in some”. **We only mention one (North Dakota) that is over 50% in the results (rather than “some”).**

“While two-thirds of people with MHP had a history of mental health and/or substance abuse treatment and **over half were currently in treatment at the time of their deaths**, much more support for this vulnerable population is needed.” **The highlighted point is only in the table right now– could add to results text.**

“While MHP are a significant contributor to suicide, 54% of suicide decedents in the current study did *not* have a known MHP. This group suffered more life stressors, especially related to relationships (e.g. intimate partner problems, arguments or conflicts, **recent perpetration of intimate partner violence**)...” **Didn’t notice this the first time around, but the highlighted portion should read “recent perpetration of *interpersonal* violence” – that variable is not specific to IPV.**

“People with known MHP also experienced life and other stressors apart from their MHP. This group was more likely to experience job and/or financial problems. **Also common were intimate partner problems (24.1%), physical health problems (21.4%), and recent or impending crises (26%).**” **The numbers in the highlighted portion are in the table, but not specifically cited in the results (because we report odds ratios instead).**



**Structured abstract (241/250 words)**

**Background:** Suicide rates have been rising in the United States (U.S.). Examining state-level trends in, and contributing circumstances to, suicide, can inform comprehensive state suicide prevention planning.

**Methods:** Trends in age-adjusted suicide rates, overall and by sex and state, among people aged ≥10 years, were ~~assessed~~ calculated ~~(using)~~ using data from the National Vital Statistics System. Changes in rates and state rankings were ~~examined~~ across six consecutive three-year periods (1999-2001, 2002-2004, 2005-2007, 2008-2010, 2011-2013, 2014-2016). Data from ~~the~~ 2015 from the National Violent Death Reporting System, across 27 states, were analyzed to ~~compare~~ examine precipitating circumstances ~~among~~ between suicide decedents with and without known mental health problems.

**Results:** Statistically significant ~~rate increases~~ ~~upward rate trends~~ were identified from 44 states. ~~For the U.S. overall and for 30 states individually, (suicide) rates increased by at least 25% over the study period. (Average annual percentage change in suicide rates increased significantly in the U.S. overall (25.4%) and in 44 states, with relative increases ranging from 5.9% in Delaware to 57.6% in North Dakota.) People with (45%) and without known mental health problems (54%) were more ( ) to experience severe contributing circumstances than those with mental health problems (45%), including relationship problems (45.1% and 49.6%), life stressors (54.2% and 46.7%), and recent crises (32.9% and 25.0, respectively).~~ However, these and other circumstances occurred frequently for both groups. Known mental health problems experienced a range of contributing circumstances contributing to their suicides, including recent crises and problems related to substance use, relationships, job/financial issues, and criminal/legal matters, and recent

**Conclusions:** Suicide rates have risen significantly in the U.S. and across most states from 1999-2016. ~~(No single factor alone contributes to suicide.) Differing (circumstances) contributing to suicides extend beyond mental health problems among those with and without mental health problems.~~

**Implications for Public Health Practice:** To reverse upward trends in suicide, states can use a population-based public health approach ~~inclusive of evidence-based strategies based on the best available evidence~~ across multiple levels (individual, family/relationship, community, societal), focused on preventing risk before it starts, identifying and supporting people already at risk, preventing reattempts, and ~~caring for~~ supporting survivors ~~after a suicide~~ ~~decedents' surviving loved ones.~~

**INTRODUCTION****BACKGROUND AND PURPOSE (210/250 words) TOTAL COUNT=1900/1800**

In 2016, nearly 45,000 suicides (13.4/100,000) occurred in the United States (U.S.).<sup>1</sup> ~~While overall rates have been declining, (state) rates of suicide rates in the U.S. have increased between 1999 and 2016, among males and females, across racial/ethnic groups, and across urbanization levels.<sup>2,4</sup> Emergency department visits for nonfatal self-harm injuries increased by more than 40% between 2001 and 2015.<sup>5</sup> In 2015, suicides and self-harm injuries cost the nation more than \$69 billion in direct medical and work loss costs.<sup>1</sup> Suicide is rarely caused by one factor; rather, the risks are often numerous and occur at multiple levels—individual, family/relationship, community, and societal.<sup>6</sup> Despite this, prevention primarily centers on mental illness (e.g., depression, bipolar disorder). Other factors associated with suicide include social and isolation, economic problems, ~~downward~~, access to lethal means (e.g. substances, firearms) among people at risk, ~~and~~ ~~adversity~~ ~~lack of~~ coping and problem-solving skills, ~~and~~ ~~loss of a~~ friend or family member ~~loved one to~~ ~~suicide~~, a prior suicide attempt, ~~and~~ ~~unsafe means~~ ~~portable~~, among others.<sup>6</sup> ~~While~~ ~~Although~~ the Surgeon General called for a comprehensive public health approach to suicide prevention in 1999, to date, most states~~

Comment [SD(): Scott's comment: This is the key stratification in my view.

Comment [SD(): Scott's comment: The

Comment [tgs9]: I like Scott's

Comment [tgs9]: I like this the way you

Comment [tgs9]: I don't think we need

Comment [snk6]:

Comment [FKA(): Should we say

Comment [SD(): Scott's comment:

Comment [tgs9]: Do you want to say

Comment [FKA(): If we have another

Comment [tgs9]: We can't focus on

Comment [IAZ(): Need to rephrase this

Comment [vid5]: Could we shorten to

Comment [CA]: I like "primary

Comment [FKA(): I think a lot of people

Comment [HK(): I pose a solution to Katie's

Comment [tgs9]: I think this frame

Comment [IAZ(): Request to change

Comment [tgs9]: Deb, in the fact sheet

Comment [SD(): Need to update

Comment [HK(): Should we add

Comment [SD(): Need reference here.

Comment [CA]: Options:

Comment [FKA(): Probably could cut

Comment [SD(): Do we want to say

Comment [FKA(): I'd vote to leave it

Comment [tgs9]: I agree

Comment [tgs9]: We need to keep this

Comment [tgs9]: I think we should



struggle to make this a reality.<sup>7</sup> ~~Understanding the extent of the problem and the contributing factors is the first step in addressing the problem.~~ ~~Understanding the extent of the problem and the contributing factors is the first step in addressing the problem.~~ ~~Understanding the extent of the problem and the contributing factors is the first step in addressing the problem.~~ To assist states ~~with suicide prevention planning~~, this study analyzes trends in state suicide rates, assesses the multiple factors associated with suicide, and provides prevention recommendations.

## METHODS (259/250 words)

Suicide rate estimates and trend analyses ~~exclude data for persons <10 years old.~~ Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases 10<sup>th</sup> Revision* [ICD-10] underlying-cause-of death codes X60-X84, Y87.0, \*U03).<sup>8</sup> Age-specific population estimates were obtained from U.S. Census Bureau / National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods ~~covering years from~~ 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Data from 2015 from the 27 states with complete data participating in the National Violent Death Reporting System (NVDRS) were used to ~~the characteristics, including precipitating circumstances, of~~ deaths by suicide among decedents with and without known current mental health problems (MHP). ~~Mental health problems~~ MHP are defined in NVDRS as disorders and syndromes listed in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5),<sup>9</sup> with the exception of alcohol and other substance dependence (captured ~~in separate variables~~). NVDRS ~~compiles aggregates~~ data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known MHP were compared using Chi-square tests; logistic regression was used to estimate adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and race/ethnicity.

## RESULTS (696/600 words)

The most recent overall suicide rates (representing 2014-2016) ranged from 6.9 (District of Columbia [D.C.]) to 29.2 (Montana) per 100,000 persons per year, a four-fold difference (Table 1). Across the entire study period, rates increased in all but one state (Nevada), with increases ranging from +0.2 (Delaware) to +8.1 (Wyoming). Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with percentage increases of at least 25% observed in over half of all states (30), as well as nationally.

Modeled suicide rates trends ~~were found to be significantly increasing~~ increased significantly for 44 states, as well as for the U.S. overall (Table 1). By sex, rate trends ~~increased significantly were found to be significantly increasing~~ in 34 states for males and in 43 states for females. Nationally, the model-estimated AAPC for overall suicide rates was +1.5%. By sex, the national AAPC was +1.1% for males and +2.6% for females.

Suicide decedents with (N=9,407) and without (N=11,039) known ~~mental health problems~~ (MHP) were compared. While both groups were predominately male and non-Hispanic white, suicide decedents without known MHP had 2.3 greater odds of being male (95% confidence interval [CI] = 2.2-2.5), and significantly greater odds of being racial/ethnic minorities (odds ratio [OR] range: 1.0-2.1; 95% CI range [1.0-1.3] – [1.6-2.0]). They also had significantly greater odds of perpetrating homicide-suicide (adjusted odds ratio [aOR] = 2.9, 95% CI =

**Comment [tgs9]:** I feel like we need a point like this to set up why we are examining those with and without mental health problems separately.

**Comment [IAZ():** There might not be enough room for an additional reference, but might want to consider including one here to highlight the rationale for excluding persons under 10 years old.

**Comment [HK():** I think you can delete this



2.2-3.8), of firearm suicide (aOR = 1.6, 95% CI = 1.5-1.7), and of positive toxicology results for alcohol (aOR = 1.2, 95% CI = 1.1-1.3). Fifteen percent of those with known MHP and 20% without ever served in the U.S. military.

Although firearms were used most often in both groups, decedents with known MHP died by poisoning more than those without MHP (19.8% vs. 10.4%), most frequently by over-the-counter/otherwise unclassified drugs (35.8%), opioids (32.7%), antidepressants (34.6%) or benzodiazepines (25.1%).

All suicide decedents with known MHP (N=9,407) and approximately 85% without known MHP (N=9,357) had precipitating circumstances information. ~~Two-thirds of decedents with known MHP had a history of MH or substance abuse treatment (67.2%) and were more likely to have any substance abuse problems (31.6% vs. 25%, p < .01).~~

Decedents without known MHP had significantly greater odds of any type of relationship problem (aOR = 1.3, 95% CI = 1.2-1.4), and specifically of intimate partner problems (aOR = 1.4, 95% CI = 1.3-1.5), arguments/ or conflicts (aOR = 1.4, 95% CI = 1.3-1.5), and having recently perpetrated or interpersonal violence (aOR = 2.0, 95% CI = 1.6-2.4). ~~They also two-thirds of decedents with known MHP had a history of MH or substance abuse treatment (67.2%) and were more likely to have any substance abuse problems (31.6% vs. 25%, p < .01).~~

~~Suicide decedents without known MHP had significantly greater odds of other life stressors, such as a criminal legal problems (aOR = 1.7, 95% CI = 1.5-1.9), or eviction/loss of home (aOR = 1.4, 95% CI = 1.2-1.6), and were also more likely to have a crisis within the preceding or upcoming two weeks (aOR = 1.4, 95% CI = 1.3-1.5). Among both groups, the most common crises were intimate partner (13.6%) and physical health (13.4%) problems.~~

~~Decedents without known MHP had significantly lower odds of recent release from any institution, but when a release was indicated, they were significantly more likely to be released from a correctional facility (aOR = 4.5, 95% CI = 3.2-6.3), or hospital (aOR = 1.3, 95% CI = 1.1-1.7). Among decedents with known MHP who were recently released from an institution (10.2%), 42.8% release was from a psychiatric institutions. Those with known MHP also more frequently had physical or financial problems (16.2% vs. 15.8%, p < .05).~~

~~Decedents without known MHP had significantly greater odds of a recent/imminent crisis (aOR = 1.3, 95% CI = 1.2-1.5). When the type of crisis was known, it was most frequently a problem related to an intimate partner (36.2%), physical health (13.3%), criminal legal issues (13.3%), a family relationships (7.1%), or a job (5.3%) problem. Over one-fourth of decedents with a known MH problem/MHP also had recent or impending crises, most frequently related to problems with an intimate partner (34.3%), physical health (13.0%), or a family relationships (8.2%). Decedents with known MHP had significantly greater odds of imminent legal problems (aOR = 1.3, 95% CI = 1.1-1.5), and significantly increased odds of not released from an institution (aOR = 1.2, 95% CI = 1.1-1.3).~~

Suicide decedents without known MHP had significantly greater odds of leaving a suicide note (aOR = 1.2, 95% CI = 1.1-1.2), while decedents with known MHP more often had a history of suicidal ideation (40.8% vs. 23.0%, p < .01) and attempts (29.4% vs. 10.3%, p < .01).

### Conclusions and Comments (735/700 words)

During the time period From 1999-2016, age-adjusted suicide rates among people ≥ 10 years increased 25.4% overall. Forty-four states saw significant rate increases, and one (Nevada) state saw a significant decline. Suicide rates increased by more than 25% in 30 states and upwards of 50% in ~~some~~ (North Dakota).

**Comment [tgs9]:** Suggestion to avoid saying "known" again. Can just use "information"

**Comment [tgs9]:** Suggest moving this sentence here to improve the flow.

**Comment [HK]:** Can you say this? Wouldn't saying this imply that if IPP is checked as a precipitating factor, then relationship problems also has to be checked? Is that how NVDRS coding of IPP works? I thought these two categories were mutually exclusive in that IPP could be checked without relationship problems being checked.

This could be easily changed by just removing "specifically"

**Comment [tgs9]:** I suggest moving this point here for flow. I think we can shorten it in this way to save on words and to focus on the fact that the most common crises applied to both groups. This helps set up our discussion.

**Comment [vid5]:** Could probably cut this if we need to for space

**Comment [vid5]:** Maybe we should be more precise

**Comment [tgs9]:** Why not give the number?

**Comment [IAZ]:** Need to take out "some" here because North Dakota is the only state over the 50% mark.



Among females (rates increased in 43 states among females and rates among males increased in 34 states among males). This signals of increasing vulnerability to suicide among females towards suicide signs with recent reports that identified indicating a 64% increase in (middle-aged female suicide rates between 1999-2014) and an annual increase of 19.2% per year in emergency department visits for self-inflicted injuries among young females aged of 10 and 14, in the period from 2009-2015.<sup>10</sup> These increases may hint at a narrowing of the suicide gender gap, historically weighted towards males (prevalence of 1.2%).<sup>11</sup> More research into this troubling trend is needed.

One important factor associated with suicide is mental health problems (MHP). Nearly half of suicide decedents in NVDRS people in this study had a known mental health problem (MHP). This group was challenged by comorbid substance abuse problems (31.6%) and histories of suicide ideation (40.8%) and attempts (29.4%). While two-thirds of people with MHP had a history of mental health (MH) and/or substance abuse treatment and over half were currently in treatment at the time of their deaths, additional evidence-based support could help address the needs of for this vulnerable population is needed. This includes the need for broader implementation of affordable and evidence-based treatments, such as doctor-patient collaborative care models and cognitive-behavioral therapy.<sup>12</sup> Additionally, greater access to behavioral health providers, especially in underserved areas is important need, as is healthcare systems change that supports suicide prevention and patient safety.<sup>12</sup>

While MHP are a significant contributor to suicide, 54% of suicide decedents in the current study did not have a known MHP. This group suffered more life stressors, especially related to relationships (e.g. intimate partner problems, arguments or conflicts, recent perpetration of intimate partner violence), but also related to other life stressors such as criminal-legal matters, eviction/loss of home, and recent or impending crises (often related to the abovementioned factors). People with known MHP also experienced life and other stressors apart from their MHP. This group was more likely to experience job and/or financial problems. Also common were intimate partner problems (15.4%), physical health problems (11.4%), and recent or impending crises (10.1%).

These results point to the need for comprehensive suicide prevention that goes beyond a focus on MH treatment alone. These prevention strategies may include: strengthening economic supports (e.g. housing stabilization policies, household financial support), teaching coping and problem-solving skills and other pro-social norms, especially early in life to manage everyday stressors and to prevent future relationship problems; and promoting social connectedness to increase a sense of belongingness and access to informational, tangible, emotional, and social support, as needed. Other strategies indicated by these results include creating protective environments (e.g., reducing access to lethal means among people at risk, and creating organizational and workplace policies to promote help-seeking and positive social norms), and supporting people after a suicide has taken place to prevent survivors' risk, and to assure safe reporting by the media in order to prevent suicide contagion.<sup>12</sup>

These findings provided of this report are subject to have at least three limitations. In four states (Maryland (MD), Utah (UT), Massachusetts (MA), and Rhode Island (RI)), state rankings might have been impacted by large proportions of deaths of undetermined intent (MD), (which were somewhat lower than expected) or by decreased percentages of undetermined deaths over time (UT, MA, RH), which likely reflect some unrecognized suicides. Second, NVDRS is not yet nationally representative. Currently, 40 states, the District of Columbia, and Puerto Rico participate in NVDRS. This study used the most current report available data available and year includes 27 states that represent half (49.6%) of the U.S. (population). Others joined the system later data for state level analyses extend from 1999 to 2016, however, data on circumstances of suicide come from a single year (2015) and encompass only 27 states.

**Comment [CA]:** Maybe could leave out ratio to save space.

**Comment [tgs9]:** This paragraph could be shortened a lot. We could have tested the change in the sex gap but we did not present this so the point seems tangential. Also, we also don't talk about sex differences in circumstances or prevention strategies so this text could get the reader wondering about issues that we don't discuss.

**Comment [vid5]:** Wondering if instead of recapping results, we could comment on the profound and not often discussed impact that life stressors, especially those that rise to the level of a crisis, can have. The research that shows the time amount of deliberation (which is often very low) may also be helpful to cite here, as these types of stressors/crises can represent short-term problems (vs. longer term problems such as chronic mental illness).

**Comment [tgs9]:** I think this is worth considering. We have the space to include a concise point about how situational factors can contribute to immediate risk.

**Comment [tgs9]:** I like this sentence.

**Comment [vid5]:** Similarly, wondering if we could condense this instead of reiterating some of these results and instead comment on the concept of

**Comment [tgs9]:** The reader won't know what you mean about norms here.

**Comment [vid5]:** I know we don't want to really be adding words – but I thought this is one thing that may not be obvious to everyone (why deaths of

**Comment [tgs9]:** I'm not sure that we need this. If we think it helps then I suggest that we shorten it and move it to the end to improve the flow. I added an

**Comment [tgs9]:** This was in the 2015 NVDRS SS. I think it would be good to include it here too. It will be good to confirm the accuracy with Katie.

**Comment [SD]:** Is it nationally representative at this point? Or no?

**Comment [vid5]:** Some suggested rephrasing here, because I don't want to trigger questions about why we would only use one data year of NVDRS data.



Third, abstractors of NVDRS data are limited to data included in the investigative reports they receive. For example, medical and mental health information are not captured directly from medical records but from informants (e.g., family, friends) via coroner/medical examiner reports and the decedent's family members and friends. Therefore, knowledge of the informant impacts completeness and accuracy of the information reported. This may explain some of the discrepancy between the prevalence of mental health disorders reported here (54%) and estimates from studies that estimate mental health problems based on symptoms described in interviews with family and friends. It is likely that some of those without known mental health problems were experiencing mental health challenges at the time of death, but the lack of awareness about their mental health problems underscores the importance of addressing the range of contributing circumstances. The 90% estimate is based on a limited number of studies.<sup>13</sup>

Suicide is a growing public health problem and mental illness is an important risk factor for suicide, but is just one of many associated factors. Resources such as CDC's *Preventing Suicide: a Technical Package of Policies, Programs, and Practices*<sup>12</sup> and data from the [National Violent Death Reporting System NVDRS](#) can help states and communities prioritize comprehensive suicide prevention.

#### References (TO BE UPDATED)

- 1 Wisqars fatal injury reports
- 2 World report
- 3 NCHS Data brief 2014
- 4 Kegler et al 2017
- 5 WISQARS Nonfatal injury reports
- 6 National Strategy for Suicide Prevention
- 7 Davidson, L., Potter, L., and Ross, V. (1999) Surgeon General's Call to Action to Prevent Suicide. Public Health Service (DHHS), Rockville, MD.
- 8 ICD-10
- 9 DSM-5
- 10 Melissa's paper
- 11 Need ref
- 12 Technical package

#### Acknowledgments

Conflict of Interest None

Corresponding author D Stone

Tables and Figures

#### Options for ref 11

- :Hawton K, van Heeringen K. Suicide. *Lancet*. 2009;373: 1372-81. [Doi.org/10.1016/S0140-6736\(06\)6032-X](https://doi.org/10.1016/S0140-6736(06)6032-X)

- . Canetto SS, Sakinofsky I. The Gender Paradox in Suicide. *Suicide & Life-Threatening Behavior*. 1998; 28:1-23.

#### From Katie:

I went through the latest draft w/Alex's comments, comparing the results and discussion. Most lined up, although there were a few places where I noticed some mismatch (""" is from the draft, bold are my comments):

"From 1999-2016, age-adjusted suicide rates among people ≥ 10 years increased 25.4% overall." **We give the national (overall) number only in the abstract, not in the results.**

**Comment [tgs9]:** I agree with the comment below that including the 90% estimate here could be problematic. It might be better to describe the alternative types of studies. I suggested an edit so you can see what I mean but this will need to be updated to be consistent with what you cite.

**Comment [vid5]:** Just to give our data enough credit, though, I am wondering if the 90% estimates could also be driven up by small or very selective samples. Was going to look into this but not sure what the reference is. Little wary of making it sound like theirs is the gold standard.

**Comment [IAZ():** Request to change reference number 3 from the 2014 NCHS data brief to the more recent 2017 MMWR that looked specifically at sex, race/ethnicity, age group, mechanism by urbanization level.



“Suicide rates increased by more than 25% in 30 states and upwards of 50% in some”. **We only mention one (North Dakota) that is over 50% in the results (rather than “some”).**

“While two-thirds of people with MHP had a history of mental health and/or substance abuse treatment and over half were currently in treatment at the time of their deaths, much more support for this vulnerable population is needed.” **The highlighted point is only in the table right now– could add to results text.**

“While MHP are a significant contributor to suicide, 54% of suicide decedents in the current study did *not* have a known MHP. This group suffered more life stressors, especially related to relationships (e.g. intimate partner problems, arguments or conflicts, recent perpetration of intimate partner violence)...” **Didn’t notice this the first time around, but the highlighted portion should read “recent perpetration of *interpersonal* violence” – that variable is not specific to IPV.**

“People with known MHP also experienced life and other stressors apart from their MHP. This group was more likely to experience job and/or financial problems. Also common were intimate partner problems (24.1%), physical health problems (21.4%), and recent or impending crises (26%).” **The numbers in the highlighted portion are in the table, but not specifically cited in the results (because we report odds ratios instead).**



1 **Short title:** Vital Signs: Increasing Trends in State Suicide Rates and Contributing Circumstances

2 Deborah M. Stone, ScD;<sup>1</sup> Thomas R. Simon PhD;<sup>1</sup> Katherine A. Fowler, PhD;<sup>1</sup> Scott R. Kegler, PhD;<sup>2</sup> Keming Yuan,  
3 MS;<sup>1</sup> Kristin M. Holland, PhD;<sup>1</sup> Asha Z. Ivey-Stephenson, PhD;<sup>1</sup> Alex E. Crosby, MD<sup>1</sup>

4 **Structured abstract (249/250 words)**

5 **Background:** Overall suicide rates have been rising in the United States (U.S.). Examining state-level trends in  
6 suicide and the multiple contributing circumstances can inform comprehensive state suicide prevention  
7 planning.

8 **Methods:** Trends in age-adjusted suicide rates, by state and sex, among people aged ≥10 years, were assessed  
9 using data from the National Vital Statistics System. Changes in rates were examined across six consecutive  
10 three-year periods from 1999-2016. The National Violent Death Reporting System (2015), covering 27 states,  
11 was used to ~~compare-examine~~ the precipitating circumstances ~~amongbetween~~ suicide decedents with and  
12 without known mental health problems (MHP).

13 **Results:** Forty-four states saw statistically significant suicide rate increases over the ~~study~~ period. In ~~30~~25 states,  
14 rates increased by ~~25%~~30% or more. Male suicide rates increased ~~significantly~~ in 34 states while female rates  
15 increased ~~significantly~~ in 43 states. People with (46%) and without (54%) known MHP had both differing and  
16 similar precipitating circumstances associated with their suicides. ~~Many-Several circumstancefactors~~, such as  
17 relationship problems (39.6 and 45.1%), life stressors (49.7 and 54.2%), and recent crises (26.0 and 32.9%),  
18 respectively, were more likely among those without known MHP, but were common among both groups.

19 **Conclusions:** Suicide rates rose significantly across most states from 1999-2016. ~~Varied circumstances beyond~~  
20 ~~MHP alone~~ contributed to suicides among people with and without known MHP.

21 **Implications for Public Health Practice:** States can use a ~~comprehensive multi-level~~ public health approach  
22 based on the best available evidence to prevent ~~multiple~~ suicide risks before they occur, identify and support  
23 people already at risk, prevent-re-attempts, and help friends/family after a suicide occurs.

24 **INTRODUCTION**

25 **BACKGROUND AND PURPOSE (243/250 words)**

26 In 2016, nearly 45,000 suicides (~~13.4~~15.6/100,000) occurred in the United States (U.S.).<sup>1</sup> Between 1999 and  
27 2016, suicide rates increased among males and females, across racial/ethnic groups, and across urbanization  
28 levels.<sup>2,3</sup> Suicide is the 10<sup>th</sup> leading cause of death and is among the only leading causes to be ~~increasing~~.<sup>1,4</sup>  
29 Additionally, rates of Emergency Department visits for nonfatal self-harm injury, a key risk factor for suicide,  
30 increased more than 40% between 2001 and 2015.<sup>1</sup> Together, suicides and self-harm injuries cost the nation  
31 more than \$69 billion in direct medical and work loss costs.<sup>1</sup>

32 The National Strategy for Suicide Prevention<sup>5</sup> calls for a public health approach to suicide with prevention efforts  
33 reaching across the social ecology (i.e., individual, family/relationship, community, and societal levels). Such an  
34 approach highlights that suicide is rarely caused by any single factor but rather is multi-determined.<sup>5</sup> Despite  
35 this, suicide prevention efforts largely focus on identifying and treating high-risk individuals with mental illness.<sup>6</sup>  
36 However, other associated risk factors exist and include social and economic problems, access to lethal means  
37 (e.g. substances, firearms) among people at risk, poor coping and problem-solving skills, and prior suicide  
38 attempts, among others.<sup>5</sup> Expanded awareness of the multiple circumstances that contribute to suicide risk  
39 apart from mental health problems alone, can help ~~achieve substantial~~ reductions in suicide rates. To assist

**Comment [tgs9]:** Suggestion because we have not explained what we mean by multi-level yet. Also, we use “comprehensive” in the background so we can be consistent.

**Comment [snk6]:** It's 15.6 (age-adjusted) when using the population denominator ≥ 10 years of age. That's consistent with how we present rates elsewhere in this report (and with what we've already stated in the Abstract).

**Comment [snk6]:** Extra mark?

**Comment [tgs9]:** Edits to save words



states in reaching this goal through and toward comprehensive suicide prevention activities planning, this study analyzes state-specific trends in suicide rates, assesses the multiple factors associated with suicide, and provides prevention recommendations.

#### **METHODS (246/250 words)**

Suicide rate estimates and trend analyses exclude data for persons <10 years old. Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases 10<sup>th</sup> Revision* [ICD-10] underlying-cause-of death codes X60-X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods from 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Data from 2015 from the 27 states with complete data participating in the National Violent Death Reporting System (NVDRS) were used to compare the characteristics among suicide decedents with and without known current mental health problems (MHP). MHP are defined in NVDRS as disorders and syndromes listed in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5),<sup>7</sup> with the exception of alcohol and other substance dependence (captured separately). NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known MHP were compared using Chi-square tests; logistic regression was used to estimate adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and race/ethnicity.

#### **RESULTS (593/600 words)**

The most recent overall suicide rates (representing 2014-2016) ranged from 6.9 (District of Columbia) to 29.2 (Montana) per 100,000 persons per year, a four-fold difference (Table 1). Across the entire study period, rates increased in all but one state (Nevada), with increases ranging from +0.2 (Delaware) to +8.1 (Wyoming). Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with percentage increases of at least ~~25%~~30% observed in ever half of all states ~~(30)~~ as well as nationally.

Modeled suicide rate trends indicated significant increases for 44 states, as well as for the U.S. overall (Table 1). By sex, modeled rate trends indicated significant increases in 34 states for males and in 43 states for females. Nationally, the model-estimated AAPC for the overall suicide rates was +1.5%. By sex, the national AAPC was +1.1% for males and +2.6% for females.

Suicide decedents with (N=9,407) and without (N=11,039) known MHP were compared. While both groups were predominately male and non-Hispanic white, suicide decedents without known MHP had 2.3 greater odds of being male (95% confidence interval [CI] = 2.2-2.5), and significantly greater odds of being racial/ethnic minorities (odds ratio [OR] range: 1.0-2.1; 95% CI range [1.0-1.3] – [1.6-2.0]). They also had significantly greater odds of perpetrating homicide-suicide (adjusted odds ratio [aOR] = 2.9, 95% CI = 2.2-3.8), of firearm suicide (aOR = 1.6, 95% CI = 1.5-1.7), and of positive toxicology results for alcohol (aOR = 1.2, 95% CI = 1.1-1.3). Fifteen percent of those with known MHP and 20% without ever served in the U.S. military.

**Comment [vid5]:** Did we want to say why? This seems to always come up.

**Comment [snk6]:**  
Need to be careful here -- no longer true nationally with the newly adopted 30% threshold.



84 Although firearms were used most often in both groups, decedents with known MHP died by poisoning more  
85 than those without MHP (19.8% vs. 10.4%), most frequently by over-the-counter/otherwise unclassified drugs  
86 (35.8%), opioids (32.7%), antidepressants (34.6%) or benzodiazepines (25.1%).

87 All suicide decedents with known MHP (N=9,407) and approximately 85% without (N=9,357) had precipitating  
88 circumstances information. People with MHP were more likely to have any substance abuse problems (31.6% vs.  
89 25%,  $p < .01$ ). While two-thirds of those with known MHP had a history of MH or substance abuse treatment  
90 (67.2%), just over half (54.0%) were in current mental health treatment at the time of their deaths.

91 Decedents without known MHP had significantly greater odds of any type of relationship problem or loss (aOR =  
92 1.3, 95% CI = 1.2-1.4), specifically intimate partner problems (aOR = 1.4, 95% CI = 1.3-1.5), arguments/conflicts  
93 (aOR = 1.4, 95% CI = 1.3-1.5), and recently perpetrating interpersonal violence (aOR = 2.0, 95% CI = 1.6-2.4).  
94 They also had significantly greater odds of other life stressors, such as criminal legal problems (aOR = 1.7, 95% CI  
95 = 1.5-1.9) or eviction/loss of home (aOR = 1.4, 95% CI = 1.2-1.6), and they were also more likely to have had a  
96 crisis within the preceding or upcoming two weeks (aOR = 1.4, 95% CI = 1.3-1.5). Among both groups, the most  
97 common crises were intimate partner (35.6%) and physical health (13.4%) problems.

98 Decedents without known MHP had significantly lower odds of recent release from any institution, but when a  
99 release was indicated, they were more likely to be recently released from a correctional facility (aOR = 4.5, 95%  
100 CI = 3.2-6.3) or hospital (aOR = 1.3, 95% CI = 1.1-1.7). Among decedents with known MHP who were recently  
101 released from an institution (10.2%), 42.8% were released from psychiatric facilities.

102 Suicide decedents without known MHP had significantly greater odds of leaving a suicide note (aOR = 1.2, 95%  
103 CI = 1.1-1.2), while decedents with known MHP more often had a history of suicidal ideation (40.8% vs. 23.0%,  $p$   
104  $< .01$ ) and attempts (29.4% vs. 10.3%,  $p < .01$ ).

105 **Conclusions and Comments (698/700 words)**

106 From 1999-2016, 44 states saw significant rate increases. Half of the states experienced increases of 30% or  
107 more. Suicide rates increased by more than 25% in 30 states and upwards of 57% in one state, North Dakota.  
108 Rates increased significantly in 34 states among males and increased significantly in 43 states among females.  
109 More research into the causes of these trends is necessary.

110 One important factor associated with suicide is MHP. Nearly half of suicide decedents in NVDRS had a known  
111 MHP. This group was challenged by comorbid substance abuse problems (31.6%) and histories of suicidal  
112 ideation (40.8%) and attempts (29.4%). While two-thirds of people with MHP had a history of MH and/or  
113 substance abuse treatment and over half were currently in treatment at the time of their deaths, additional  
114 support could help address the needs of this vulnerable population. This includes broader implementation of  
115 affordable and evidence-based treatments, such as doctor-patient collaborative care models and cognitive-  
116 behavioral therapy.<sup>8</sup> Additionally, greater access to behavioral health providers, especially in underserved areas  
117 is important, as is healthcare systems change that supports suicide prevention and patient safety through care  
118 transitions.<sup>8</sup>

119 While MHP are a significant contributor to suicide, 54% of suicide decedents in this study did not have a known  
120 MHP. This group suffered more relationship problems and life stressors such as criminal-legal matters,  
121 eviction/loss of home, and recent or impending crises. This is noteworthy in light of findings that suggest many  
122 suicides and attempts occur with minimal deliberation time, particularly among people without mental health  
123 disorders and who faced impending life crises.<sup>9,10</sup> People with known MHP also experienced other multiple life  
124 and other stressors such as job and/or financial problems, relationship problems, and physical health problems.

**Comment [tgs9]:** I'm wondering if we could add the %'s. This would make this consistent with the abstract and be more in line with our emphasis on the fact that there were differences but the circumstances are relevant for both groups.

The structure would stay the same. We could use the approach that you used below (green highlighted text) to make the % comparison and reflect the significance testing without giving the aOR and 95% CI's. This would also save words.

**Comment [snk6]:**

This sounds so precise all of a sudden, compared to the very general benchmark of 25% in this same sentence. I'm thinking about a different way to communicate this, but I don't have anything better at the moment.

**Comment [tgs9]:** I agree. What about taking out the ND point.

**Comment [tgs9]:** I think it would be good to cite some work that describes potential explanations and the need for additional research.



125 These findings point to the need to both prevent the conditions associated with mental health problems in the  
126 first place and the need to support people with MHP to decrease their vulnerability to poor social, health, and  
127 economic outcomes.<sup>11</sup>

128 These ~~underscore the importance of results point to the need for~~ comprehensive state suicide prevention  
129 ~~activities~~ that goes beyond a focus on MH treatment alone. Prevention strategies may include: strengthening  
130 economic supports (e.g. housing stabilization policies, household financial support), teaching coping and  
131 problem-solving skills, especially early in life to manage everyday stressors and prevent future relationship  
132 problems; and promoting social connectedness to increase a sense of belongingness and access to  
133 informational, tangible, emotional, and social support, as needed. Other strategies indicated by these results  
134 include creating protective environments (e.g., reducing access to lethal means among people at risk, creating  
135 organizational and workplace policies to promote help-seeking and positive social norms), supporting people  
136 after a suicide has taken place to ~~prevent survivors'~~ risk, and assuring safe reporting by the media in order to  
137 prevent suicide contagion.<sup>8</sup> ~~While few states have had the opportunity for such a comprehensive approach,~~  
138 ~~states such as Colorado are taking up the challenge.~~<sup>12</sup>

139 ~~These~~The study findings have at least three limitations. In four states (~~MD, UT, MA, RI~~ ~~MD, MA, RI, UT~~), rankings  
140 might have been impacted by large proportions of ~~injury~~ deaths of undetermined intent, or by decreased  
141 percentages of ~~undetermined-such~~ deaths over time, ~~which likely reflect include~~ some unrecognized suicides.  
142 Second, NVDRS is not yet nationally representative. This study used the most current data available ~~which and~~  
143 includes 27 states that represent half (49.6%) of the U.S. population. Third, abstractors of NVDRS data are  
144 limited to data included in investigative reports. For example, medical and MH information are not captured  
145 directly from medical records but from key informants (e.g., family, friends) via coroner/medical examiner  
146 reports. Therefore, knowledge of the informant impacts completeness and accuracy of the information  
147 reported, ~~and in-depth studies with family members often see greater attributions to mental health and~~  
148 ~~substance abuse disorders. This may explain some of the discrepancy between the prevalence of MHP reported~~  
149 ~~here and studies that obtain estimates based on in-depth interviews with next-of-kin.~~<sup>13</sup> It is likely that some  
150 people without known mental health problems in the current study were experiencing mental health challenges  
151 at the time of death, ~~that were either not known or reported by informants, or were not captured in reports~~  
152 ~~from NVDRS's primary data sources, but the absence of a diagnosis~~ underscores the importance of addressing  
153 ~~the range of other contributing circumstances.~~

154 Suicide is a growing public health problem and mental illness is an important risk factor for suicide, but is ~~just~~  
155 one of many. Resources such as CDC's *Preventing Suicide: a Technical Package of Policies, Programs, and*  
156 *Practices*<sup>12</sup> and data from the NVDRS can help states and communities prioritize comprehensive suicide  
157 prevention.

#### 158 Acknowledgments

159 The authors acknowledge Robert Anderson, Holly Hedegaard, and Margaret Warner from the Division of Vital  
160 Statistics, National Center for Health Statistics, CDC, for their statistical consultation.

161  
162 **Conflict of Interest** No conflicts of interest were reported.

163  
164 **Corresponding author:** Deborah M. Stone, [dstone3@cdc.gov](mailto:dstone3@cdc.gov), 770-488-3942

165  
166 **Author Affiliations:**

**Comment [vid5]:** Still wondering if people might get confused re: the term "survivor" – is there a different way to put this?

**Comment [tgs9]:** You include two #12 references below.

I'm not sure that I buy the lack of opportunity frame here. What about saying "Some states, such as CO, have already developed and are implement plans for comprehensive suicide prevention." ?

**Comment [snk6]:**  
Suggest ordering alphabetically.

**Comment [vid5]:** Isn't this referring to the first part (large proportions of undetermined deaths)? I like that we're explaining this point a little but the structure here kind of looks like we're referring to the decreased %s (probably just tweak it a little and would be fine)

**Comment [tgs9]:** This makes it sound like the NVDRS and these studies use similar approaches. It looks to me like the 90% estimate in the review you cite includes mental or substance abuse disorders. What do you think of the edit suggested? I'm still not sure of the best way to make this point but I think this is close.

**Comment [vid5]:** Responding to Tom's email from earlier: MHP in NVDRS are based on reports that the decedent had a MH disorder that is a diagnosis in the DSM. Often informants will report information that seems to reflect that the

**Comment [tgs9]:** Did our classification rely on a diagnosis? This implies that we did.

**Comment [vid5]:** MHP in NVDRS are based on reports that the decedent had a MH disorder that is a diagnosis in the DSM. Often informants will report information that seems to reflect that the person was diagnosed by a professional.

**Comment [tgs9]:** I think some will take issue with saying it is "just" one of many.



167 <sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis,  
168 Research, and Practice Integration, National Center for Injury Prevention and Control, CDC

169 **References**

- 170 1 CDC. Web-based Injury Statistics Query and Reporting System (WISQARS). Atlanta, GA: US Department of  
171 Health and Human Services, CDC; 2016. <https://www.cdc.gov/injury/wisqars/index.html>
- 172 2 Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide Trends Among and  
173 Within Urbanization Levels by Sex, Race/Ethnicity, Age Group, and Mechanism of Death - United States,  
174 2001-2015. *MMWR Surveill Summ* 2017;66(18):1-16.
- 175 3 Kegler SR, Stone DM, Holland KM. Trends in Suicide by Level of Urbanization - United States, 1999-2015.  
176 *MMWR Morb Mortal Wkly Rep* 2017;66(10):270-273.
- 177 4 Kochanek KD, Murphy SL, Xu J, Arias E. Mortality in the United States. *NCHS Data Brief* 2017;293.
- 178 5 US Department of Health and Human Services. 2012 National Strategy for Suicide Prevention: Goals and  
179 Objectives for Action. Washington, DC: HHS; 2012.
- 180 6 Rosenman, Stephen J. "Preventing suicide: what will work and what will not." *The Medical Journal of*  
181 *Australia* 169.2 (1998): 100-102.
- 182 7 American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders (DSM-5®): American  
183 Psychiatric Association; Arlington, VA. 2013.
- 184 8 Stone DM, Holland KM, Bartholow BN, Crosby AE, Jack SPD, Wilkins N. Preventing suicide: a technical  
185 package of policies, programs and practices. Atlanta, GA: US Department of Health and Human Services,  
186 CDC; 2017.
- 187 9 Simon, Thomas R., et al. "Characteristics of impulsive suicide attempts and attempters." *Suicide and Life-*  
188 *Threatening Behavior* 32.s1 (2002): 49-59.
- 189 10 Schiff, Lara B., et al. "Acute and chronic risk preceding suicidal crises among middle-aged men without  
190 known mental health and/or substance abuse problems: An exploratory mixed-methods analysis." *Crisis:*  
191 *The Journal of Crisis Intervention and Suicide Prevention* 36.5 (2015): 304.
- 192 11 World Health Organization. Risks to Mental Health: An Overview of Vulnerability and Risk Factors. August  
193 2012.
- 194 12 Caine, Eric D., et al. "Comprehensive, integrated approaches to suicide prevention: practical guidance."  
195 *Injury prevention* (2017): injuryprev-2017. (epub ahead of print)
- 196 12 Cavanagh, J.T.O., Carson, A.J., Sharpe, M., & Lawrie, S.M. Psychological autopsy studies of suicide: A  
197 systematic review. *Psychological Medicine*, 2003; 33, 395-405.

200 **Tables and Figures (attachments)**

201 Table 1 and Figure 1.doc

202 Tables 2 and 3.pdf

203 **Word Count:** 1780/1800



1 **Short title: Vital Signs: Increasing Trends in State Suicide Rates and Contributing Circumstances**

2 Deborah M. Stone, ScD;<sup>1</sup> Thomas R. Simon PhD;<sup>1</sup> Katherine A. Fowler, PhD;<sup>1</sup> Scott R. Kegler, PhD;<sup>2</sup> Keming Yuan,  
3 MS;<sup>1</sup> Kristin M. Holland, PhD;<sup>1</sup> Asha Z. Ivey-Stephenson, PhD;<sup>1</sup> Alex E. Crosby, MD<sup>1</sup>

4 **Structured abstract (249/250 words)**

5 **Background:** Overall suicide rates have been rising in the United States (U.S.). Examining state-level trends in  
6 suicide and the multiple contributing circumstances can inform comprehensive state suicide prevention  
7 planning.

8 **Methods:** Trends in age-adjusted suicide rates, by state and sex, among people aged ≥10 years, were assessed  
9 using data from the National Vital Statistics System. Changes in rates were examined across six consecutive  
10 three-year periods from 1999-2016. The National Violent Death Reporting System (2015), covering 27 states,  
11 was used to compare the precipitating circumstances between suicide decedents with and without known  
12 mental health problems (MHP).

13 **Results:** Forty-four states saw statistically significant suicide rate increases over the *study* period. In 30 states,  
14 rates increased by 25% or more. Male suicide rates increased *significantly* in 34 states while female rates  
15 increased *significantly* in 43. People with (46%) and without (54%) known MHP had both differing and similar  
16 precipitating circumstances associated with their suicides. Many factors, such as relationship problems (39.6  
17 and 45.1%), life stressors (49.7 and 54.2%), and recent crises (26.0 and 32.9%), respectively, were more likely  
18 among those without known MHP, but were common among both groups.

19 **Conclusions:** Suicide rates rose significantly across most states from 1999-2016. *Varied circumstances beyond*  
20 *MHP alone* contributed to suicides among people with and without known MHP.

21 **Implications for Public Health Practice:** States can use a multi-level public health approach based on the best  
22 available evidence to prevent multiple suicide risks before they occur, identify and support people already at  
23 risk, prevent re-attempts, and help friends/family after a suicide occurs.

24 **INTRODUCTION**

25 **BACKGROUND AND PURPOSE (243/250 words)**

26 In 2016, nearly 45,000 suicides (*13.4*~~15.6~~/100,000) occurred in the United States (U.S.).<sup>1</sup> Between 1999 and  
27 2016, suicide rates increased among males and females, across racial/ethnic groups, and across urbanization  
28 levels.<sup>2,3</sup> Suicide is the 10<sup>th</sup> leading cause of death and is among the only leading causes to be *increasing*.<sup>1,4</sup>  
29 Additionally, rates of Emergency Department visits for nonfatal self-harm injury, a key risk factor for suicide,  
30 increased more than 40% between 2001 and 2015.<sup>1</sup> Together, suicides and self-harm injuries cost the nation  
31 more than \$69 billion in direct medical and work loss costs.<sup>1</sup>

32 The National Strategy for Suicide Prevention<sup>5</sup> calls for a public health approach to suicide with prevention efforts  
33 reaching across the social ecology (i.e., individual, family/relationship, community, and societal levels). Such an  
34 approach highlights that suicide is rarely caused by any single factor but rather is multi-determined.<sup>5</sup> Despite  
35 this, suicide prevention efforts largely focus on identifying and treating high-risk individuals with mental illness.<sup>6</sup>  
36 However, other associated risk factors exist and include social and economic problems, access to lethal means  
37 (e.g. substances, firearms) among people at risk, poor coping and problem-solving skills, and prior suicide  
38 attempts, among others.<sup>5</sup> Expanded awareness of the multiple circumstances that contribute to suicide risk  
39 apart from mental health problems alone, can help achieve substantial reductions in suicide rates. To assist

**Comment [snk6]:**

It's 15.6 (age-adjusted) when using the population denominator ≥ 10 years of age. That's consistent with how we present rates elsewhere in this report (and with what we've already stated in the Abstract).



states in this goal and toward comprehensive suicide prevention planning, this study analyzes state-specific trends in suicide rates, assesses the multiple factors associated with suicide, and provides prevention recommendations.

## **METHODS (246/250 words)**

Suicide rate estimates and trend analyses exclude data for persons <10 years old. Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases 10<sup>th</sup> Revision* [ICD-10] underlying-cause-of death codes X60-X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods from 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Data from 2015 from the 27 states with complete data participating in the National Violent Death Reporting System (NVDRS) were used to compare the characteristics among suicide decedents with and without known current mental health problems (MHP). MHP are defined in NVDRS as disorders and syndromes listed in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5),<sup>7</sup> with the exception of alcohol and other substance dependence (captured separately). NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known MHP were compared using Chi-square tests; logistic regression was used to estimate adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and race/ethnicity.

## **RESULTS (593/600 words)**

The most recent overall suicide rates (representing 2014-2016) ranged from 6.9 (District of Columbia) to 29.2 (Montana) per 100,000 persons per year, a four-fold difference (Table 1). Across the entire study period, rates increased in all but one state (Nevada), with increases ranging from +0.2 (Delaware) to +8.1 (Wyoming). Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with percentage increases of at least 25% observed in over half of all states (30), as well as nationally.

Modeled suicide rate trends indicated significant increases for 44 states, as well as for the U.S. overall (Table 1). By sex, modeled rate trends indicated significant increases in 34 states for males and in 43 states for females. Nationally, the model-estimated AAPC for the overall suicide rates was +1.5%. By sex, the national AAPC was +1.1% for males and +2.6% for females.

Suicide decedents with (N=9,407) and without (N=11,039) known MHP were compared. While both groups were predominately male and non-Hispanic white, suicide decedents without known MHP had 2.3 greater odds of being male (95% confidence interval [CI] = 2.2-2.5), and significantly greater odds of being racial/ethnic minorities (odds ratio [OR] range: 1.0-2.1; 95% CI range [1.0-1.3] – [1.6-2.0]). They also had significantly greater odds of perpetrating homicide-suicide (adjusted odds ratio [aOR] = 2.9, 95% CI = 2.2-3.8), of firearm suicide (aOR = 1.6, 95% CI = 1.5-1.7), and of positive toxicology results for alcohol (aOR = 1.2, 95% CI = 1.1-1.3). Fifteen percent of those with known MHP and 20% without ever served in the U.S. military.



84 Although firearms were used most often in both groups, decedents with known MHP died by poisoning more  
85 than those without MHP (19.8% vs. 10.4%), most frequently by over-the-counter/otherwise unclassified drugs  
86 (35.8%), opioids (32.7%), antidepressants (34.6%) or benzodiazepines (25.1%).

87 All suicide decedents with known MHP (N=9,407) and approximately 85% without (N=9,357) had precipitating  
88 circumstances information. People with MHP were more likely to have any substance abuse problems (31.6% vs.  
89 25%,  $p < .01$ ). While two-thirds had a history of MH or substance abuse treatment (67.2%), just over half (54.0%)  
90 were in current mental health treatment at the time of their deaths.

91 Decedents without known MHP had significantly greater odds of any type of relationship problem (aOR = 1.3,  
92 95% CI = 1.2-1.4), specifically intimate partner problems (aOR = 1.4, 95% CI = 1.3-1.5), arguments/conflicts (aOR  
93 = 1.4, 95% CI = 1.3-1.5), and recently perpetrating interpersonal violence (aOR = 2.0, 95% CI = 1.6-2.4). They also  
94 had significantly greater odds of other life stressors, such as criminal legal problems (aOR = 1.7, 95% CI = 1.5-1.9)  
95 or eviction/loss of home (aOR = 1.4, 95% CI = 1.2-1.6), and they were also more likely to have a crisis within the  
96 preceding or upcoming two weeks (aOR = 1.4, 95% CI = 1.3-1.5). Among both groups, the most common crises  
97 were intimate partner (35.6%) and physical health (13.4%) problems.

98 Decedents without known MHP had significantly lower odds of recent release from any institution, but when a  
99 release was indicated, they were more likely to be released from a correctional facility (aOR = 4.5, 95% CI = 3.2-  
100 6.3) or hospital (aOR = 1.3, 95% CI = 1.1-1.7). Among decedents with known MHP who were recently released  
101 from an institution (10.2%), 42.8% were released from psychiatric facilities.

102 Suicide decedents without known MHP had significantly greater odds of leaving a suicide note (aOR = 1.2, 95%  
103 CI = 1.1-1.2), while decedents with known MHP more often had a history of suicidal ideation (40.8% vs. 23.0%,  $p$   
104  $\leq .01$ ) and attempts (29.4% vs. 10.3%,  $p \leq .01$ ).

#### 105 **Conclusions and Comments (698/700 words)**

106 From 1999-2016, 44 states saw significant rate increases. Suicide rates increased by more than 25% in 30 states  
107 and upwards of 57% in one state, North Dakota. Rates increased significantly in 34 states among males and  
108 increased significantly in 43 states among females. More research into the causes of these trends is necessary.

109 One important factor associated with suicide is MHP. Nearly half of suicide decedents in NVDRS had a known  
110 MHP. This group was challenged by comorbid substance abuse problems (31.6%) and histories of suicide  
111 ideation (40.8%) and attempts (29.4%). While two-thirds of people with MHP had a history of MH and/or  
112 substance abuse treatment and over half were currently in treatment at the time of their deaths, additional  
113 support could help address the needs of this vulnerable population. This includes broader implementation of  
114 affordable and evidence-based treatments, such as doctor-patient collaborative care models and cognitive-  
115 behavioral therapy.<sup>8</sup> Additionally, greater access to behavioral health providers, especially in underserved areas  
116 is important, as is healthcare systems change that supports suicide prevention and patient safety through care  
117 transitions.<sup>8</sup>

118 While MHP are a significant contributor to suicide, 54% of suicide decedents in this study did *not* have a known  
119 MHP. This group suffered more relationship problems and life stressors such as criminal-legal matters,  
120 eviction/loss of home, and recent or impending crises. This is noteworthy in light of findings that suggest many  
121 suicides and attempts occur with minimal deliberation time, particularly among people without mental health  
122 disorders and who faced impending life crises.<sup>9,10</sup> People with known MHP also experienced multiple life and  
123 other stressors such as job and/or financial problems, relationship problems, and physical health problems.

124 These findings point to the need to both prevent the conditions associated with mental health problems in the

#### **Comment [snk6]:**

This sounds so precise all of a sudden, compared to the very general benchmark of 25% in this same sentence. I'm thinking about a different way to communicate this, but I don't have anything better at the moment.



125 first place and the need to support people with MHP to decrease their vulnerability to poor social, health, and  
126 economic outcomes.<sup>11</sup>

127 These results point to the need for comprehensive state suicide prevention that goes beyond a focus on MH  
128 treatment alone. Prevention strategies may include: strengthening economic supports (e.g. housing stabilization  
129 policies, household financial support), teaching coping and problem-solving skills, especially early in life to  
130 manage everyday stressors and prevent future relationship problems; and promoting social connectedness to  
131 increase a sense of belongingness and access to informational, tangible, emotional, and social support, as  
132 needed. Other strategies indicated by these results include creating protective environments (e.g., reducing  
133 access to lethal means among people at risk, creating organizational and workplace policies to promote help-  
134 seeking and positive social norms), supporting people after a suicide has taken place to prevent survivors' risk,  
135 and assuring safe reporting by the media in order to prevent suicide contagion.<sup>8</sup> While few states have had the  
136 opportunity for such a comprehensive approach, states such as Colorado are taking up the challenge.<sup>12</sup>

137 ~~These~~ The study findings have at least three limitations. In four states (~~MD, UT, MA, RI~~ ~~(MD, MA, RI, UT)~~), rankings  
138 might have been impacted by large proportions of ~~injury~~ deaths of undetermined intent, or by decreased  
139 percentages of ~~undetermined-such~~ deaths over time, which likely ~~reflect-include~~ some unrecognized suicides.  
140 Second, NVDRS is not yet nationally representative. This study used the most current data available and  
141 includes 27 states that represent half (49.6%) of the U.S. population. Third, abstractors of NVDRS data are  
142 limited to data included in investigative reports. For example, medical and MH information are not captured  
143 directly from medical records but from key informants (e.g., family, friends) via coroner/medical examiner  
144 reports. Therefore, knowledge of the informant impacts completeness and accuracy of the information  
145 reported. This may explain some of the discrepancy between the prevalence of MHP reported here and studies  
146 that obtain estimates based on in-depth interviews with next-of-kin.<sup>13</sup> It is likely that some people without  
147 known mental health problems in the current study were experiencing mental health challenges at the time of  
148 death, but the absence of a diagnosis underscores the importance of addressing the range of other contributing  
149 circumstances.

150 Suicide is a growing public health problem and mental illness is an important risk factor for suicide, but is just  
151 one of many. Resources such as CDC's *Preventing Suicide: a Technical Package of Policies, Programs, and*  
152 *Practices*<sup>12</sup> and data from the NVDRS can help states and communities prioritize comprehensive suicide  
153 prevention.

#### 154 Acknowledgments

155 The authors acknowledge Robert Anderson, Holly Hedegaard, and Margaret Warner from the Division of Vital  
156 Statistics, National Center for Health Statistics, CDC, for their statistical consultation.

157  
158 **Conflict of Interest** No conflicts of interest were reported.

159  
160 **Corresponding author:** Deborah M. Stone, [dstone3@cdc.gov](mailto:dstone3@cdc.gov), 770-488-3942

#### 162 Author Affiliations:

163 <sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis,  
164 Research, and Practice Integration, National Center for Injury Prevention and Control, CDC

#### 165 References

Comment [snk6]:

Suggest ordering alphabetically.



- 166 1 CDC. Web-based Injury Statistics Query and Reporting System (WISQARS). Atlanta, GA: US Department of  
167 Health and Human Services, CDC; 2016. <https://www.cdc.gov/injury/wisqars/index.html>
- 168 2 Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide Trends Among and  
169 Within Urbanization Levels by Sex, Race/Ethnicity, Age Group, and Mechanism of Death - United States,  
170 2001-2015. *MMWR Surveill Summ* 2017;66(18):1-16.
- 171 3 Kegler SR, Stone DM, Holland KM. Trends in Suicide by Level of Urbanization - United States, 1999-2015.  
172 *MMWR Morb Mortal Wkly Rep* 2017;66(10):270-273.
- 173 4 Kochanek KD, Murphy SL, Xu J, Arias E. Mortality in the United States. *NCHS Data Brief* 2017;293.
- 174 5 US Department of Health and Human Services. 2012 National Strategy for Suicide Prevention: Goals and  
175 Objectives for Action. Washington, DC: HHS; 2012.
- 176 6 Rosenman, Stephen J. "Preventing suicide: what will work and what will not." *The Medical Journal of*  
177 *Australia* 169.2 (1998): 100-102.
- 178 7 American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders (DSM-5®): American  
179 Psychiatric Association; Arlington, VA. 2013.
- 180 8 Stone DM, Holland KM, Bartholow BN, Crosby AE, Jack SPD, Wilkins N. Preventing suicide: a technical  
181 package of policies, programs and practices. Atlanta, GA: US Department of Health and Human Services,  
182 CDC; 2017.
- 183 9 Simon, Thomas R., et al. "Characteristics of impulsive suicide attempts and attempters." *Suicide and Life-*  
184 *Threatening Behavior* 32.s1 (2002): 49-59.
- 185 10 Schiff, Lara B., et al. "Acute and chronic risk preceding suicidal crises among middle-aged men without  
186 known mental health and/or substance abuse problems: An exploratory mixed-methods analysis." *Crisis:*  
187 *The Journal of Crisis Intervention and Suicide Prevention* 36.5 (2015): 304.
- 188 11 World Health Organization. Risks to Mental Health: An Overview of Vulnerability and Risk Factors. August  
189 2012.
- 190 12 Caine, Eric D., et al. "Comprehensive, integrated approaches to suicide prevention: practical guidance."  
191 *Injury prevention* (2017): injuryprev-2017. (epub ahead of print)
- 192 12 Cavanagh, J.T.O., Carson, A.J., Sharpe, M., & Lawrie, S.M. Psychological autopsy studies of suicide: A  
193 systematic review. *Psychological Medicine*, 2003; 33, 395-405.

196 **Tables and Figures (attachments)**

197 Table 1 and Figure 1.doc

198 Tables 2 and 3.pdf

199 **Word Count:** 1780/1800



1 **Short title: Vital Signs: Increasing Trends in State Suicide Rates and Contributing Circumstances**

2 Deborah M. Stone, ScD;<sup>1</sup> Thomas R. Simon PhD;<sup>1</sup> Katherine A. Fowler, PhD;<sup>1</sup> Scott R. Kegler, PhD;<sup>2</sup> Keming Yuan,  
3 MS;<sup>1</sup> Kristin M. Holland, PhD;<sup>1</sup> Asha Z. Ivey-Stephenson, PhD;<sup>1</sup> Alex E. Crosby, MD<sup>1</sup>

4 **Structured abstract (249/250 words)**

5 **Background:** Overall suicide rates have been rising in the United States (U.S.). Examining state-level trends in  
6 suicide and the multiple contributing circumstances can inform comprehensive state suicide prevention  
7 planning.

8 **Methods:** Trends in age-adjusted suicide rates, by state and sex, among people aged  $\geq 10$  years, were assessed  
9 using data from the National Vital Statistics System. Changes in rates were examined across six consecutive  
10 three-year periods from 1999-2016. The National Violent Death Reporting System (2015), covering 27 states,  
11 was used to compare the precipitating circumstances between suicide decedents with and without known  
12 mental health problems (MHP).

13 **Results:** Forty-four states saw statistically significant suicide rate increases over the period. In 30 states, rates  
14 increased by 25% or more. Male suicide rates increased in 34 states while female rates increased in 43. People  
15 with (46%) and without (54%) known MHP had both differing and similar precipitating circumstances associated  
16 with their suicides. Many factors, such as relationship problems (39.6 and 45.1%), life stressors (49.7 and  
17 54.2%), and recent crises (26.0 and 32.9%), respectively, were more likely among those without known MHP,  
18 but were common among both groups.

19 **Conclusions:** Suicide rates rose significantly across most states from 1999-2016. Varied circumstances beyond  
20 MHP alone contributed to suicides among people with and without known MHP.

21 **Implications for Public Health Practice:** States can use a multi-level public health approach based on the best  
22 available evidence to prevent multiple suicide risks before they occur, identify and support people already at  
23 risk, prevent-re-attempts, and help friends/family after a suicide occurs.

24 **INTRODUCTION**

25 **BACKGROUND AND PURPOSE (243/250 words)**

26 In 2016, nearly 45,000 suicides (13.4/100,000) occurred in the United States (U.S.).<sup>1</sup> Between 1999 and 2016,  
27 suicide rates increased among males and females, across racial/ethnic groups, and across urbanization levels.<sup>2,3</sup>  
28 Suicide, is the 10<sup>th</sup> leading cause of death and is among the only leading causes to be *increasing*.<sup>1,4</sup> Additionally,  
29 rates of Emergency Department visits for nonfatal self-harm injury, a key risk factor for suicide, increased more  
30 than 40% between 2001 and 2015.<sup>1</sup> Together, suicides and self-harm injuries cost the nation more than \$69  
31 billion in direct medical and work loss costs.<sup>1</sup>

32 The National Strategy for Suicide Prevention<sup>5</sup> calls for a public health approach to suicide with prevention efforts  
33 reaching across the social ecology (i.e., individual, family/relationship, community, and societal levels). Such an  
34 approach highlights that suicide is rarely caused by any single factor but rather is multi-determined.<sup>5</sup> Despite  
35 this, suicide prevention efforts largely focus on identifying and treating high-risk individuals with mental illness.<sup>6</sup>  
36 However, other associated risk factors exist and include social and economic problems, access to lethal means  
37 (e.g. substances, firearms) among people at risk, poor coping and problem-solving skills, and prior suicide  
38 attempts, among others.<sup>5</sup> Expanded awareness of the multiple circumstances that contribute to suicide risk  
39 apart from mental health problems alone, can help achieve substantial reductions in suicide rates. To assist



states in this goal and toward comprehensive suicide prevention planning, this study analyzes state-specific trends in suicide rates, assesses the multiple factors associated with suicide, and provides prevention recommendations.

## **METHODS (246/250 words)**

Suicide rate estimates and trend analyses exclude data for persons <10 years old. Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases 10<sup>th</sup> Revision* [ICD-10] underlying-cause-of death codes X60-X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods from 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Data from 2015 from the 27 states with complete data participating in the National Violent Death Reporting System (NVDRS) were used to compare the characteristics among suicide decedents with and without known current mental health problems (MHP). MHP are defined in NVDRS as disorders and syndromes listed in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5),<sup>7</sup> with the exception of alcohol and other substance dependence (captured separately). NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known MHP were compared using Chi-square tests; logistic regression was used to estimate adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and race/ethnicity.

## **RESULTS (593/600 words)**

The most recent overall suicide rates (representing 2014-2016) ranged from 6.9 (District of Columbia) to 29.2 (Montana) per 100,000 persons per year, a four-fold difference (Table 1). Across the entire study period, rates increased in all but one state (Nevada), with increases ranging from +0.2 (Delaware) to +8.1 (Wyoming). Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with percentage increases of at least 25% observed in over half of all states (30), as well as nationally.

Modeled suicide rate trends indicated significant increases for 44 states, as well as for the U.S. overall (Table 1). By sex, modeled rate trends indicated significant increases in 34 states for males and 43 states for females. Nationally, the model-estimated AAPC for overall suicide rates was +1.5%. By sex, the national AAPC was +1.1% for males and +2.6% for females.

Suicide decedents with (N=9,407) and without (N=11,039) known MHP were compared. While both groups were predominately male and non-Hispanic white, suicide decedents without known MHP had 2.3 greater odds of being male (95% confidence interval [CI] = 2.2-2.5), and significantly greater odds of being racial/ethnic minorities (odds ratio [OR] range: 1.0-2.1; 95% CI range [1.0-1.3] – [1.6-2.0]). They also had significantly greater odds of perpetrating homicide-suicide (adjusted odds ratio [aOR] = 2.9, 95% CI = 2.2-3.8), of firearm suicide (aOR = 1.6, 95% CI = 1.5-1.7), and of positive toxicology results for alcohol (aOR = 1.2, 95% CI = 1.1-1.3). Fifteen percent of those with known MHP and 20% without ever served in the U.S. military.



84 Although firearms were used most often in both groups, decedents with known MHP died by poisoning more  
85 than those without MHP (19.8% vs. 10.4%), most frequently by over-the-counter/otherwise unclassified drugs  
86 (35.8%), opioids (32.7%), antidepressants (34.6%) or benzodiazepines (25.1%).

87 All suicide decedents with known MHP (N=9,407) and approximately 85% without (N=9,357) had precipitating  
88 circumstances information. People with MHP were more likely to have any substance abuse problems (31.6% vs.  
89 25%,  $p < .01$ ). While two-thirds had a history of MH or substance abuse treatment (67.2%), just over half (54.0%)  
90 were in current mental health treatment at the time of their deaths.

91 Decedents without known MHP had significantly greater odds of any type of relationship problem (aOR = 1.3,  
92 95% CI = 1.2-1.4), specifically intimate partner problems (aOR = 1.4, 95% CI = 1.3-1.5), arguments/conflicts (aOR  
93 = 1.4, 95% CI = 1.3-1.5), and recently perpetrating interpersonal violence (aOR = 2.0, 95% CI = 1.6-2.4). They also  
94 had significantly greater odds of other life stressors, such as criminal legal problems (aOR = 1.7, 95% CI = 1.5-1.9)  
95 or eviction/loss of home (aOR = 1.4, 95% CI = 1.2-1.6), and they were also more likely to have a crisis within the  
96 preceding or upcoming two weeks (aOR = 1.4, 95% CI = 1.3-1.5). Among both groups, the most common crises  
97 were intimate partner (35.6%) and physical health (13.4%) problems.

98 Decedents without known MHP had significantly lower odds of recent release from any institution, but when a  
99 release was indicated, they were more likely to be released from a correctional facility (aOR = 4.5, 95% CI = 3.2-  
100 6.3) or hospital (aOR = 1.3, 95% CI = 1.1-1.7). Among decedents with known MHP who were recently released  
101 from an institution (10.2%), 42.8% were released from psychiatric facilities.

102 Suicide decedents without known MHP had significantly greater odds of leaving a suicide note (aOR = 1.2, 95%  
103 CI = 1.1-1.2), while decedents with known MHP more often had a history of suicidal ideation (40.8% vs. 23.0%,  $p$   
104  $\leq .01$ ) and attempts (29.4% vs. 10.3%,  $p \leq .01$ ).

#### 105 **Conclusions and Comments (698/700 words)**

106 From 1999-2016, 44 states saw significant rate increases. Suicide rates increased by more than 25% in 30 states  
107 and upwards of 57% in one state, North Dakota. Rates increased in 34 states among males and increased in 43  
108 states among females. More research into the causes of these trends is necessary.

109 One important factor associated with suicide is MHP. Nearly half of suicide decedents in NVDRS had a known  
110 MHP. This group was challenged by comorbid substance abuse problems (31.6%) and histories of suicide  
111 ideation (40.8%) and attempts (29.4%). While two-thirds of people with MHP had a history of MH and/or  
112 substance abuse treatment and over half were currently in treatment at the time of their deaths, additional  
113 support could help address the needs of this vulnerable population. This includes broader implementation of  
114 affordable and evidence-based treatments, such as doctor-patient collaborative care models and cognitive-  
115 behavioral therapy.<sup>8</sup> Additionally, greater access to behavioral health providers, especially in underserved areas  
116 is important, as is healthcare systems change that supports suicide prevention and patient safety through care  
117 transitions.<sup>8</sup>

118 While MHP are a significant contributor to suicide, 54% of suicide decedents in this study did *not* have a known  
119 MHP. This group suffered more relationship problems and life stressors such as criminal-legal matters,  
120 eviction/loss of home, and recent or impending crises. This is noteworthy in light of findings that suggest many  
121 suicides and attempts occur with minimal deliberation time, particularly among people without mental health  
122 disorders and who faced impending life crises.<sup>9,10</sup> People with known MHP also experienced multiple life and  
123 other stressors such as job and/or financial problems, relationship problems, and physical health problems.  
124 These findings point to the need to both prevent the conditions associated with mental health problems in the



125 first place and the need to support people with MHP to decrease their vulnerability to poor social, health, and  
126 economic outcomes.<sup>11</sup>

127 These results point to the need for comprehensive state suicide prevention that goes beyond a focus on MH  
128 treatment alone. Prevention strategies may include: strengthening economic supports (e.g. housing stabilization  
129 policies, household financial support), teaching coping and problem-solving skills, especially early in life to  
130 manage everyday stressors and prevent future relationship problems; and promoting social connectedness to  
131 increase a sense of belongingness and access to informational, tangible, emotional, and social support, as  
132 needed. Other strategies indicated by these results include creating protective environments (e.g., reducing  
133 access to lethal means among people at risk, creating organizational and workplace policies to promote help-  
134 seeking and positive social norms), supporting people after a suicide has taken place to prevent survivors' risk,  
135 and assuring safe reporting by the media in order to prevent suicide contagion.<sup>8</sup> While few states have had the  
136 opportunity for such a comprehensive approach, states such as Colorado are taking up the challenge.<sup>12</sup>

137 These findings have at least three limitations. In four states (MD, UT, MA, RI), rankings might have been  
138 impacted by large proportions of deaths of undetermined intent, or by decreased percentages of undetermined  
139 deaths over time, which likely reflect some unrecognized suicides. Second, NVDRS is not yet nationally  
140 representative. This study used the most current data available and includes 27 states that represent half  
141 (49.6%) of the U.S. population. Third, abstractors of NVDRS data are limited to data included in investigative  
142 reports. For example, medical and MH information are not captured directly from medical records but from key  
143 informants (e.g., family, friends) via coroner/medical examiner reports. Therefore, knowledge of the informant  
144 impacts completeness and accuracy of the information reported. This may explain some of the discrepancy  
145 between the prevalence of MHP reported here and studies that obtain estimates based on in-depth interviews  
146 with next-of-kin.<sup>13</sup> It is likely that some people without known mental health problems in the current study were  
147 experiencing mental health challenges at the time of death, but the absence of a diagnosis underscores the  
148 importance of addressing the range of other contributing circumstances.

149 Suicide is a growing public health problem and mental illness is an important risk factor for suicide, but is just  
150 one of many. Resources such as CDC's *Preventing Suicide: a Technical Package of Policies, Programs, and*  
151 *Practices*<sup>12</sup> and data from the NVDRS can help states and communities prioritize comprehensive suicide  
152 prevention.

### 153 Acknowledgments

154 The authors acknowledge Robert Anderson, Holly Hedegaard, and Margaret Warner from the Division of Vital  
155 Statistics, National Center for Health Statistics, CDC, for their statistical consultation.

157 **Conflict of Interest** No conflicts of interest were reported.

159 **Corresponding author:** Deborah M. Stone, [dstone3@cdc.gov](mailto:dstone3@cdc.gov), 770-488-3942

### 161 Author Affiliations:

162 <sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis,  
163 Research, and Practice Integration, National Center for Injury Prevention and Control, CDC

### 164 References

165 1 CDC. Web-based Injury Statistics Query and Reporting System (WISQARS). Atlanta, GA: US Department of  
166 Health and Human Services, CDC; 2016. <https://www.cdc.gov/injury/wisqars/index.html>



- 167 2 Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide Trends Among and  
168 Within Urbanization Levels by Sex, Race/Ethnicity, Age Group, and Mechanism of Death - United States,  
169 2001-2015. *MMWR Surveill Summ* 2017;66(18):1-16.
- 170 3 Kegler SR, Stone DM, Holland KM. Trends in Suicide by Level of Urbanization - United States, 1999-2015.  
171 *MMWR Morb Mortal Wkly Rep* 2017;66(10):270-273.
- 172 4 Kochanek KD, Murphy SL, Xu J, Arias E. Mortality in the United States. *NCHS Data Brief* 2017;293.
- 173 5 US Department of Health and Human Services. 2012 National Strategy for Suicide Prevention: Goals and  
174 Objectives for Action. Washington, DC: HHS; 2012.
- 175 6 Rosenman, Stephen J. "Preventing suicide: what will work and what will not." *The Medical Journal of*  
176 *Australia* 169.2 (1998): 100-102.
- 177 7 American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders (DSM-5®)*: American  
178 Psychiatric Association; Arlington, VA. 2013.
- 179 8 Stone DM, Holland KM, Bartholow BN, Crosby AE, Jack SPD, Wilkins N. Preventing suicide: a technical  
180 package of policies, programs and practices. Atlanta, GA: US Department of Health and Human Services,  
181 CDC; 2017.
- 182 9 Simon, Thomas R., et al. "Characteristics of impulsive suicide attempts and attempters." *Suicide and Life-*  
183 *Threatening Behavior* 32.s1 (2002): 49-59.
- 184 10 Schiff, Lara B., et al. "Acute and chronic risk preceding suicidal crises among middle-aged men without  
185 known mental health and/or substance abuse problems: An exploratory mixed-methods analysis." *Crisis:*  
186 *The Journal of Crisis Intervention and Suicide Prevention* 36.5 (2015): 304.
- 187 11 World Health Organization. *Risks to Mental Health: An Overview of Vulnerability and Risk Factors*. August  
188 2012.
- 189 12 Caine, Eric D., et al. "Comprehensive, integrated approaches to suicide prevention: practical guidance."  
190 *Injury prevention* (2017): injuryprev-2017. (epub ahead of print)
- 191 12 Cavanagh, J.T.O., Carson, A.J., Sharpe, M., & Lawrie, S.M. Psychological autopsy studies of suicide: A  
192 systematic review. *Psychological Medicine*, 2003; 33, 395-405.

193  
194  
195 **Tables and Figures (attachments)**

196 Table 1 and Figure 1.doc

197 Tables 2 and 3.pdf

198 **Word Count:** 1780/1800



1 **Short title:** Vital Signs: Increasing Trends in State Suicide Rates and Contributing Circumstances

2 Deborah M. Stone, ScD;<sup>1</sup> Thomas R. Simon PhD;<sup>1</sup> Katherine A. Fowler, PhD;<sup>1</sup> Scott R. Kegler, PhD;<sup>2</sup> Keming Yuan,  
3 MS;<sup>1</sup> Kristin M. Holland, PhD;<sup>1</sup> Asha Z. Ivey-Stephenson, PhD;<sup>1</sup> Alex E. Crosby, MD<sup>1</sup>

4 **Structured abstract (251/250 words)**

5 **Background:** Overall suicide rates have been rising in the United States. Examining state-level trends in suicide  
6 and its multiple contributing circumstances, can inform comprehensive state suicide prevention planning.

7 **Methods:** Trends in age-adjusted suicide rates, by state and sex, among people aged  $\geq 10$  years, were assessed  
8 using data from the National Vital Statistics System. Changes in rates were examined across six consecutive  
9 three-year periods from 1999-2016. The National Violent Death Reporting System (2015), covering 27 states,  
10 was used to examine the precipitating circumstances among suicide decedents with and without known mental  
11 health problems (MHP).

12 **Results:** Forty-four states saw statistically significant suicide rate increases from 1999-2016. In 25 states, rates  
13 increased by 30% or more. Male suicide rates increased significantly in 34 states while female rates increased  
14 significantly in 43 states. People with (46%) and without (54%) known MHP had both differing and similar  
15 circumstances precipitating suicide. Several circumstance, such as any relationship problems/loss (39.6 and  
16 45.1%,  $p \leq .01$ ), any life stressors/loss (49.7 and 54.2%,  $p \leq .01$ ), and recent crises (26.0 and 32.9%,  $p \leq .01$ ),  
17 respectively, were more likely among those without known MHP, but were common across groups.

18 **Conclusions:** Suicide rates rose significantly across most states from 1999-2016. Varied circumstances beyond  
19 MHP alone contributed to suicides among people with and without known MHP.

20 **Implications for Public Health Practice:** States can use a comprehensive public health approach based on the  
21 best available evidence to prevent suicide risks before they occur, identify and support people already at risk,  
22 prevent-re-attempts, and help friends/family after a suicide occurs.

23 **INTRODUCTION**

24 **BACKGROUND AND PURPOSE (260/250 words)**

25 In 2016, nearly 45,000 suicides (15.6/100,000) occurred in the United States (U.S.), among people  $\geq 10$  years [1].  
26 Between 1999 and 2016, suicide rates increased across sexes, racial/ethnic groups, and urbanization levels [2,  
27 3]. Suicide is the 10<sup>th</sup> leading cause of death and is among the only leading causes to be *increasing* [1, 4].  
28 Additionally, rates of Emergency Department visits for nonfatal self-harm injury, a key risk factor for suicide,  
29 increased more than 40% between 2001 and 2015 [1]. Together, suicides and self-harm injuries cost the nation  
30 more than \$69 billion in direct medical and work loss costs [1].

31 The *National Strategy for Suicide Prevention (NSSP)* [5] calls for a public health approach to suicide with  
32 prevention efforts spanning across multiple levels (i.e., individual, family/relationship, community, and societal ),  
33 of the social ecology. Such an approach underscores that suicide is rarely caused by any single factor alone, but  
34 rather, is multi-determined. Despite the NSSP guidance, suicide prevention efforts largely focus on identifying  
35 and treating individuals with mental health problems (MHP) [6]. Other associated risk factors include social and  
36 economic problems, access to lethal means (e.g. substances, firearms, bridges) among people at risk, poor  
37 coping and problem-solving skills, and prior suicide attempts, among others [5]. Expanded awareness of the  
38 additional circumstances that contribute to suicide risk apart from MHP, can help reach the nation's goal of  
39 reducing suicide rates 20% by 2025 [7]. To assist states in achieving this goal, this study analyzes state-specific



40 trends in suicide rates, assesses the multiple factors associated with suicide, and provides recommendations for  
41 multi-level comprehensive suicide prevention.

## 42 **METHODS (256/250 words)**

43 Suicide rate estimates and trend analyses exclude data for persons <10 years old because intent for self-harm  
44 typically is not attributed to young children. Age-specific suicide counts were tabulated based on National Vital  
45 Statistics System coded death certificate records (*International Classification of Diseases 10<sup>th</sup> Revision* [ICD-10]  
46 underlying-cause-of death codes X60-X84, Y87.0, U03). Age-specific population estimates were obtained from  
47 U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

48  
49 National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods  
50 from 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per  
51 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data  
52 aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends  
53 are reported in terms of average annual percentage changes (AAPCs).

54  
55 Data from 2015 from the 27 states with complete data participating in the National Violent Death Reporting  
56 System (NVDRS) were used to compare the characteristics among suicide decedents with and without known  
57 current mental health problems (MHP). MHP are defined in NVDRS as disorders and syndromes listed in the  
58 *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5)* [8], except alcohol and other  
59 substance use disorders (captured separately). NVDRS aggregates data from three primary data sources: death  
60 certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents  
61 with and without known MHP were compared using Chi-square tests; logistic regression was used to estimate  
62 adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and race/ethnicity.

## 63 **RESULTS (596/600 words)**

64 The most recent overall suicide rates (representing 2014-2016) ranged from 6.9 (District of Columbia) to 29.2  
65 (Montana) per 100,000 persons per year, a four-fold difference (Table 1). Across the entire study period, rates  
66 increased in all but one state (Nevada), with absolute increases ranging from +0.2 (Delaware) to +8.1 (Wyoming)  
67 per 100,000. Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with  
68 percentage increases of at least 30% observed in half of all states.

69  
70 Modeled suicide rate trends indicated significant increases for 44 states, as well as for the U.S. overall (Table 1).  
71 By sex, modeled rate trends indicated significant increases in 34 states for males and in 43 states for females.  
72 Nationally, the model-estimated AAPC for the overall suicide rate was +1.5%. By sex, the national AAPC was  
73 +1.1% for males and +2.6% for females.

74  
75 Suicide decedents with (N=9,407) and without (N=11,039) known MHP were compared. While both groups were  
76 predominately male and non-Hispanic white, suicide decedents without known MHP had 2.3 greater odds of  
77 being male (95% confidence interval [CI] = 2.2-2.5), and significantly greater odds of being racial/ethnic  
78 minorities (odds ratio [OR] range: 1.0-2.1; 95% CI range [1.0-1.3] – [1.6-2.0]). They also had significantly greater  
79 odds of perpetrating homicide-suicide (adjusted odds ratio [aOR] = 2.9, 95% CI = 2.2-3.8), of firearm suicide (aOR  
80 = 1.6, 95% CI = 1.5-1.7), and of positive toxicology results for alcohol (aOR = 1.2, 95% CI = 1.1-1.3). Fifteen  
81 percent of those with known MHP and 20% without ever served in the U.S. military.

82 Although firearms were used most often in both groups, decedents with known MHP died by poisoning more  
83 than those without MHP (19.8% vs. 10.4%), most frequently by over-the-counter/otherwise unclassified drugs  
84 (35.8%), opioids (32.7%), antidepressants (34.6%) or benzodiazepines (25.1%).

**Comment [zaf9]:** Realized this wasn't correct as stated. Did you guys notice I added this and is that how you'd (Katie) want to say it?



85 All suicide decedents with known MHP (N=9,407) and approximately 85% without (N=9,357) had precipitating  
86 circumstances information. People with MHP were more likely to have any substance abuse problems (31.6% vs.  
87 25%,  $p < .01$ ). While two-thirds of those with known MHP had a history of MH or substance abuse treatment  
88 (67.2%), just over half (54.0%) were in current mental health treatment at the time of their deaths.

89 Decedents without known MHP, ~~versus those with MHP~~ had ~~significantly greater odds of any type a greater~~  
90 ~~likelihood~~ of any relationship problem/-or-loss ((45.1 and 39.6%,  $p < .01$ , aOR = 1.3, 95% CI = 1.2-1.4), specifically  
91 intimate partner problems (30.2 and 24.1%,  $p < .01$ , aOR = 1.4, 95% CI = 1.3-1.5), arguments/conflicts (17.5 and  
92 13.6%,  $p < .01$ , aOR = 1.4, 95% CI = 1.3-1.5), and recently perpetrating interpersonal violence (3.0 and 1.4%,  $p < .01$ , aOR = 2.0, 95% CI = 1.6-2.4). They also had significantly greater odds of any other life stressors, such as  
93 criminal legal problems (aOR = 1.7, 95% CI = 1.5-1.9), 10.7 and 6.2%,  $p < .01$ ) or eviction/loss of home (aOR = 1.4,  
94 95% CI = 1.2-1.6), 4.3 and 3.4%,  $p < .01$ ), and they were also more likely to have had a crisis within the preceding or  
95 upcoming two weeks (32.9 and 26.0%,  $p < .01$ , aOR = 1.4, 95% CI = 1.3-1.5). Among both groups, the most  
96 common crises were intimate partner (35.6%) and physical health (13.4%) problems.

98 Decedents without known MHP had significantly lower odds of recent release from any institution, but when a  
99 release was indicated, they were more likely to be recently released from a correctional facility (aOR = 4.5, 95%  
100 CI = 3.2-6.3) or hospital (aOR = 1.3, 95% CI = 1.1-1.7). Among decedents with known MHP recently released from  
101 an institution (10.2%), 42.8% were released from psychiatric facilities.

102 Suicide decedents without known MHP ~~had significantly greater odds of were more likely to leave~~ a suicide  
103 note (35.1 and 31.8%,  $p < .01$ , aOR = 1.2, 95% CI = 1.1-1.2), while decedents with known MHP, compared to those  
104 without MHP, more often had a history of suicidal ideation (40.8% vs. 23.0%,  $p \leq .01$ ) and attempts (29.4% vs.  
105 10.3%,  $p \leq .01$ ).

#### 106 Conclusions and Comments (688/700 words)

107 From 1999-2016, 44 states saw significant rate increases. Half of the states experienced increases of 30% or  
108 more. Rates increased significantly in 34 states among males and 43 states among females. More research into  
109 the causes of these trends is necessary [9].

110 One important factor associated with suicide is MHP. Nearly half of suicide decedents in NVDRS had a known  
111 MHP. This group was challenged by comorbid substance abuse problems (31.6%) and histories of suicidal  
112 ideation (40.8%) and attempts (29.4%). While two-thirds of people with MHP had a history of MH and/or  
113 substance abuse treatment and over half were currently in treatment at the time of their deaths, additional  
114 support could help address the needs of this vulnerable population. This includes broader implementation of  
115 affordable and evidence-based treatments, such as doctor-patient collaborative care models and cognitive-  
116 behavioral therapy. Additionally, greater access to behavioral health providers, especially in underserved areas  
117 is important, as is healthcare systems change that supports suicide prevention and patient safety through care  
118 transitions [10].

119 While MHP are a significant contributor to suicide, 54% of suicide decedents in this study did *not* have a known  
120 MHP. This group suffered more relationship problems and life stressors such as criminal-legal matters,  
121 eviction/loss of home, and recent or impending crises. This is noteworthy in light of findings that suggest many  
122 suicides and attempts occur with minimal deliberation time, particularly among people without mental health  
123 disorders and who faced impending life crises [11, 12]. People with known MHP also experienced other life  
124 stressors such as job and/or financial problems, relationship problems, and physical health problems. These  
125 findings point to the need to both prevent the conditions associated with mental health problems in the first

Comment [zaf9]: I took Tom's suggestion and added the percentages instead of aORs. Not sure if this will be confusing now that some paragraphs are written one way (%) and others are written another (ORs).

Comment [zaf9]: This is a systematic review showing that socioeconomic factors are at least as important as MHP in suicide. Could instead link to something on the economy or the IOM report from 2002 which describes the many risk factors and the need to address them.



place and the need to support people with MHP to decrease their vulnerability to poor social, health, and economic outcomes [13].

These results underscore the importance of comprehensive state suicide prevention activities that go beyond a focus on MH treatment alone. Prevention strategies may include: strengthening economic supports (e.g. housing stabilization policies, household financial support), teaching coping and problem-solving skills, especially early in life to manage everyday stressors and prevent future relationship problems; and promoting social connectedness to increase a sense of belongingness and access to informational, tangible, emotional, and social support, as needed. Other strategies indicated by these results include creating protective environments (e.g., reducing access to lethal means among people at risk, creating organizational and workplace policies to promote help-seeking and positive social norms), supporting family and friends after a suicide has taken place, and assuring safe reporting by the media in order to prevent suicide contagion [10]. Some states, such as Colorado, are underway planning and implementing a comprehensive approach to suicide prevention [14].

The study findings have at least three limitations. Related to state trend analyses, four states (MD, MA, RI, UT), rankings might have been impacted by large proportions of injury deaths of undetermined intent, or by decreased percentages of such deaths over time, which likely include some unrecognized suicides. Second, related to circumstances, NVDRS is not yet nationally representative. The most recent data from NVDRS inclusive of 27 states, represents half (49.6%) of the U.S. population. Third, NVDRS abstractors are limited to data from investigative reports. Health/mental health information is not captured directly from medical records but from key informants (e.g., family) via coroner/medical examiner reports. Therefore, completeness and accuracy of information is reliant on informant knowledge. Studies including in-depth interviews with key informants often see greater attributions to MH and substance abuse disorders [15]. It is likely that some people without known MHP in the current study were experiencing mental health challenges at the time of death that were either not known or reported by informants, or were not captured in NVDRS's primary data sources.

Suicide is a growing public health problem. Mental illness is an important risk factor for suicide, and is one of many requiring preventive action. Data from NVDRS and resources such as CDC's *Preventing Suicide: a Technical Package of Policies, Programs, and Practices* [10] can help states and communities better understand their suicide problem and prioritize comprehensive suicide prevention.

#### **Acknowledgments**

The authors acknowledge Robert Anderson, Holly Hedegaard, and Margaret Warner from the Division of Vital Statistics, National Center for Health Statistics, CDC, for their statistical consultation.

**Conflict of Interest** No conflicts of interest were reported.

**Corresponding author:** Deborah M. Stone, [dstone3@cdc.gov](mailto:dstone3@cdc.gov), 770-488-3942

#### **Author Affiliations:**

<sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis, Research, and Practice Integration, National Center for Injury Prevention and Control, CDC

#### **References:**



- 166 1. Centers for Disease Control and Prevention, *Web-based Injury Statistics Query and Reporting System*  
167 *(WISQARS)*. Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018.  
168 2016.
- 169 2. Ivey-Stephenson, A.Z., et al., *Suicide Trends Among and Within Urbanization Levels by Sex,*  
170 *Race/Ethnicity, Age Group, and Mechanism of Death - United States, 2001-2015*. MMWR Surveill Summ,  
171 2017. **66**(18): p. 1-16.
- 172 3. Kegler, S.R., D.M. Stone, and K.M. Holland, *Trends in suicide by level of urbanization—United States,*  
173 *1999–2015*. MMWR. Morbidity and mortality weekly report, 2017. **66**(10): p. 270.
- 174 4. Kochanek, K., et al., *Mortality in the United States, 2016*. NCHS Data Brief, no 293. National Center for  
175 Health Statistics, 2017.
- 176 5. Office of the Surgeon General and National Action Alliance for Suicide Prevention, *2012 National*  
177 *strategy for suicide prevention: goals and objectives for action: a report of the US Surgeon General and*  
178 *of the National Action Alliance for Suicide Prevention*. 2012.
- 179 6. Rosenman, S.J., *Preventing suicide: what will work and what will not*. The Medical Journal of Australia,  
180 1998. **169**(2): p. 100-102.
- 181 7. Torguson, K. and A. O'Brien, *Leading Suicide Prevention Efforts Unite to Address Rising National Suicide*  
182 *Rate*. 2017: Washington, D.C.
- 183 8. American Psychiatric Association, *Diagnostic and statistical manual of mental disorders (DSM-5®)*. 2013:  
184 American Psychiatric Pub.
- 185 9. Li, Z., et al., *Attributable risk of psychiatric and socio-economic factors for suicide from individual-level,*  
186 *population-based studies: A systematic review*. Social Science & Medicine, 2011. **72**(4): p. 608-616.
- 187 10. Stone, D.M., et al., *Preventing suicide: A technical package of policies, programs, and practice*. 2017.
- 188 11. Simon, T.R., et al., *Characteristics of impulsive suicide attempts and attempters*. Suicide and Life-  
189 Threatening Behavior, 2002. **32**(s1): p. 49-59.
- 190 12. Schiff, L.B., et al., *Acute and chronic risk preceding suicidal crises among middle-aged men without*  
191 *known mental health and/or substance abuse problems: An exploratory mixed-methods analysis*. Crisis:  
192 The Journal of Crisis Intervention and Suicide Prevention, 2015. **36**(5): p. 304.
- 193 13. World Health Organization, *Risks to mental health: An overview of vulnerabilities and risk factors*.  
194 Geneva: WHO, 2012.
- 195 14. Caine, E.D., et al., *Comprehensive, integrated approaches to suicide prevention: practical guidance*.  
196 Injury prevention, 2017: p. injuryprev-2017-042366.
- 197 15. Cavanagh, J.T., et al., *Psychological autopsy studies of suicide: a systematic review*. Psychological  
198 medicine, 2003. **33**(3): p. 395-405.

## 199 **Tables and Figures (attachments)**

200 Table 1 and Figure 1.doc

201 Tables 2 and 3.pdf

202 **Word Count:** 1806/1800

203



1 **Structured abstract (250/250 words)**

2 **Background:** Overall suicide rates have been rising in the United States (U.S.). Examining state-level trends in  
3 suicide and the multiple contributing circumstances can inform comprehensive state suicide prevention  
4 planning.

5 **Methods:** Trends in age-adjusted suicide rates, by state and sex, among people aged  $\geq 10$  years, were assessed  
6 using data from the National Vital Statistics System. Changes in rates and state rankings were examined across  
7 six consecutive three-year periods (1999-2001, 2002-2004, 2005-2007, 2008-2010, 2011-2013, 2014-2016). The  
8 National Violent Death Reporting System (2015), covering 27 states, was used to compare the precipitating  
9 circumstances between suicide decedents with and without known mental health problems (MHP).

10 **Results:** Forty-four states saw statistically significant suicide rate increases, over the period. In 30 states, rates  
11 increased by 25% or more. Male suicide rates increased in 34 states while female rates increased in 43. People  
12 with (46%) and without (54%) known MHP had both unique and similar precipitating circumstances associated  
13 with their suicides, and many factors, such as relationship problems (39.6 and 45.1%), life stressors (49.7 and  
14 54.2%), and recent crises (26.0 and 32.9%), respectively, were common to both.

15 **Conclusions:** Suicide rates rose significantly across most states from 1999-2016. People with and without known  
16 MHP faced multiple circumstances contributing to their suicides.

17 **Implications for Public Health Practice:** To reverse upward suicide trends, states can use a multi-level public  
18 health approach based on the best available evidence to: prevent multiple suicide risks before they occurs,  
19 identify and support people already at risk, prevent-re-attempts, and help friends/family after a suicide occurs.

20 **INTRODUCTION**

21 **BACKGROUND AND PURPOSE (244/250 words) TOTAL COUNT=1757/1800**

22 In 2016, nearly 45,000 suicides (13.4/100,000) occurred in the United States (U.S.).<sup>1</sup> Between 1999 and 2016,  
23 suicide rates increased among males and females, across racial/ethnic groups, and across urbanization levels.<sup>3,4</sup>  
24 Suicide, is the 10<sup>th</sup> leading cause of death and is among the only leading causes to be *increasing*. Additionally,  
25 rates of Emergency Department visits for nonfatal self-harm injury, a key risk factor for suicide, increased more  
26 than 40% between 2001 and 2015.<sup>5</sup> Together, suicides and self-harm injuries cost the nation more than \$69  
27 billion in direct medical and work loss costs.<sup>1</sup>

28 The National Strategy for Suicide Prevention calls for a public health approach to suicide with prevention efforts  
29 reaching across the social ecology (i.e., individual, family/relationship, community, and societal levels). Such an  
30 approach highlights that suicide is rarely caused by any single factor but rather is multi-determined.<sup>6</sup> Despite  
31 this, suicide prevention efforts primarily focus on identifying and treating mental illness (e.g., depression).  
32 However, other associated risk factors exist and include social and economic problems, access to lethal means  
33 (e.g. substances, firearms) among people at risk, poor coping and problem-solving skills, and prior suicide  
34 attempts, among others.<sup>6</sup> Expanded awareness of the multiple circumstances that contribute to suicide risk  
35 apart from mental health problems alone, can help achieve substantial reductions in suicide rates. To assist  
36 states in this goal and toward comprehensive suicide prevention planning, this study analyzes state-specific  
37 trends in state suicide rates, assesses the multiple factors associated with suicide, and provides prevention  
38 recommendations.

39 **METHODS (246/250 words)**

Comment |SD(): Need to update



Suicide rate estimates and trend analyses exclude data for persons <10 years old. Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases 10<sup>th</sup> Revision* [ICD-10] underlying-cause-of death codes X60-X84, Y87.0, \*U03).<sup>8</sup> Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods from 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Data from 2015 from the 27 states with complete data participating in the National Violent Death Reporting System (NVDRS) were used to compare the characteristics among suicide decedents with and without known current mental health problems (MHP). MHP are defined in NVDRS as disorders and syndromes listed in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5),<sup>9</sup> with the exception of alcohol and other substance dependence (captured separately). NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known MHP were compared using Chi-square tests; logistic regression was used to estimate adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and race/ethnicity.

## **RESULTS (580/600 words)**

The most recent overall suicide rates (representing 2014-2016) ranged from 6.9 (District of Columbia [D.C.]) to 29.2 (Montana) per 100,000 persons per year, a four-fold difference (Table 1). Across the entire study period, rates increased in all but one state (Nevada), with increases ranging from +0.2 (Delaware) to +8.1 (Wyoming). Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with percentage increases of at least 25% observed in over half of all states (30), as well as nationally.

Modeled suicide rate trends indicated significant increases for 44 states, as well as for the U.S. overall (Table 1). By sex, modeled rate trends indicated significant increases in 34 states for males and 43 states for females. Nationally, the model-estimated AAPC for overall suicide rates was +1.5%. By sex, the national AAPC was +1.1% for males and +2.6% for females.

Suicide decedents with (N=9,407) and without (N=11,039) known MHP were compared. While both groups were predominately male and non-Hispanic white, suicide decedents without known MHP had 2.3 greater odds of being male (95% confidence interval [CI] = 2.2-2.5), and significantly greater odds of being racial/ethnic minorities (odds ratio [OR] range: 1.0-2.1; 95% CI range [1.0-1.3] – [1.6-2.0]). They also had significantly greater odds of perpetrating homicide-suicide (adjusted odds ratio [aOR] = 2.9, 95% CI = 2.2-3.8), of firearm suicide (aOR = 1.6, 95% CI = 1.5-1.7), and of positive toxicology results for alcohol (aOR = 1.2, 95% CI = 1.1-1.3). Fifteen percent of those with known MHP and 20% without ever served in the U.S. military.

Although firearms were used most often in both groups, decedents with known MHP died by poisoning more than those without MHP (19.8% vs. 10.4%), most frequently by over-the-counter/otherwise unclassified drugs (35.8%), opioids (32.7%), antidepressants (34.6%) or benzodiazepines (25.1%).

All suicide decedents with known MHP (N=9,407) and approximately 85% without (N=9,357) had precipitating circumstances information. Two-thirds of decedents with known MHP had a history of MH or substance abuse treatment (67.2%) and were more likely to have any substance abuse problems (31.6% vs. 25%,  $p < .01$ ).



Decedents without known MHP had significantly greater odds of any type of relationship problem (aOR = 1.3, 95% CI = 1.2-1.4), specifically intimate partner problems (aOR = 1.4, 95% CI = 1.3-1.5), arguments/conflicts (aOR = 1.4, 95% CI = 1.3-1.5), and recently perpetrating interpersonal violence (aOR = 2.0, 95% CI = 1.6-2.4). They also had significantly greater odds of other life stressors, such as criminal legal problems (aOR = 1.7, 95% CI = 1.5-1.9) or eviction/loss of home (aOR = 1.4, 95% CI = 1.2-1.6), and they were also more likely to have a crisis within the preceding or upcoming two weeks (aOR = 1.4, 95% CI = 1.3-1.5). Among both groups, the most common crises were intimate partner (35.6%) and physical health (13.4%) problems.

Decedents without known MHP had significantly lower odds of recent release from any institution, but when a release was indicated, they were more likely to be released from a correctional facility (aOR = 4.5, 95% CI = 3.2-6.3) or hospital (aOR = 1.3, 95% CI = 1.1-1.7). Among decedents with known MHP who were recently released from an institution (10.2%), 42.8% were released from psychiatric facilities.

Suicide decedents without known MHP had significantly greater odds of leaving a suicide note (aOR = 1.2, 95% CI = 1.1-1.2), while decedents with known MHP more often had a history of suicidal ideation (40.8% vs. 23.0%,  $p \leq .01$ ) and attempts (29.4% vs. 10.3%,  $p \leq .01$ ).

#### 100 Conclusions and Comments (684/700 words)

From 1999-2016, 44 states saw significant rate increases. One state (Nevada) saw a significant decline. Suicide rates increased by more than 25% in 30 states and upwards of 57% in one (North Dakota) state. Rates increased in 34 states among males and increased in 43 states among females. These increases may signal a narrowing of the suicide gender gap, historically weighted heavily towards males.<sup>11</sup> More research into this troubling trend is needed.

One important factor associated with suicide is MHP. Nearly half of suicide decedents in NVDRS had a known MHP. This group was challenged by comorbid substance abuse problems (31.6%) and histories of suicide ideation (40.8%) and attempts (29.4%). While two-thirds of people with MHP had a history of MH and/or substance abuse treatment and over half were currently in treatment at the time of their deaths, additional support could help address the needs of this vulnerable population. This includes broader implementation of affordable and evidence-based treatments, such as doctor-patient collaborative care models and cognitive-behavioral therapy.<sup>12</sup> Additionally, greater access to behavioral health providers, especially in underserved areas is important, as is healthcare systems change that supports suicide prevention and patient safety through care transitions.<sup>12</sup>

While MHP are a significant contributor to suicide, 54% of suicide decedents in this study did not have a known MHP. This group suffered more life stressors, especially related to relationships (e.g. intimate partner problems, arguments or conflicts, recent perpetration of intimate partner violence), but also related to other life stressors such as criminal-legal matters, eviction/loss of home, and recent or impending crises (often related to the abovementioned factors). People with known MHP also experienced life and other stressors apart from their MHP. This group was more likely to experience job and/or financial problems. Also common were intimate partner problems, physical health problems, and recent or impending crises.

These results point to the need for comprehensive suicide prevention that goes beyond a focus on MH treatment alone. Prevention strategies may include: strengthening economic supports (e.g. housing stabilization policies, household financial support), teaching coping and problem-solving skills, especially early in life to manage everyday stressors and prevent future relationship problems; and promoting social connectedness to increase a sense of belongingness and access to informational, tangible, emotional, and social support, as needed. Other strategies indicated by these results include creating protective environments (e.g., reducing

**Comment [HK]:** Can you say this? Wouldn't saying this imply that if IPP is checked as a precipitating factor, then relationship problems also has to be checked? Is that how NVDRS coding of IPP works? I thought these two categories were mutually exclusive in that IPP could be checked without relationship problems being checked.

This could be easily changed by just removing "specifically"

**Comment [vid5]:** Wondering if instead of recapping results, we could comment on the profound and not often discussed impact that life stressors, especially those that rise to the level of a crisis, can have. The research that shows the time amount of deliberation (which is often very low) may also be helpful to cite here, as these types of stressors/crises can represent short-term problems (vs. longer term problems such as chronic mental illness)

**Comment [tgs9]:** I think this is worth considering. We have the space to include a concise point about how situational factors can contribute to immediate risk and that some suicides are impulsive. This could probably be included at the end of the paragraph since it applies to both those with and without MH problem.

**Comment [vid5]:** Similarly, wondering if we could condense this instead of reiterating some of these results and instead comment on the concept of "functional impairment," as a reason why people with mental health problems might have more job/financial problems (e.g., they often have more inconsistent work histories as a result of trying to cope with their illness, perhaps have medical bills to deal with regarding treatment, periods of disability, etc.). This would go a little deeper and interpret the results a bit. I'm sure we could find some references on this.



128 access to lethal means among people at risk, creating organizational and workplace policies to promote help-  
129 seeking and positive social norms), supporting people after a suicide has taken place to prevent survivors' risk,  
130 and assuring safe reporting by the media in order to prevent suicide contagion.<sup>12</sup>

131 These findings have at least three limitations. In four states (MD, UT, MA, RI), rankings might have been  
132 impacted by large proportions of deaths of undetermined intent, or by decreased percentages of undetermined  
133 deaths over time, which likely reflect some unrecognized suicides. Second, NVDRS is not yet nationally  
134 representative. This study used the most current data available and includes 27 states that represent half  
135 (49.6%) of the U.S. (population). Third, abstractors of NVDRS data are limited to data included in investigative  
136 reports. For example, medical and MH information are not captured directly from medical records but from key  
137 informants (e.g., family, friends) via coroner/medical examiner reports. Therefore, knowledge of the informant  
138 impacts completeness and accuracy of the information reported. This may explain some of the discrepancy  
139 between the prevalence of mental health disorders reported here and that (from) studies that estimate mental  
140 health problems based on symptoms described in interviews with family and friends. It is likely that some people  
141 without known mental health problems in the current study were experiencing mental health challenges at the  
142 time of death, but the lack of awareness about their mental health problems underscores the importance of  
143 addressing the range of contributing circumstances.<sup>13</sup>

144 Suicide is a growing public health problem and mental illness is an important risk factor for suicide, but is just  
145 one of many. Resources such as CDC's *Preventing Suicide: a Technical Package of Policies, Programs, and*  
146 *Practices*<sup>12</sup> and data from the NVDRS can help states and communities prioritize comprehensive suicide  
147 prevention.

#### 148 References (TO BE UPDATED)

- 149 1 CDC. Web-based Injury Statistics Query and Reporting System (WISQARS). Atlanta, GA: US Department of  
150 Health and Human Services, CDC; 2016. <https://www.cdc.gov/injury/wisqars/index.html>
- 151 2 World Health Organization. Preventing Suicide: A Global Imperative. Geneva, Switzerland: World Health  
152 Organization; 2014.
- 153 3 Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide Trends Among and  
154 Within Urbanization Levels by Sex, Race/Ethnicity, Age Group, and Mechanism of Death - United States,  
155 2001-2015. *MMWR Surveill Summ* 2017;66(18):1-16.
- 156 4 Kegler SR, Stone DM, Holland KM. Trends in Suicide by Level of Urbanization - United States, 1999-2015.  
157 *MMWR Morb Mortal Wkly Rep* 2017;66(10):270-273.
- 158 5 National Action Alliance for Suicide Prevention, Office of the Surgeon General. 2012 National Strategy for  
159 Suicide Prevention: Goals and Objectives for Action. Washington, DC: US Department of Health and Human  
160 Services, Office of the Surgeon General; 2012.
- 161 6 Davidson, L, Potter, L, and Ross, V. Surgeon General's Call to Action to Prevent Suicide. Public Health  
162 Service (DHHS), Rockville, MD. 1999.
- 163 7 American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders (DSM-5®): American  
164 Psychiatric Association; Arlington, VA. 2013.
- 165 8 Mercado MC, Holland K, Leemis RW, Stone DM, Wang J. Trends in emergency department visits for nonfatal  
166 self-inflicted injuries among youth aged 10 to 24 years in the united states, 2001-2015. *JAMA*  
167 2017;318(19):1931-1933.
- 168 9 Canetto, S.S., and Sakinofsky. I. "The gender paradox in suicide." *Suicide and life-threatening behavior* 28(1):  
169 1998: 1-23.
- 170 10 Stone DM, Holland KM, Bartholow BN, Crosby AE, Jack SPD, Wilkins N. Preventing suicide: a technical  
171 package of policies, programs and practices. Atlanta, GA: US Department of Health and Human Services,  
172 CDC; 2017.

**Comment [tgs9]:** This was in the 2015 NVDRS SS. I think it would be good to include it here too. It will be good to confirm the accuracy with Katie.

**Comment [tgs9]:** I agree with the comment below that including the 90% estimate here could be problematic. It might be better to describe the alternative types of studies. I suggested an edit so you can see what I mean but this will need to be updated to be consistent with what you cite.



173 11 Isometsä E. Psychological autopsy studies—a review. European psychiatry 2001;16(7):379-385.

174

175 **Acknowledgments**

176 **Conflict of Interest** None

177 **Corresponding author** D Stone

178 **Tables and Figures**

179

180 **To address**

181

182 “While two-thirds of people with MHP had a history of mental health and/or substance abuse treatment and  
183 over half were currently in treatment at the time of their deaths, much more support for this vulnerable  
184 population is needed.” **The highlighted point is only in the table right now– could add to results text.**

185 “People with known MHP also experienced life and other stressors apart from their MHP. This group was more  
186 likely to experience job and/or financial problems. Also common were intimate partner problems (24.1%),  
187 physical health problems (21.4%), and recent or impending crises (26%).” **The numbers in the highlighted  
188 portion are in the table, but not specifically cited in the results (because we report odds ratios instead).**

189



1 **Structured abstract (250/250 words)**

2 **Background:** Overall suicide rates have been rising in the United States (U.S.). Examining state-level trends in  
 3 suicide and the multiple contributing circumstances can inform comprehensive state suicide prevention  
 4 planning.

5 **Methods:** Trends in age-adjusted suicide rates, by state and sex, among people aged ≥10 years, were assessed  
 6 using data from the National Vital Statistics System. Changes in rates ~~and state rankings~~ were examined across  
 7 six consecutive three-year periods ~~from 1999-2016 (1999-2001, 2002-2004, 2005-2007, 2008-2010, 2011-2013,~~  
 8 ~~2014-2016)~~. The National Violent Death Reporting System (2015), covering 27 states, was used to compare the  
 9 precipitating circumstances between suicide decedents with and without known mental health problems (MHP).

10 **Results:** Forty-four states saw statistically significant suicide rate increases, over the period. In 30 states, rates  
 11 increased by 25% or more. Male suicide rates increased in 34 states while female rates increased in 43. People  
 12 with (46%) and without (54%) known MHP had both differing and similar precipitating circumstances associated  
 13 with their suicides, and many factors, such as relationship problems (39.6 and 45.1%), life stressors (49.7 and  
 14 54.2%), and recent crises (26.0 and 32.9%), respectively, were more likely among those with no known MHP, but  
 15 were common among both groups.

16 ~~People with (46%) and without (54%) known MHP had both unique and similar precipitating circumstances~~  
 17 ~~associated with their suicides, and many factors, such as relationship problems (39.6 and 45.1%), life stressors~~  
 18 ~~(49.7 and 54.2%), and recent crises (26.0 and 32.9%), respectively, were common to both.~~

19 **Conclusions:** Suicide rates rose significantly across most states from 1999-2016. A variety of circumstances  
 20 beyond MHP contributed to suicides among P ~~People with and without known MHP faced multiple~~  
 21 ~~circumstances contributing to their suicides.~~

22 **Implications for Public Health Practice:** ~~To reverse upward suicide trends, s~~States can use a multi-level public  
 23 health approach based on the best available evidence to: prevent multiple suicide risks before they occurs,  
 24 identify and support people already at risk, prevent-reattempts, and help friends/family after a suicide occurs.

25 **INTRODUCTION**26 **BACKGROUND AND PURPOSE (244/250 words) TOTAL COUNT=1757/1800**

27 In 2016, nearly 45,000 suicides (13.4/100,000) occurred in the United States (U.S.).<sup>1</sup> Between 1999 and 2016,  
 28 suicide rates increased among males and females, across racial/ethnic groups, and across urbanization levels.<sup>3,4</sup>  
 29 Suicide, is the 10<sup>th</sup> leading cause of death and is among the only leading causes to be *increasing*. Additionally,  
 30 rates of Emergency Department visits for nonfatal self-harm injury, a key risk factor for suicide, increased more  
 31 than 40% between 2001 and 2015.<sup>5</sup> Together, suicides and self-harm injuries cost the nation more than ~~\$69~~  
 32 ~~billion~~ in direct medical and work loss costs.<sup>1</sup>

33 The National Strategy for Suicide Prevention calls for a public health approach to suicide with prevention efforts  
 34 reaching across the social ecology (i.e., individual, family/relationship, community, and societal levels). Such an  
 35 approach highlights that suicide is rarely caused by any single factor but rather is multi-determined.<sup>6</sup> Despite  
 36 this, suicide prevention efforts primarily focus on identifying and treating mental illness (e.g., depression).  
 37 However, other associated risk factors exist and include social and economic problems, access to lethal means  
 38 (e.g. substances, firearms) among people at risk, poor coping and problem-solving skills, and prior suicide  
 39 attempts, among others.<sup>6</sup> Expanded awareness of the multiple circumstances that contribute to suicide risk  
 40 apart from mental health problems alone, can help achieve substantial reductions in suicide rates. To assist

Comment [SD(): Need to update



states in this goal and toward comprehensive suicide prevention planning, this study analyzes state-specific trends in ~~state~~ suicide rates, assesses the multiple factors associated with suicide, and provides prevention recommendations.

#### **METHODS (246/250 words)**

Suicide rate estimates and trend analyses exclude data for persons <10 years old. Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases 10<sup>th</sup> Revision* [ICD-10] underlying-cause-of death codes X60-X84, Y87.0, \*U03).<sup>8</sup> Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods from 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Data from 2015 from the 27 states with complete data participating in the National Violent Death Reporting System (NVDRS) were used to compare the characteristics among suicide decedents with and without known current mental health problems (MHP). MHP are defined in NVDRS as disorders and syndromes listed in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5),<sup>9</sup> with the exception of alcohol and other substance dependence (captured separately). NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known MHP were compared using Chi-square tests; logistic regression was used to estimate adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and race/ethnicity.

#### **RESULTS (580/600 words)**

The most recent overall suicide rates (representing 2014-2016) ranged from 6.9 (District of Columbia ~~(D.C.)~~) to 29.2 (Montana) per 100,000 persons per year, a four-fold difference (Table 1). Across the entire study period, rates increased in all but one state (Nevada), with increases ranging from +0.2 (Delaware) to +8.1 (Wyoming). Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with percentage increases of at least 25% observed in over half of all states (30), as well as nationally.

Modeled suicide rate trends indicated significant increases for 44 states, as well as for the U.S. overall (Table 1). By sex, modeled rate trends indicated significant increases in 34 states for males and 43 states for females. Nationally, the model-estimated AAPC for overall suicide rates was +1.5%. By sex, the national AAPC was +1.1% for males and +2.6% for females.

Suicide decedents with (N=9,407) and without (N=11,039) known MHP were compared. While both groups were predominately male and non-Hispanic white, suicide decedents without known MHP had 2.3 greater odds of being male (95% confidence interval [CI] = 2.2-2.5), and significantly greater odds of being racial/ethnic minorities (odds ratio [OR] range: 1.0-2.1; 95% CI range [1.0-1.3] – [1.6-2.0]). They also had significantly greater odds of perpetrating homicide-suicide (adjusted odds ratio [aOR] = 2.9, 95% CI = 2.2-3.8), of firearm suicide (aOR = 1.6, 95% CI = 1.5-1.7), and of positive toxicology results for alcohol (aOR = 1.2, 95% CI = 1.1-1.3). Fifteen percent of those with known MHP and 20% without ever served in the U.S. military.



85 Although firearms were used most often in both groups, decedents with known MHP died by poisoning more  
 86 than those without MHP (19.8% vs. 10.4%), most frequently by over-the-counter/otherwise unclassified drugs  
 87 (35.8%), opioids (32.7%), antidepressants (34.6%) or benzodiazepines (25.1%).

88 All suicide decedents with known MHP (N=9,407) and approximately 85% without (N=9,357) had precipitating  
 89 circumstances information. Two-thirds of decedents with known MHP had a history of MH or substance abuse  
 90 treatment (67.2%) and were more likely to have any substance abuse problems (31.6% vs. 25%,  $p < .01$ ).

91 Decedents without known MHP had significantly greater odds of any type of relationship problem (aOR = 1.3,  
 92 95% CI = 1.2-1.4), specifically intimate partner problems (aOR = 1.4, 95% CI = 1.3-1.5), arguments/conflicts (aOR  
 93 = 1.4, 95% CI = 1.3-1.5), and recently perpetrating interpersonal violence (aOR = 2.0, 95% CI = 1.6-2.4). They also  
 94 had significantly greater odds of other life stressors, such as criminal legal problems (aOR = 1.7, 95% CI = 1.5-1.9)  
 95 or eviction/loss of home (aOR = 1.4, 95% CI 1.2-1.6), and they were also more likely to have a crisis within the  
 96 preceding or upcoming two weeks (aOR = 1.4, 95% CI = 1.3-1.5). Among both groups, the most common crises  
 97 were intimate partner (35.6%) and physical health (13.4%) problems.

98 Decedents without known MHP had significantly lower odds of recent release from any institution, but when a  
 99 release was indicated, they were more likely to be released from a correctional facility (aOR = 4.5, 95% CI = 3.2-  
 100 6.3) or hospital (aOR = 1.3, 95% CI = 1.1-1.7). Among decedents with known MHP who were recently released  
 101 from an institution (10.2%), 42.8% were released from psychiatric facilities.

102 Suicide decedents without known MHP had significantly greater odds of leaving a suicide note (aOR = 1.2, 95%  
 103 CI = 1.1-1.2), while decedents with known MHP more often had a history of suicidal ideation (40.8% vs. 23.0%,  $p$   
 104  $\leq .01$ ) and attempts (29.4% vs. 10.3%,  $p \leq .01$ ).

#### 105 **Conclusions and Comments (684/700 words)**

106 From 1999-2016, 44 states saw significant rate increases. ~~One state (Nevada) saw a significant decline.~~ Suicide  
 107 rates increased by more than 25% in 30 states and upwards of 57% in one (North Dakota) state. Rates increased  
 108 in 34 states among males and increased in 43 states among females. ~~These increases may signal a narrowing of~~  
 109 ~~the suicide gender gap, historically weighted heavily towards males.<sup>11</sup> More research into this troubling trend is~~  
 110 ~~needed.~~

111 One important factor associated with suicide is MHP. Nearly half of suicide decedents in NVDRS had a known  
 112 MHP. This group was challenged by comorbid substance abuse problems (31.6%) and histories of suicide  
 113 ideation (40.8%) and attempts (29.4%). While two-thirds of people with MHP had a history of MH and/or  
 114 substance abuse treatment and over half were currently in treatment at the time of their deaths, additional  
 115 support could help address the needs of this vulnerable population. This includes broader implementation of  
 116 affordable and evidence-based treatments, such as doctor-patient collaborative care models and cognitive-  
 117 behavioral therapy.<sup>12</sup> Additionally, greater access to behavioral health providers, especially in underserved areas  
 118 is important, as is healthcare systems change that supports suicide prevention and patient safety through care  
 119 transitions.<sup>12</sup>

120 While MHP are a significant contributor to suicide, 54% of suicide decedents in this study did *not* have a known  
 121 MHP. This group suffered more ~~life stressors, especially related to relationships (e.g. intimate partner problems,~~  
 122 ~~arguments or conflicts, -recent perpetration of intimate partner violence), but also related to other life stressors~~  
 123 ~~such as criminal-legal matters, eviction/loss of home, and recent or impending crises (often related to the~~  
 124 ~~abovementioned factors).~~ People with known MHP also experienced life and other stressors apart from their

**Comment [HK]:** Need to think about what to do with this sentence. – Perhaps delete and say “More research into these trends is needed.”

**Comment [vid5]:** Wondering if instead of recapping results, we could comment on the profound and not often discussed impact that life stressors, especially those that rise to the level of a crisis, can have. The research that shows the time amount of deliberation (which is often very low) may also be helpful to cite here, as these types of stressors/crises can represent short-term problems (vs. longer term problems such as chronic mental illness)

**Comment [tgs9]:** I think this is worth considering. We have the space to include a concise point about how situational factors can contribute to immediate risk and that some suicides are impulsive. This could probably be included at the end of the paragraph since it applies to both those with and without MH problem.



125 MHP. This group was more likely to experience job and/or financial problems. Also common were intimate  
126 partner problems, physical health problems, and recent or impending crises.)

127 These results point to the need for comprehensive suicide prevention that goes beyond a focus on MH  
128 treatment alone. Prevention strategies may include: strengthening economic supports (e.g. housing stabilization  
129 policies, household financial support), teaching coping and problem-solving skills, especially early in life to  
130 manage everyday stressors and prevent future relationship problems; and promoting social connectedness to  
131 increase a sense of belongingness and access to informational, tangible, emotional, and social support, as  
132 needed. Other strategies indicated by these results include creating protective environments (e.g., reducing  
133 access to lethal means among people at risk, creating organizational and workplace policies to promote help-  
134 seeking and positive social norms), supporting people after a suicide has taken place to prevent survivors' risk,  
135 and assuring safe reporting by the media in order to prevent suicide contagion.<sup>12</sup>

136 These findings have at least three limitations. In four states (MD, UT, MA, RI), rankings might have been  
137 impacted by large proportions of deaths of undetermined intent, or by decreased percentages of undetermined  
138 deaths over time, which likely reflect some unrecognized suicides. Second, NVDRS is not yet nationally  
139 representative. This study used the most current data available and includes 27 states that represent half  
140 (49.6%) of the U.S. population. Third, abstractors of NVDRS data are limited to data included in investigative  
141 reports. For example, medical and MH information are not captured directly from medical records but from key  
142 informants (e.g., family, friends) via coroner/medical examiner reports. Therefore, knowledge of the informant  
143 impacts completeness and accuracy of the information reported. This may explain some of the discrepancy  
144 between the prevalence of mental health disorders reported here and that from studies that estimate mental  
145 health problems based on symptoms described in interviews with family and friends. It is likely that some people  
146 without known mental health problems in the current study were experiencing mental health challenges at the  
147 time of death, but the potential lack of awareness about their mental health problems underscores the  
148 importance of addressing the range of contributing circumstances.<sup>13</sup>

149 Suicide is a growing public health problem and mental illness is an important risk factor for suicide, but is just  
150 one of many. Resources such as CDC's *Preventing Suicide: a Technical Package of Policies, Programs, and*  
151 *Practices*<sup>12</sup> and data from the NVDRS can help states and communities prioritize comprehensive suicide  
152 prevention.

## 153 References (TO BE UPDATED)

- 154 1 CDC. Web-based Injury Statistics Query and Reporting System (WISQARS). Atlanta, GA: US Department of  
155 Health and Human Services, CDC; 2016. <https://www.cdc.gov/injury/wisqars/index.html>
- 156 2 World Health Organization. Preventing Suicide: A Global Imperative. Geneva, Switzerland: World Health  
157 Organization; 2014.
- 158 3 Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide Trends Among and  
159 Within Urbanization Levels by Sex, Race/Ethnicity, Age Group, and Mechanism of Death - United States,  
160 2001-2015. *MMWR Surveill Summ* 2017;66(18):1-16.
- 161 4 Kegler SR, Stone DM, Holland KM. Trends in Suicide by Level of Urbanization - United States, 1999-2015.  
162 *MMWR Morb Mortal Wkly Rep* 2017;66(10):270-273.
- 163 5 National Action Alliance for Suicide Prevention, Office of the Surgeon General. 2012 National Strategy for  
164 Suicide Prevention: Goals and Objectives for Action. Washington, DC: US Department of Health and Human  
165 Services, Office of the Surgeon General; 2012.
- 166 6 Davidson, L., Potter, L., and Ross, V. Surgeon General's Call to Action to Prevent Suicide. Public Health  
167 Service (DHHS), Rockville, MD. 1999.

**Comment [vid5]:** Similarly, wondering if we could condense this instead of reiterating some of these results and instead comment on the concept of "functional impairment," as a reason why people with mental health problems might have more job/financial problems (e.g., they often have more inconsistent work histories as a result of trying to cope with their illness, perhaps have medical bills to deal with regarding treatment, periods of disability, etc.). This would go a little deeper and interpret the results a bit. I'm sure we could find some references on this.

**Comment [tgs9]:** This was in the 2015 NVDRS SS. I think it would be good to include it here too. It will be good to confirm the accuracy with Katie.

**Comment [tgs9]:** I agree with the comment below that including the 90% estimate here could be problematic. It might be better to describe the alternative types of studies. I suggested an edit so you can see what I mean but this will need to be updated to be consistent with what you cite.



- 168 7 American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders (DSM-5®): American  
169 Psychiatric Association; Arlington, VA. 2013.
- 170 8 Mercado MC, Holland K, Leemis RW, Stone DM, Wang J. Trends in emergency department visits for nonfatal  
171 self-inflicted injuries among youth aged 10 to 24 years in the united states, 2001-2015. JAMA  
172 2017;318(19):1931-1933.
- 173 9 Canetto, S.S., and Sakinofsky. I. "The gender paradox in suicide." *Suicide and life-threatening behavior* 28(1):  
174 1998: 1-23.
- 175 10 Stone DM, Holland KM, Bartholow BN, Crosby AE, Jack SPD, Wilkins N. Preventing suicide: a technical  
176 package of policies, programs and practices. Atlanta, GA: US Department of Health and Human Services,  
177 CDC; 2017.
- 178 11 Isometsä E. Psychological autopsy studies—a review. *European psychiatry* 2001;16(7):379-385.

179  
180 **Acknowledgments**

181 **Conflict of Interest** None

182 **Corresponding author** D Stone

183 **Tables and Figures**

184

185 **To address**

186

187 "While two-thirds of people with MHP had a history of mental health and/or substance abuse treatment and  
188 over half were currently in treatment at the time of their deaths, much more support for this vulnerable  
189 population is needed." **The highlighted point is only in the table right now— could add to results text.**

190 "People with known MHP also experienced life and other stressors apart from their MHP. This group was more  
191 likely to experience job and/or financial problems. Also common were intimate partner problems (24.1%),  
192 physical health problems (21.4%), and recent or impending crises (26%)." **The numbers in the highlighted  
193 portion are in the table, but not specifically cited in the results (because we report odds ratios instead).**

194



#### Structured abstract (241/250 words)

**Background:** Suicide rates have been rising in the United States (U.S.). Examining state-level trends in, and contributing circumstances to, suicide, can inform comprehensive state suicide prevention planning.

**Methods:** Trends in age-adjusted suicide rates, by ~~sex and state~~ **state and sex**, among people aged ≥10 years, were evaluated using data from the National Vital Statistics System. Changes in rates and state rankings were assessed across six consecutive three-year periods (1999-2001, 2002-2004, 2005-2007, 2008-2010, 2011-2013, 2014-2016). Data from 2015 from the National Violent Death Reporting System, across 27 states, were analyzed to compare precipitating circumstances between suicide decedents with and without known mental health problems.

**Results:** Statistically significant upward rate trends were identified for 44 states. For the U.S. overall and for 30 states individually, empirical rates increased by at least 25% over the study period. People with (46%) and without (54%) known mental health problems experienced a range of circumstances contributing to their suicides, including recent crises and problems related to substance use, relationships, job/financial issues, and criminal-legal matters.

**Conclusions:** Suicide rates have risen significantly in the U.S. and across most states from 1999-2016. No single factor alone contributes to suicide. Differing circumstances contribute to suicides among those with and without mental health problems.

**Implications for Public Health Practice:** To reverse upward trends in suicide, states can use a population-based public health approach inclusive of evidence-based strategies across multiple levels (individual, family/relationship, community, societal), focused on preventing risk before it starts, identifying and supporting people already at risk, preventing-re-attempts, and caring for survivors after a suicide.

#### INTRODUCTION

##### BACKGROUND AND PURPOSE (210/250 words) **TOTAL COUNT=1900/1800**

In 2016, nearly 45,000 suicides (13.4/100,000) occurred in the United States (U.S.).<sup>1</sup> While overall rates have been declining globally,<sup>2</sup> rates of suicide in the U.S. increased between 1999 and 2016, among males and females, across racial/ethnic groups, and across urbanization levels.<sup>3,4</sup> Emergency department visits for nonfatal self-harm injuries increased more than 40% between 2001 and 2015.<sup>5</sup> In 2015, suicides and self-harm injuries cost the nation more than \$69 billion in direct medical and work loss costs.<sup>1</sup> Suicide is rarely caused by one factor; rather, the risks are often numerous and occur at multiple levels--individual, family/relationship, community, and societal.<sup>6</sup> Despite this, prevention primarily centers on mental illness, (e.g., depression, bipolar disorder). Other factors associated with suicide include social isolation, economic downturns, access to lethal means (e.g. substances, firearms) among people at risk, childhood adversity, lack of coping and problem-solving skills, loss of a friend or family member to suicide, a prior suicide attempt, and unsafe media portrayals, among others.<sup>6</sup> While the Surgeon General called for a comprehensive public health approach to suicide prevention in 1999, to date, most states struggle to make this a reality.<sup>7</sup> To better assist states, this study analyzes trends in state suicide rates, assesses the multiple factors associated with suicide, and provides prevention recommendations.

##### METHODS (259/250 words)

Suicide rate estimates and trend analyses exclude data for persons <10 years old. Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of*

**Comment [snk6]:**

Really the more important ordering – my bad.



*Diseases 10<sup>th</sup> Revision* [ICD-10] underlying-cause-of death codes X60-X84, Y87.0, \*U03).<sup>8</sup> Age-specific population estimates were obtained from U.S. Census Bureau / National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods covering years 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Data from 2015 from the 27 states with complete data participating in the National Violent Death Reporting System (NVDRS) were used to compare the characteristics, including precipitating circumstances, of deaths by suicide among decedents with and without known current mental health problems (MHP). Mental health problems are defined in NVDRS as disorders and syndromes listed in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5),<sup>9</sup> with the exception of alcohol and other substance dependence (captured separately). NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known MHP were compared using Chi-square tests; logistic regression was used to estimate adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and race/ethnicity.

## RESULTS (696/600 words)

The most recent overall suicide rates (representing 2014-2016) ranged from 6.9 (District of Columbia [D.C.]) to 29.2 (Montana) per 100,000 persons per year, a four-fold difference (Table 1). Across the entire study period, rates increased in all but one state (Nevada), with increases ranging from +0.2 (Delaware) to +8.1 (Wyoming). Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with percentage increases of at least 25% observed in over half of all states (30), as well as nationally.

Modeled suicide rate trends ~~increased significantly indicate significant increases~~ for 44 states, as well as for the U.S. overall (Table 1). By sex, ~~modeled~~ rate trends ~~increased significantly indicate significant increases~~ in 34 states for males and in 43 states for females. Nationally, the model-estimated AAPC for overall suicide rates was +1.5%. By sex, the national AAPC was +1.1% for males and +2.6% for females.

Suicide decedents with (N=9,407) and without (N=11,039) known mental health problems (MHP) were compared. While both groups were predominately male and non-Hispanic white, suicide decedents without known MHP had 2.3 greater odds of being male (95% confidence interval [CI] = 2.2-2.5), and significantly greater odds of being racial/ethnic minorities (odds ratio [OR] range: 1.0-2.1; 95% CI range [1.0-1.3] – [1.6-2.0]). They also had significantly greater odds of perpetrating homicide-suicide (adjusted odds ratio [aOR] = 2.9, 95% CI = 2.2-3.8), of firearm suicide (aOR = 1.6, 95% CI = 1.5-1.7), and of positive toxicology results for alcohol (aOR = 1.2, 95% CI = 1.1-1.3). Fifteen percent of those with known MHP and 20% without ever served in the U.S. military.

Although firearms were used most often in both groups, decedents with known MHP died by poisoning more than those without MHP (19.8% vs. 10.4%), most frequently by over-the-counter/otherwise unclassified drugs (35.8%), opioids (32.7%), antidepressants (34.6%) or benzodiazepines (25.1%).

All suicide decedents with known MHP (N=9,407) and approximately 85% without (N=9,357) had known precipitating circumstances. Decedents without known MHP had significantly greater odds of any type of relationship problem (aOR = 1.3, 95% CI = 1.2-1.4), specifically intimate partner problems (aOR = 1.4, 95% CI = 1.3-1.5), arguments/conflicts (aOR = 1.4, 95% CI = 1.3-1.5), and recently perpetrating interpersonal violence



(aOR = 2.0, 95% CI = 1.6-2.4). Two-thirds of decedents with known MHP had a history of MH or substance abuse treatment (67.2%), and were more likely to have any substance abuse problems (31.6% vs. 25%,  $p \leq .01$ ),

Suicide decedents without known MHP had significantly greater odds of other life stressors, such as a criminal legal problems (aOR = 1.7, 95% CI = 1.5-1.9), or eviction/loss of home (aOR = 1.4, 95% CI 1.2-1.6). They had significantly lower odds of recent release from any institution, but when a release was indicated, they were significantly more likely to be released from a correctional facility (aOR = 4.5, 95% CI = 3.2-6.3), or hospital (aOR = 1.3, 95% CI = 1.1-1.7). Among decedents with known MHP who were recently released from an institution, 42.8% were from psychiatric institutions. Those with known MHP also more frequently had job and/or financial problems (16.8% vs. 15.6%;  $p \leq .05$ ).

Decedents without known MHP had significantly greater odds of a recent/impending crisis (aOR = 1.4, 95% CI = 1.3-1.5). When the type of crisis was known, it was most frequently related to an intimate partner (36.2%), physical health (13.8%), criminal legal issues (13.6%), family relationships (7.1%), or a job (5.3%). Over one-fourth of decedents with a known MHP also had recent or impending crises, most frequently related to an intimate partner (34.9%), physical health (12.9%), or family relationships (8.7%). Decedents without known MHP had significantly greater odds of criminal legal crises (aOR = 1.6, 95% CI = 1.3-1.9), and significantly lowered odds of job-related crises (aOR = 0.7, 95% CI = 0.5-0.8).

Suicide decedents without known MHP had significantly greater odds of leaving a suicide note (aOR = 1.2, 95% CI = 1.1-1.2), while decedents with known MHP more often had a history of suicidal ideation (40.8% vs. 23.0%,  $p \leq .01$ ) and attempts (29.4% vs. 10.3%,  $p \leq .01$ ).

### **Conclusions and Comments (735/700 words)**

From 1999-2016, age-adjusted suicide rates among people  $\geq 10$  years increased 25.4% overall. Forty-four states saw significant rate increases and one (Nevada) state saw a significant decline. Suicide rates increased by more than 25% in 30 states and upwards of 50% in some.

Among females, rates increased in 43 states and rates among males increased in 34. This signal of increasing vulnerability of females towards suicide aligns with recent reports that identified a 63% increase in middle-aged female suicide rates between 1999-2014 and an annual increase of 18.8% per year in emergency department visits for self-inflicted injuries among young females, aged of 10 and 14, in the period 2009-2015.<sup>3,10</sup> These increases may hint at a narrowing of the suicide gender gap, historically weighted towards males by a ratio of 4-5:1.<sup>11</sup> More research into this troubling trend is needed.

One important factor associated with suicide is mental health problems. Nearly half of people in this study had a known mental health problem. This group was challenged by comorbid substance abuse problems (31.6%) and histories of suicide ideation (40.8%) and attempts (29.4%). While two-thirds of people with MHP had a history of mental health and/or substance abuse treatment and over half were currently in treatment at the time of their deaths, much more support for this vulnerable population is needed. This includes the need for broader implementation of affordable and evidence-based treatments, such as doctor-patient collaborative care models and cognitive-behavioral therapy.<sup>12</sup> Additionally, greater access to behavioral health providers, especially in underserved areas is needed, as is healthcare systems change that supports suicide prevention and patient safety.<sup>12</sup>

While MHP are a significant contributor to suicide, 54% of suicide decedents in the current study did *not* have a known MHP. This group suffered more life stressors, especially related to relationships (e.g. intimate partner problems, arguments or conflicts, recent perpetration of intimate partner violence), but also related to other



life stressors such as criminal-legal matters, eviction/loss of home, and recent or impending crises (often related to the abovementioned factors). People with known MHP also experienced life and other stressors apart from their MHP. This group was more likely to experience job and/or financial problems. Also common were intimate partner problems (24.1%), physical health problems (21.4%), and recent or impending crises (26%).

These results point to the need for comprehensive suicide prevention that goes beyond a focus on MH treatment alone. These strategies may include: strengthening economic supports (e.g. housing stabilization policies, household financial support), teaching coping and problem-solving skills and other pro-social norms, especially early in life to manage everyday stressors and to prevent future relationship problems; and promoting social connectedness to increase a sense of belongingness and access to informational, tangible, emotional, and social support, as needed. Other strategies indicated by these results include creating protective environments (e.g., reducing access to lethal means among people at risk, and creating organizational and workplace policies to promote help-seeking and positive social norms), and supporting people after a suicide has taken place to prevent survivors' risk and to assure safe reporting by the media in order to prevent suicide contagion.<sup>12</sup>

These findings have at least three limitations. In four states, Maryland (MD), Utah (UT), Massachusetts (MA), and Rhode Island (RI), state rankings might have been impacted by large proportions of deaths of undetermined intent (MD), which often represent cases where a suicide determination was judged not to be conclusive, or by decreased percentages of undetermined deaths over time (UT, MA, RI). Second, NVDRS is not yet nationally representative. Currently, 40 states, the District of Columbia, and Puerto Rico participate in NVDRS, but the most recent available data year includes 27 states as others joined the system later. Third, abstractors of NVDRS data are limited to data included in investigative reports. For example, medical and mental health information are not captured directly from medical records but from informants (e.g., family, friends) via coroner/medical examiner reports. Therefore, knowledge of the informant impacts completeness and accuracy of the information reported. This may explain some of the discrepancy between the prevalence of mental health disorders reported here (54%) and the 90% statistic frequently cited in other studies.<sup>13</sup>

Suicide is a growing public health problem and mental illness is an important risk factor for suicide, but is just one of many associated factors. Resources such as CDC's *Preventing Suicide: a Technical Package of Policies, Programs, and Practices*<sup>12</sup> and the National Violent Death Reporting System can help states and communities prioritize comprehensive suicide prevention.

## References (TO BE UPDATED)

- 1 Wisqars fatal injury reports
- 2 World report
- 3 NCHS Data brief 2014
- 4 Kegler et al 2017
- 5 WISQARS Nonfatal injury reports
- 6 National Strategy for Suicide Prevention
- 7 Davidson, L., Potter, L., and Ross, V. (1999) Surgeon General's Call to Action to Prevent Suicide. Public Health Service (DHHS), Rockville, MD.
- 8 ICD-10
- 9 DSM-5
- 10 Melissa's paper
- 11 Need ref
- 12 Technical package

## Acknowledgments

**Conflict of Interest** None

**Corresponding author** D Stone



## Tables and Figures

### Options for ref 11

- :Hawton K, van Heeringen K. Suicide. Lancet. 2009;373: 1372-81. Doi.org/10.1016/S0140-6736(06)6032-X

- . Canetto SS, Sakinofsky I. The Gender Paradox in Suicide. Suicide & Life-Threatening Behavior. 1998; 28:1-23.

### From Katie:

I went through the latest draft w/Alex's comments, comparing the results and discussion. Most lined up, although there were a few places where I noticed some mismatch ("" is from the draft, bold are my comments):

"From 1999-2016, age-adjusted suicide rates among people  $\geq 10$  years increased 25.4% overall." **We give the national (overall) number only in the abstract, not in the results.**

"Suicide rates increased by more than 25% in 30 states and upwards of 50% in some". **We only mention one (North Dakota) that is over 50% in the results (rather than "some").**

"While two-thirds of people with MHP had a history of mental health and/or substance abuse treatment and over half were currently in treatment at the time of their deaths, much more support for this vulnerable population is needed." **The highlighted point is only in the table right now– could add to results text.**

"While MHP are a significant contributor to suicide, 54% of suicide decedents in the current study did *not* have a known MHP. This group suffered more life stressors, especially related to relationships (e.g. intimate partner problems, arguments or conflicts, recent perpetration of intimate partner violence)..." **Didn't notice this the first time around, but the highlighted portion should read "recent perpetration of interpersonal violence" – that variable is not specific to IPV.**

"People with known MHP also experienced life and other stressors apart from their MHP. This group was more likely to experience job and/or financial problems. Also common were intimate partner problems (24.1%), physical health problems (21.4%), and recent or impending crises (26%)." **The numbers in the highlighted portion are in the table, but not specifically cited in the results (because we report odds ratios instead).**



## Morbidity and Mortality Weekly Report

### Contributing Circumstances to Suicide and Increasing Trends in State Suicide Rates

Journal:	<i>Morbidity and Mortality Weekly Report</i>
Manuscript ID	CDC-2018-0112
Manuscript Type:	Manuscript – CDC author
Date Submitted by the Author:	25-Apr-2018
Complete List of Authors:	Stone, Deborah; National Center for Injury Prevention and Control, Division of Violence Prevention Simon, Thomas; CDC, NCIPC Fowler, Katherine; Centers for Disease Control and Prevention, Division of Violence Prevention Kegler, Scott; Centers for Disease Control and Prevention, National Center for Injury Prevention and Control Yuan, Keming; National Center for Injury Prevention and Control, Division of Violence Prevention Holland, Kristin; Centers for Disease Control and Prevention, National Center for Injury Prevention and Control Ivey-Stephenson, Asha; Centers for Disease Control and Prevention, DVP Crosby, Alexander; National Center for Injury Prevention and Control
Jurisdiction – Country (select all that apply):	United States
Multistate – >15 states:	Yes
Jurisdiction – States and U.S. Territories (if ≤ 15 states, select all that apply):	N/A
Note: The following files were submitted by the author for peer review, but cannot be converted to PDF. You must view these files (e.g. movies) online.	
DStone_Figure 1.emf	

SCHOLARONE<sup>®</sup>  
Manuscripts



1 4.25.18

2 **Title:** Vital Signs: Contributing Circumstances to Suicide and Increasing Trends in State Suicide Rates

3  
4 Deborah M. Stone, ScD;<sup>1</sup> Thomas R. Simon PhD;<sup>1</sup> Katherine A. Fowler, PhD;<sup>1</sup> Scott R. Kegler, PhD;<sup>2</sup> Keming Yuan,  
5 MS;<sup>1</sup> Kristin M. Holland, PhD;<sup>1</sup> Asha Z. Ivey-Stephenson, PhD;<sup>1</sup> Alex E. Crosby, MD<sup>1</sup>

6  
7 **Background:** Suicide rates in the United States have risen nearly 30% since 1999. Mental health problems (MHP)  
8 are just one factor contributing to suicide. Examining state-level trends in, and the multiple contributing  
9 circumstances to, suicide can inform comprehensive state suicide prevention planning.

10  
11 **Methods:** Trends in age-adjusted suicide rates among people aged ≥10 years, by state and sex, across six  
12 consecutive three-year periods (1999-2016), were assessed using data from the National Vital Statistics System  
13 for 50 states and Washington, D.C. Data from the National Violent Death Reporting System, covering 27 states  
14 in 2015, were used to examine contributing circumstances among decedents with and without known mental  
15 health problems (MHP).

16  
17 **Results:** From 1999-2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases  
18 of more than 30%. Rates increased significantly among males and females in 34 and 43 states, respectively. In  
19 2015, more than half (54%) of decedents in 27 states did not have a known MHP. Among people with  
20 circumstance information, several circumstances, including relationship problems/loss (45.1% vs 39.6%), life  
21 stressors (54.2% vs 49.7%), and recent/impending crises (32.9% vs 26.0%) were significantly more likely among  
22 those without a known MHP than decedents with MHP, but were common across groups.

23  
24 **Conclusions:** Suicide rates increased significantly across most states from 1999-2016. Various circumstances  
25 contributed to suicides among people with and without known MHP.

26  
27 **Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach  
28 to prevent suicide risk before it occurs, identify and support people at risk, prevent reattempts, and help  
29 friends/family after a suicide occurs.

30  
31 **INTRODUCTION**

32  
33 **BACKGROUND AND PURPOSE**

34  
35 In 2016, nearly 45,000 suicides (15.6/100,000 [age-adjusted]) occurred in the United States (U.S.), among people  
36 ≥10 years old (1). Between 1999 and 2015, suicide rates increased across sexes, racial/ethnic groups, and  
37 urbanization levels (2, 3). Suicide is the 10<sup>th</sup> leading cause of death and is one of just three leading causes that  
38 are *increasing* (1, 4). Additionally, rates of emergency department visits for nonfatal self-harm, a key risk factor  
39 for suicide, increased nearly 45% between 2001 and 2015 (1). Together, suicides and self-harm injuries cost the  
40 nation more than \$69 billion in direct medical and work loss costs (1).

41  
42 The *National Strategy for Suicide Prevention(NSSP)* (5) calls for a public health approach to suicide prevention  
43 with efforts spanning across multiple levels (i.e., individual, family/relationship, community, and societal). Such a  
44 comprehensive approach underscores that suicide is rarely caused by any single factor, but rather, is multi-  
45 determined. Despite the NSSP guidance, suicide prevention largely focuses on identifying suicidal people,  
46 providing treatment for mental health problems (MHP) and preventing re-attempts (6). In addition to MHP and  
47 prior attempts, other contributing circumstances to suicide include social and economic problems, access to  
48 lethal means (e.g., substances, firearms) among people at risk, and poor coping and problem-solving skills (5).  
49 Expanded awareness of these additional circumstances contributing to suicide risk and action to address them,



4.25.18

can help reach the nation's goal of reducing suicide rates 20% by 2025 (7). To assist states in achieving this goal, this study analyzes state-specific trends in suicide rates, assesses the multiple contributing factors to suicide, and provides options for multi-level comprehensive suicide prevention based on the best available evidence.

## METHODS

Suicide rates were analyzed for people aged  $\geq 10$  years only, as determining suicidal intent in younger children can be difficult (8). Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases 10<sup>th</sup> Revision*, underlying-cause-of death codes X60-X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods spanning 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Characteristics and circumstances of suicide decedents  $\geq 10$  years old, with and without known MHP, were compared in the 27 states with complete data participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines MHP as disorders and syndromes listed in the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (9), with the exception of alcohol and other substance dependence, which are captured separately in NVDRS. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known MHP were compared using Chi-square tests. Logistic regression analyses estimated adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and race/ethnicity.

## RESULTS

The most recent overall suicide rates (representing 2014-2016) varied four-fold, from 6.9 (D.C.) to 29.2 (Montana) per 100,000 persons per year (Table 1). Across the study period, rates increased in all states, except Nevada (which had a consistently high rate throughout), with absolute increases ranging from +0.8 (Delaware) to +8.1 (Wyoming) per 100,000. Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with increases of more than 30% observed in 25 states (Table 1, Figure 1).

Modeled suicide rate trends indicated significant increases for 44 states, for males (34 states) and females (43 states), as well as for the U.S. overall (Table 1). Nationally, the model-estimated AAPC for the overall suicide rate was +1.5%. By sex, estimated national rate trends further indicated significant increases for males (AAPC +1.1%) and females (AAPC +2.6%).

Suicide decedents without known MHP (N=11,039) were compared to those with MHP (N=9,407) in 27 states. While all decedents were predominately male (Table 2; 76.8%) and non-Hispanic white (83.6%), those without known MHP, relative to those with MHP, were more likely male (83.6% vs. 68.8%; odds ratio (OR)=2.3, 95% CI = 2.2-2.5) and racial/ethnic minorities (OR range: 1.2-2.0). Suicide decedents without known MHP also had significantly greater odds of perpetrating homicide-suicide (adjusted odds ratio aOR = 2.9, 95% CI = 2.2-3.8).



1 4.25.18

2 Among adult decedents, 20.1% of those without known MHP and 15.3% of those with MPH ever served, or were  
3 currently serving, in the U.S. military.

4 While firearms were the most common method of suicide used overall (48.5%) and for both groups, decedents  
5 without known MHP were more likely to die by firearm (55.3% vs. 40.6%) and less likely to die by  
6 hanging/strangulation/suffocation (26.9% vs 31.3%) or poisoning (10.4% vs 19.8%) than those with known MHP.  
7 These differences remained significant in the adjusted models.

8 Decedents without known MHP were less likely to receive toxicology testing. Among those with toxicology  
9 results, decedents without known MHP were less likely to test positive for any substance overall (aOR=0.8, 95%  
10 CI=0.7-0.8), such as opioids (aOR=.90 95% CI=0.81-.99) but more likely to test positive for alcohol (aOR=1.2, 95%  
11 CI=1.1-1.3).

12 All suicide decedents with MHP (N=9,407) and approximately 85% without known MHP (N=9,357) had available  
13 circumstances information (Table 3). People without known MHP were less likely to have any substance abuse  
14 problems (aOR=0.7, 95% CI=0.7-0.8). While two-thirds of those with known MHP had a history of mental health  
15 or substance abuse treatment (67.2%), just over half (54.0%) were in current treatment.

16 Decedents without, versus those with, known MHP, had significantly greater likelihood of any relationship  
17 problem/loss (45.1% vs. 39.6%), specifically intimate partner problems (30.2% vs. 24.1%), arguments/conflicts  
18 (17.5% vs. 13.6%), and recently perpetrating interpersonal violence (3.0% vs. 1.4%). They also were more likely  
19 to have experienced any life stressors (54.2% vs 49.7%), such as criminal-legal problems (10.7% vs. 6.2%), or  
20 eviction/loss of home (4.3% vs. 3.4%) and were more likely to have had a crisis within the preceding or  
21 upcoming two weeks (32.9% vs. 26.0%). All of these differences remained significant in the adjusted models.  
22 Among all people with crises, intimate partner problems were the most common types and did not differ by  
23 group. Similarly, among people without versus with MHP, physical health problems (23.2% and 21.4%) and  
24 job/financial problems (15.6% and 16.8%) were commonly experienced by both groups.

25 Decedents without known MHP had significantly lower odds of recent release from any institution (aOR=0.5,  
26 95% CI=0.4-0.5), but among those who were recently released (5.1%), they were significantly more likely to be  
27 released from a correctional facility (25.7% vs. 8.7%), hospital (43.7% vs. 33.0%), or other facility (e.g.,  
28 alcohol/substance treatment) (aOR=2.5 95% CI=1.8-3.3), than those with a known MHP. Among decedents with  
29 known MHP who were recently released from an institution (10.2%), 46.7% of this group were released from  
30 psychiatric facilities.

31 Decedents without known MHP, compared to those with MHP, were significantly less likely to have a history of  
32 suicidal ideation (23.0% vs. 40.8%) and prior suicide attempts (10.3% vs. 29.4%). More than one in five people in  
33 both groups disclosed suicide intent (22.4% vs. 24.5%).

34 **Conclusions and Comments**

35 From 1999-2016, 44 states saw significant increases in suicide rates and 25 states experienced substantial  
36 increases in suicide rates of more than 30%. Rates increased significantly among males, in 34 states, and  
37 females, in 43 states. This finding is consistent with prior research showing a decreasing gender gap in male-  
38 female suicide rates between 1999-2014 (3). Additional research into the specific causes of these trends is  
39 necessary. Fortunately, data from the 27 states participating in NVDRS provides important insight into suicide  
40 circumstances and can help states identify prevention priorities.



4.25.18

Suicidologists regularly state that suicide is not caused by a single factor; (5) however, suicide prevention is often oriented towards downstream identification of suicidal people, treatment of MHP and prevention of reattempts. Additional focus on non-mental health factors, further upstream, is essential to a public health approach (10), as the current study found that more than half of suicide decedents in NVDRS did *not* have a known MHP. This group suffered more from relationship problems and other life stressors such as criminal-legal matters, eviction/loss of home, and recent or impending crises.

Similarly, people with MHP often experienced relationship problems and other life stressors such as job/financial and/or physical health problems. These findings point to the need to both help people manage the conditions associated with mental health problems in the first place, and to support people with known MHP to decrease their risk of poor outcomes (11). Two-thirds of this group had a history of any mental health and/or substance abuse treatment, with over half in treatment when they died. This suggests the need for additional safety supports, including broader implementation of affordable and effective treatment modalities such as doctor-patient collaborative care models and proven cognitive-behavioral therapies. Additionally, greater access to behavioral health providers in underserved areas is needed, as is expansion of healthcare systems needed that integrates physical and behavioral health with a priority on suicide prevention and patient safety, especially through care transitions (12).

Comprehensive statewide suicide prevention activities are needed to address the full range of factors contributing to suicide. Prevention strategies include: strengthening economic supports (e.g., housing stabilization policies, household financial support); teaching coping and problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in life; promoting social connectedness to increase a sense of belongingness and access to informational, tangible, emotional, and social support; and identifying and better supporting people at risk (e.g., Veterans, people with physical/mental health problems) (12). Other strategies include creating protective environments (e.g., reducing access to lethal means among people at risk, creating organizational and workplace policies to promote help-seeking, easing transitions into and out of work for people with MHP and other life challenges), supporting family and friends after a suicide, and assuring safe reporting by the media in order to prevent suicide contagion (12). Some states, such as Colorado, are planning to implement such a comprehensive approach to suicide prevention (10).

These findings have at least three limitations. In the state-level analysis, rankings for four states (MD, MA, RI, UT) might have been impacted by large proportions of injury deaths of undetermined intent (potentially biasing reported suicide rates downward), or decreased percentages of such deaths over time (potentially biasing estimated rate trends upward). Second, NVDRS is not yet nationally representative; the 27 states included represent 49.6% of the population (<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml>).

Third, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the extent of informant knowledge can impact data completeness and accuracy. Studies including more in-depth interviews with next-of-kin often see greater attributions to mental disorders (13), however many methodological variations across studies exist (14). It is likely that some people without known MHP in the current study were experiencing mental health challenges that were unknown, and hence underreported by key informants. Nonetheless, the high prevalence of diverse contributing circumstances among those with and without known MHP suggests the importance of addressing the broad range of factors that contribute to suicide.

Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are available. States and communities can use data from NVDRS and resources such as CDC's *Preventing Suicide: a Technical Package of Policies, Programs, and Practices* (12) to better understand their suicide problem, prioritize evidence-based comprehensive suicide prevention, and save lives.



1 4.25.18

2 **Acknowledgments**

3 The authors acknowledge Robert Anderson, Holly Hedegaard, and Margaret Warner from the Division of Vital  
4 Statistics, National Center for Health Statistics, CDC, for their statistical consultation.

5  
6  
7 **Conflict of Interest** No conflicts of interest were reported.

8  
9 **Corresponding author:** Deborah M. Stone, [dstone3@cdc.gov](mailto:dstone3@cdc.gov) , 770-488-3942

10 **Author Affiliations:**

11 <sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis,  
12 Research, and Practice Integration, National Center for Injury Prevention and Control, CDC

13  
14 **References:**

- 15  
16 1. Centers for Disease Control and Prevention. Web-based Injury Statistics Query and Reporting System  
17 (WISQARS). Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018. In.  
18 2. Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide Trends Among and  
19 Within Urbanization Levels by Sex, Race/Ethnicity, Age Group, and Mechanism of Death - United States,  
20 2001-2015. MMWR Surveill Summ 2017;66(18):1-16.  
21 3. Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999-2014. In: US Department  
22 of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health  
23 Statistics Hyattsville, MD; 2016.  
24 4. Kochanek K, Murphy S, Xu J, Arias E. Mortality in the United States, 2016. NCHS Data Brief, no 293.  
25 National Center for Health Statistics 2017.  
26 5. Office of the Surgeon General, National Action Alliance for Suicide Prevention. 2012 National strategy for  
27 suicide prevention: Goals and objectives for action: a report of the US Surgeon General and of the National  
28 Action Alliance for Suicide Prevention. 2012.  
29 6. Zalsman G, Hawton K, Wasserman D, van Heeringen K, Arensman E, Sarchiapone M, et al. Suicide  
30 prevention strategies revisited: 10-year systematic review. The Lancet Psychiatry 2016;3(7):646-659.  
31 7. Torguson K, O'Brien A. Leading Suicide Prevention Efforts Unite to Address Rising National Suicide Rate. In.  
32 Washington, D.C.; 2017.  
33 8. Crepeau-Hobson F. The Psychological Autopsy and Determination of Child Suicides: A Survey of Medical  
34 Examiners. Archives of Suicide Research 2010;14(1):24-34.  
35 9. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5®):  
36 American Psychiatric Pub; 2013.  
37 10. Caine ED, Reed J, Hindman J, Quinlan K. Comprehensive, integrated approaches to suicide prevention:  
38 practical guidance. Injury prevention 2017;injuryprev-2017-042366.  
39 11. World Health Organization. Risks to mental health: An overview of vulnerabilities and risk factors. Geneva:  
40 WHO 2012.  
41 12. Stone DM, Holland KM, Bartholow BN, Crosby AE, Davis SP, Wilkins N. Preventing suicide: A technical  
42 package of policies, programs, and practice. 2017.  
43 13. Milner A, Svetlicic J, De Leo D. Suicide in the absence of mental disorder? A review of psychological autopsy  
44 studies across countries. Int J Soc Psychiatry 2013;59(6):545-54.  
45 14. Pouliot L, De Leo D. Critical issues in psychological autopsy studies. Suicide Life Threat Behav  
46 2006;36(5):491-510.

47  
48  
49 **Word Count:** 1904/1800



**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, National Vital Statistics System, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
U.S.	Both	12.3 (n/a)	12.7 (+ 0.4)	12.9 (+ 0.2)	13.8 (+ 0.9)	14.5 (+ 0.8)	15.4 (+ 0.9)	+ 1.5 % (p<.01)	n/a	+ 3.1 (n/a)	+ 25.4 % (n/a)
	Male	20.9 (n/a)	21.2 (+ 0.4)	21.3 (+ 0.0)	22.5 (+1.3)	23.5 (+ 1.0)	24.5 (+ 1.0)	+ 1.1 % (p<.01)			
	Female	4.7 (n/a)	5.0 (+ 0.3)	5.3 (+ 0.2)	5.7 (+ 0.4)	6.2 (+ 0.5)	6.9 (+ 0.7)	+ 2.6 % (p<.01)			
AL	Both	14.3 (n/a)	13.4 (- 0.9)	14.1 (+ 0.6)	15.6 (+ 1.6)	16.4 (+ 0.7)	17.5 (+ 1.1)	+ 1.6 % (p<.05)	25	+ 3.1 (31)	+ 21.9 % (33)
	Male	25.1 (n/a)	23.4 (- 1.7)	24.4 (+ 1.0)	26.4 (+ 2.0)	27.6 (+ 1.1)	29.1 (+ 1.5)	+ 1.3 % (p<.05)			
	Female	5.1 (n/a)	4.8 (- 0.3)	5.0 (+ 0.2)	6.1 (+ 1.1)	6.4 (+ 0.3)	7.0 (+ 0.7)	+ 2.6 % (p<.01)			
AK	Both	21.0 (n/a)	24.8 (+ 3.8)	24.2 (- 0.6)	26.0 (+ 1.7)	25.4 (- 0.5)	28.8 (+ 3.4)	+ 1.7 % (p<.05)	2	+ 7.8 ( 4)	+ 37.4 % (13)
	Male	33.2 (n/a)	38.1 (+ 4.9)	38.9 (+ 0.8)	40.1 (+ 1.2)	40.1 (- 0.1)	42.9 (+ 2.8)	+ 1.4 % (p<.01)			
	Female	8.6 (n/a)	11.4 (+ 2.9)	9.8 (- 1.6)	11.1 (+ 1.2)	9.9 (- 1.2)	13.2 (+ 3.4)	+ 1.7 % n/s			
AZ	Both	17.8 (n/a)	18.5 (+ 0.7)	19.1 (+ 0.5)	19.1 (- 0.0)	20.4 (+ 1.3)	20.9 (+ 0.5)	+ 1.0 % (p<.01)	15	+ 3.1 (32)	+ 17.3 % (42)
	Male	29.3 (n/a)	30.2 (+ 1.0)	30.6 (+ 0.4)	30.2 (- 0.5)	32.0 (+ 1.9)	32.4 (+ 0.4)	+ 0.6 % (p<.05)			
	Female	7.1 (n/a)	7.5 (+ 0.4)	8.2 (+ 0.7)	8.6 (+ 0.5)	9.2 (+ 0.6)	9.9 (+ 0.6)	+ 2.2 % (p<.01)			
AR	Both	15.5 (n/a)	15.8 (+ 0.3)	16.2 (+ 0.5)	17.6 (+ 1.4)	19.2 (+ 1.6)	21.2 (+ 2.0)	+ 2.2 % (p<.01)	12	+ 5.7 (14)	+ 36.8 % (15)
	Male	26.7 (n/a)	26.7 (+ 0.0)	27.2 (+ 0.5)	28.2 (+ 1.0)	31.7 (+ 3.5)	33.5 (+ 1.9)	+ 1.6 % (p<.05)			
	Female	5.6 (n/a)	5.9 (+ 0.3)	6.2 (+ 0.4)	7.9 (+ 1.7)	7.5 (- 0.4)	9.6 (+ 2.1)	+ 3.6 % (p<.01)			
CA	Both	10.6 (n/a)	11.3 (+ 0.7)	11.0 (- 0.3)	12.0 (+ 1.0)	11.8 (- 0.1)	12.1 (+ 0.3)	+ 0.9 % (p<.05)	45	+ 1.6 (46)	+ 14.8 % (46)
	Male	17.9 (n/a)	18.4 (+ 0.5)	17.7 (- 0.7)	19.1 (+ 1.4)	18.9 (- 0.2)	19.2 (+ 0.3)	+ 0.5 % n/s			
	Female	4.1 (n/a)	5.0 (+ 0.9)	4.9 (- 0.1)	5.4 (+ 0.5)	5.3 (- 0.1)	5.6 (+ 0.3)	+ 1.7 % (p<.05)			
CO	Both	17.3 (n/a)	19.2 (+ 1.9)	19.0 (- 0.2)	20.0 (+ 1.0)	21.6 (+ 1.5)	23.2 (+ 1.6)	+ 1.8 % (p<.01)	8	+ 5.9 (12)	+ 34.1 % (22)
	Male	28.6 (n/a)	30.9 (+ 2.3)	30.5 (- 0.4)	31.5 (+ 1.0)	33.4 (+ 1.9)	36.3 (+ 2.9)	+ 1.4 % (p<.01)			
	Female	7.0 (n/a)	8.2 (+ 1.3)	8.2 (+ 0.0)	9.1 (+ 0.9)	10.1 (+ 1.0)	10.4 (+ 0.3)	+ 2.6 % (p<.01)			
CT	Both	9.6 (n/a)	8.9 (- 0.7)	9.1 (+ 0.2)	10.2 (+ 1.1)	11.0 (+ 0.8)	11.5 (+ 0.5)	+ 1.6 % (p<.05)	46	+ 1.9 (43)	+ 19.2 % (34)
	Male	16.4 (n/a)	14.6 (- 1.8)	15.0 (+ 0.4)	16.6 (+ 1.6)	17.6 (+ 1.0)	17.3 (- 0.3)	+ 0.9 % n/s			
	Female	3.6 (n/a)	3.8 (+ 0.2)	3.7 (- 0.2)	4.4 (+ 0.7)	4.9 (+ 0.5)	6.2 (+ 1.3)	+ 3.5 % (p<.05)			



**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, National Vital Statistics System, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
DE	Both	13.6 (n/a)	12.2 (- 1.4)	11.9 (- 0.3)	13.6 (+ 1.7)	14.2 (+ 0.6)	14.4 (+ 0.2)	+ 0.9 % n/s	42	+ 0.8 (50)	+ 5.9 % (50)
	Male	23.0 (n/a)	20.3 (- 2.7)	19.9 (- 0.4)	23.1 (+ 3.2)	22.7 (- 0.4)	23.5 (+ 0.8)	+ 0.6 % n/s			
	Female	5.3 (n/a)	5.0 (- 0.2)	4.6 (- 0.4)	4.9 (+ 0.3)	6.4 (+ 1.5)	6.2 (- 0.2)	+ 1.6 % n/s			
DC	Both	5.9 (n/a)	6.4 (+ 0.5)	6.4 (- 0.0)	7.3 (+ 0.8)	6.6 (- 0.7)	6.9 (+ 0.3)	+ 0.9 % n/s	51	+ 1.0 (48)	+ 16.1 % (45)
	Male	10.7 (n/a)	11.1 (+ 0.4)	10.3 (- 0.8)	12.7 (+ 2.4)	10.0 (- 2.6)	11.7 (+ 1.7)	+ 0.3 % n/s			
	Female	1.7 (n/a) ††	2.3 (+ 0.6) ††	3.3 (+ 1.0)	2.6 (- 0.7)	3.6 (+ 1.0)	2.8 (- 0.8)	+ 3.5 % n/s			
FL	Both	14.8 (n/a)	15.2 (+ 0.4)	14.9 (- 0.3)	16.3 (+ 1.4)	16.3 (- 0.0)	16.4 (+ 0.1)	+ 0.8 % (p<.05)	29	+ 1.6 (45)	+ 10.6 % (48)
	Male	24.3 (n/a)	24.4 (+ 0.1)	23.6 (- 0.8)	26.2 (+ 2.6)	25.6 (- 0.6)	25.6 (- 0.1)	+ 0.5 % n/s			
	Female	6.3 (n/a)	6.8 (+ 0.5)	6.8 (+ 0.0)	7.1 (+ 0.3)	7.6 (+ 0.5)	7.8 (+ 0.3)	+ 1.4 % (p<.01)			
GA	Both	12.9 (n/a)	13.2 (+ 0.3)	12.3 (- 0.9)	13.2 (+ 0.9)	13.7 (+ 0.5)	15.0 (+ 1.3)	+ 0.9 % n/s	39	+ 2.1 (40)	+ 16.2 % (44)
	Male	22.1 (n/a)	23.1 (+ 1.0)	21.3 (- 1.8)	21.9 (+ 0.6)	22.6 (+ 0.7)	24.4 (+ 1.7)	+ 0.5 % n/s			
	Female	5.0 (n/a)	4.8 (- 0.2)	4.6 (- 0.2)	5.5 (+ 0.9)	5.8 (+ 0.3)	6.6 (+ 0.8)	+ 2.1 % (p<.05)			
HI	Both	12.9 (n/a)	11.1 (- 1.8)	10.3 (- 0.7)	14.5 (+ 4.1)	14.4 (- 0.1)	15.2 (+ 0.8)	+ 2.0 % n/s	35	+ 2.4 (35)	+ 18.3 % (38)
	Male	20.4 (n/a)	17.2 (- 3.1)	15.3 (- 1.9)	21.9 (+ 6.7)	22.5 (+ 0.5)	24.3 (+ 1.8)	+ 2.1 % n/s			
	Female	5.4 (n/a)	5.0 (- 0.4)	5.5 (+ 0.5)	7.1 (+ 1.5)	6.2 (- 0.9)	5.9 (- 0.3)	+ 1.2 % n/s			
ID	Both	17.3 (n/a)	19.2 (+ 2.0)	18.3 (- 0.9)	21.6 (+ 3.3)	21.9 (+ 0.3)	24.7 (+ 2.8)	+ 2.3 % (p<.01)	6	+ 7.5 ( 6)	+ 43.2 % ( 7)
	Male	28.4 (n/a)	33.1 (+ 4.7)	31.1 (- 2.0)	34.9 (+ 3.8)	34.7 (- 0.2)	38.0 (+ 3.3)	+ 1.6 % (p<.05)			
	Female	7.2 (n/a)	6.1 (- 1.1)	6.1 (+ 0.0)	9.0 (+ 2.9)	9.5 (+ 0.5)	11.8 (+ 2.3)	+ 4.4 % (p<.05)			
IL	Both	9.9 (n/a)	9.8 (- 0.1)	9.7 (- 0.1)	10.6 (+ 0.8)	11.2 (+ 0.6)	12.2 (+ 1.0)	+ 1.5 % (p<.05)	44	+ 2.3 (38)	+ 22.8 % (32)
	Male	17.1 (n/a)	16.7 (- 0.4)	16.2 (- 0.4)	17.6 (+ 1.4)	18.5 (+ 0.9)	19.8 (+ 1.3)	+ 1.1 % (p<.05)			
	Female	3.7 (n/a)	3.6 (- 0.0)	3.8 (+ 0.2)	4.2 (+ 0.4)	4.5 (+ 0.4)	5.2 (+ 0.6)	+ 2.4 % (p<.01)			
IN	Both	13.0 (n/a)	13.7 (+ 0.7)	14.4 (+ 0.7)	14.9 (+ 0.5)	16.4 (+ 1.4)	17.1 (+ 0.7)	+ 1.9 % (p<.01)	26	+ 4.1 (23)	+ 31.9 % (25)
	Male	22.4 (n/a)	23.2 (+ 0.8)	24.4 (+ 1.2)	24.7 (+ 0.4)	26.7 (+ 2.0)	28.3 (+ 1.6)	+ 1.5 % (p<.01)			
	Female	4.6 (n/a)	5.0 (+ 0.4)	5.3 (+ 0.2)	5.9 (+ 0.6)	6.8 (+ 0.9)	6.6 (- 0.2)	+ 2.7 % (p<.01)			



**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, National Vital Statistics System, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
IA	Both	11.8 (n/a)	13.2 (+ 1.4)	12.8 (- 0.4)	14.2 (+ 1.4)	15.9 (+ 1.7)	16.0 (+ 0.1)	+ 2.1 % (p<.01)	31	+ 4.3 (20)	+ 36.2 % (18)
	Male	20.6 (n/a)	22.1 (+ 1.5)	20.8 (- 1.4)	23.3 (+ 2.5)	26.0 (+ 2.7)	25.7 (- 0.3)	+ 1.6 % (p<.05)			
	Female	3.7 (n/a)	4.7 (+ 1.0)	5.3 (+ 0.6)	5.5 (+ 0.2)	6.1 (+ 0.6)	6.7 (+ 0.6)	+ 3.8 % (p<.01)			
KS	Both	13.3 (n/a)	15.1 (+ 1.8)	15.8 (+ 0.7)	15.3 (- 0.5)	17.7 (+ 2.4)	19.4 (+ 1.6)	+ 2.2 % (p<.01)	19	+ 6.0 (11)	+ 45.0 % ( 5)
	Male	22.7 (n/a)	25.0 (+ 2.3)	26.5 (+ 1.5)	25.6 (- 0.9)	29.1 (+ 3.5)	30.7 (+ 1.6)	+ 1.9 % (p<.01)			
	Female	4.6 (n/a)	6.0 (+ 1.4)	5.7 (- 0.3)	5.4 (- 0.3)	6.8 (+ 1.4)	8.4 (+ 1.6)	+ 3.2 % (p<.05)			
KY	Both	14.1 (n/a)	15.4 (+ 1.3)	16.7 (+ 1.3)	16.2 (- 0.5)	18.2 (+ 2.0)	19.3 (+ 1.1)	+ 1.9 % (p<.01)	20	+ 5.2 (16)	+ 36.6 % (16)
	Male	25.0 (n/a)	26.8 (+ 1.9)	28.3 (+ 1.4)	27.2 (- 1.0)	30.1 (+ 2.9)	31.7 (+ 1.6)	+ 1.4 % (p<.01)			
	Female	4.8 (n/a)	5.2 (+ 0.4)	6.1 (+ 0.8)	6.1 (+ 0.1)	7.1 (+ 0.9)	7.7 (+ 0.6)	+ 3.2 % (p<.01)			
LA	Both	13.1 (n/a)	12.9 (- 0.2)	13.4 (+ 0.4)	13.6 (+ 0.3)	14.4 (+ 0.8)	17.0 (+ 2.5)	+ 1.6 % (p<.05)	27	+ 3.8 (27)	+ 29.3 % (26)
	Male	22.9 (n/a)	22.3 (- 0.6)	22.4 (+ 0.1)	23.3 (+ 0.8)	23.7 (+ 0.5)	27.3 (+ 3.6)	+ 1.1 % n/s			
	Female	4.8 (n/a)	4.7 (- 0.1)	5.2 (+ 0.5)	4.9 (- 0.2)	6.1 (+ 1.2)	7.5 (+ 1.4)	+ 2.8 % (p<.05)			
ME	Both	14.5 (n/a)	13.6 (- 0.9)	14.4 (+ 0.8)	15.4 (+ 1.0)	18.9 (+ 3.5)	18.5 (- 0.4)	+ 2.2 % (p<.05)	21	+ 4.0 (25)	+ 27.4 % (29)
	Male	25.0 (n/a)	22.9 (- 2.1)	24.6 (+ 1.7)	25.7 (+ 1.1)	31.1 (+ 5.4)	29.8 (- 1.3)	+ 1.8 % (p<.05)			
	Female	5.3 (n/a)	5.3 (- 0.0)	5.2 (- 0.1)	6.0 (+ 0.7)	7.6 (+ 1.6)	7.9 (+ 0.3)	+ 3.1 % (p<.05)			
MD	Both	10.0 (n/a)	10.3 (+ 0.3)	10.1 (- 0.2)	10.2 (+ 0.1)	10.7 (+ 0.5)	10.8 (+ 0.1)	+ 0.5 % (p<.05)	47 §§	+ 0.8 (49 §§)	+ 8.5 % (49 §§)
	Male	17.6 (n/a)	17.8 (+ 0.1)	17.3 (- 0.5)	17.7 (+ 0.4)	18.2 (+ 0.5)	18.0 (- 0.2)	+ 0.2 % n/s			
	Female	3.5 (n/a)	3.8 (+ 0.4)	3.9 (+ 0.0)	3.7 (- 0.2)	4.1 (+ 0.4)	4.5 (+ 0.4)	+ 1.3 % (p<.05)			
MA	Both	7.4 (n/a)	7.6 (+ 0.2)	8.4 (+ 0.8)	9.3 (+ 1.0)	9.8 (+ 0.4)	10.0 (+ 0.3)	+ 2.3 % (p<.01)	48	+ 2.6 (34 ¶¶)	+ 35.3 % (20 ¶¶)
	Male	12.1 (n/a)	12.8 (+ 0.7)	13.3 (+ 0.5)	15.4 (+ 2.1)	15.2 (- 0.2)	16.0 (+ 0.8)	+ 2.0 % (p<.01)			
	Female	3.3 (n/a)	2.9 (- 0.4)	4.0 (+ 1.0)	3.8 (- 0.1)	4.8 (+ 1.0)	4.6 (- 0.2)	+ 3.0 % (p<.05)			
MI	Both	11.8 (n/a)	12.5 (+ 0.7)	12.9 (+ 0.4)	13.9 (+ 1.0)	14.5 (+ 0.7)	15.6 (+ 1.1)	+ 1.9 % (p<.01)	33	+ 3.9 (26)	+ 32.9 % (24)
	Male	20.0 (n/a)	20.9 (+ 0.9)	21.6 (+ 0.7)	22.8 (+ 1.3)	23.9 (+ 1.0)	25.0 (+ 1.2)	+ 1.5 % (p<.01)			
	Female	4.4 (n/a)	4.8 (+ 0.4)	5.0 (+ 0.2)	5.6 (+ 0.6)	5.9 (+ 0.3)	6.7 (+ 0.9)	+ 2.8 % (p<.01)			



**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, National Vital Statistics System, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
MN	Both	10.7 (n/a)	11.5 (+ 0.9)	12.4 (+ 0.8)	12.9 (+ 0.5)	14.2 (+ 1.3)	15.0 (+ 0.9)	+ 2.3 % (p<.01)	38	+ 4.3 (19)	+ 40.6 % ( 8)
	Male	18.3 (n/a)	19.3 (+ 1.1)	20.4 (+ 1.0)	20.9 (+ 0.6)	22.9 (+ 1.9)	23.3 (+ 0.4)	+ 1.7 % (p<.01)			
	Female	3.6 (n/a)	4.2 (+ 0.6)	4.8 (+ 0.6)	5.1 (+ 0.4)	5.8 (+ 0.6)	6.9 (+ 1.2)	+ 4.2 % (p<.01)			
MS	Both	12.9 (n/a)	14.1 (+ 1.2)	14.7 (+ 0.6)	15.5 (+ 0.8)	15.6 (+ 0.1)	15.2 (- 0.3)	+ 1.1 % (p<.05)	36	+ 2.3 (36)	+ 17.8 % (40)
	Male	22.9 (n/a)	24.6 (+ 1.7)	25.1 (+ 0.6)	26.8 (+ 1.7)	25.9 (- 0.9)	25.3 (- 0.6)	+ 0.7 % n/s			
	Female	4.3 (n/a)	5.0 (+ 0.7)	5.5 (+ 0.5)	5.5 (- 0.0)	6.4 (+ 0.9)	6.2 (- 0.2)	+ 2.4 % (p<.01)			
MO	Both	14.7 (n/a)	14.1 (- 0.6)	15.4 (+ 1.3)	16.0 (+ 0.7)	17.8 (+ 1.7)	20.0 (+ 2.3)	+ 2.2 % (p<.01)	16	+ 5.3 (15)	+ 36.4 % (17)
	Male	25.3 (n/a)	23.7 (- 1.6)	25.6 (+ 1.9)	26.6 (+ 1.0)	28.9 (+ 2.3)	32.2 (+ 3.3)	+ 1.8 % (p<.05)			
	Female	5.4 (n/a)	5.4 (+ 0.1)	6.1 (+ 0.7)	6.3 (+ 0.2)	7.4 (+ 1.1)	8.6 (+ 1.2)	+ 3.2 % (p<.01)			
MT	Both	21.1 (n/a)	22.6 (+ 1.4)	23.6 (+ 1.0)	24.7 (+ 1.1)	26.7 (+ 2.0)	29.2 (+ 2.5)	+ 2.1 % (p<.01)	1	+ 8.0 ( 2)	+ 38.0 % (11)
	Male	36.9 (n/a)	37.3 (+ 0.4)	39.8 (+ 2.5)	39.7 (- 0.1)	41.0 (+ 1.4)	45.5 (+ 4.4)	+ 1.3 % (p<.01)			
	Female	6.7 (n/a)	8.4 (+ 1.8)	8.4 (- 0.1)	10.0 (+ 1.6)	12.6 (+ 2.6)	13.1 (+ 0.5)	+ 4.6 % (p<.01)			
NE	Both	12.7 (n/a)	12.2 (- 0.5)	12.6 (+ 0.4)	11.7 (- 0.8)	13.5 (+ 1.8)	14.8 (+ 1.3)	+ 1.0 % n/s	40	+ 2.1 (42)	+ 16.2 % (43)
	Male	22.2 (n/a)	20.7 (- 1.5)	20.3 (- 0.4)	19.8 (- 0.5)	22.0 (+ 2.2)	23.9 (+ 1.9)	+ 0.6 % n/s			
	Female	3.8 (n/a)	4.2 (+ 0.4)	5.1 (+ 0.9)	4.0 (- 1.1)	5.5 (+ 1.4)	5.8 (+ 0.3)	+ 2.6 % n/s			
NV	Both	23.3 (n/a)	22.6 (- 0.6)	22.1 (- 0.5)	22.6 (+ 0.5)	21.4 (- 1.2)	23.1 (+ 1.6)	- 0.2 % n/s	9	- 0.2 (51)	- 1.0 % (51)
	Male	38.3 (n/a)	36.7 (- 1.7)	35.1 (- 1.6)	35.6 (+ 0.5)	32.5 (- 3.0)	35.4 (+ 2.8)	- 0.7 % n/s			
	Female	8.9 (n/a)	9.5 (+ 0.5)	9.6 (+ 0.1)	10.0 (+ 0.4)	10.6 (+ 0.6)	11.2 (+ 0.6)	+ 1.5 % (p<.01)			
NH	Both	13.5 (n/a)	12.5 (- 1.0)	13.3 (+ 0.8)	15.2 (+ 1.9)	15.8 (+ 0.6)	20.0 (+ 4.2)	+ 2.7 % (p<.05)	17	+ 6.5 ( 8)	+ 48.3 % ( 3)
	Male	22.5 (n/a)	21.1 (- 1.4)	21.7 (+ 0.6)	24.8 (+ 3.1)	25.4 (+ 0.6)	30.6 (+ 5.2)	+ 2.2 % (p<.05)			
	Female	5.3 (n/a)	4.8 (- 0.5)	5.9 (+ 1.0)	6.2 (+ 0.4)	6.6 (+ 0.4)	9.8 (+ 3.2)	+ 3.9 % (p<.05)			
NJ	Both	7.8 (n/a)	7.7 (- 0.1)	7.5 (- 0.2)	8.0 (+ 0.5)	8.9 (+ 0.9)	9.2 (+ 0.4)	+ 1.3 % (p<.05)	50	+ 1.5 (47)	+ 19.2 % (35)
	Male	13.0 (n/a)	13.1 (+ 0.0)	12.6 (- 0.5)	13.7 (+ 1.1)	14.5 (+ 0.8)	14.6 (+ 0.1)	+ 0.9 % (p<.05)			
	Female	3.2 (n/a)	2.9 (- 0.3)	3.0 (+ 0.0)	2.9 (- 0.1)	3.8 (+ 0.9)	4.4 (+ 0.6)	+ 2.3 % n/s			



**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, National Vital Statistics System, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
NM	Both	22.0 (n/a)	22.0 (- 0.1)	21.8 (- 0.2)	23.0 (+ 1.2)	24.1 (+ 1.1)	26.0 (+ 1.9)	+ 1.1 % (p<.05)	4	+ 4.0 (24)	+ 18.3 % (39)
	Male	36.8 (n/a)	37.7 (+ 0.9)	36.4 (- 1.2)	35.8 (- 0.6)	37.1 (+ 1.3)	40.7 (+ 3.6)	+ 0.4 % n/s			
	Female	8.5 (n/a)	7.4 (- 1.1)	8.2 (+ 0.7)	10.7 (+ 2.6)	11.7 (+ 0.9)	12.0 (+ 0.3)	+ 3.3 % (p<.05)			
NY	Both	7.2 (n/a)	7.1 (- 0.1)	7.7 (+ 0.6)	8.4 (+ 0.8)	9.5 (+ 1.1)	9.3 (- 0.1)	+ 2.1 % (p<.01)	49	+ 2.1 (41)	+ 28.8 % (27)
	Male	12.5 (n/a)	12.2 (- 0.3)	12.9 (+ 0.7)	13.9 (+ 1.0)	15.4 (+ 1.4)	14.5 (- 0.9)	+ 1.4 % (p<.05)			
	Female	2.7 (n/a)	2.6 (- 0.1)	3.0 (+ 0.3)	3.5 (+ 0.5)	4.2 (+ 0.7)	4.6 (+ 0.5)	+ 4.2 % (p<.01)			
NC	Both	13.6 (n/a)	13.5 (- 0.1)	13.7 (+ 0.1)	14.2 (+ 0.5)	14.5 (+ 0.4)	15.3 (+ 0.8)	+ 0.8 % (p<.01)	34	+ 1.7 (44)	+ 12.7 % (47)
	Male	22.7 (n/a)	22.7 (+ 0.0)	22.2 (- 0.6)	23.3 (+ 1.1)	23.3 (+ 0.0)	23.9 (+ 0.6)	+ 0.4 % n/s			
	Female	5.6 (n/a)	5.5 (- 0.2)	6.2 (+ 0.8)	6.0 (- 0.2)	6.7 (+ 0.7)	7.6 (+ 0.9)	+ 2.0 % (p<.05)			
ND	Both	13.3 (n/a)	14.6 (+ 1.3)	16.0 (+ 1.4)	16.6 (+ 0.6)	18.4 (+ 1.9)	20.9 (+ 2.5)	+ 2.9 % (p<.01)	14	+ 7.6 ( 5)	+ 57.6 % ( 1)
	Male	21.4 (n/a)	24.6 (+ 3.2)	28.0 (+ 3.4)	27.1 (- 0.9)	29.6 (+ 2.5)	32.7 (+ 3.0)	+ 2.5 % (p<.01)			
	Female	5.6 (n/a)	4.5 (- 1.0)	3.7 (- 0.8)	5.7 (+ 2.0)	6.7 (+ 1.0)	8.5 (+ 1.8)	+ 3.9 % n/s			
OH	Both	11.6 (n/a)	12.3 (+ 0.8)	13.1 (+ 0.8)	13.4 (+ 0.2)	14.8 (+ 1.4)	15.8 (+ 1.0)	+ 2.0 % (p<.01)	32	+ 4.2 (21)	+ 36.0 % (19)
	Male	20.4 (n/a)	20.9 (+ 0.5)	22.2 (+ 1.3)	22.1 (- 0.1)	24.2 (+ 2.1)	25.5 (+ 1.3)	+ 1.5 % (p<.01)			
	Female	4.0 (n/a)	4.7 (+ 0.7)	4.9 (+ 0.1)	5.3 (+ 0.5)	6.2 (+ 0.9)	6.7 (+ 0.6)	+ 3.4 % (p<.01)			
OK	Both	17.0 (n/a)	16.5 (- 0.6)	17.2 (+ 0.8)	18.4 (+ 1.1)	20.7 (+ 2.3)	23.5 (+ 2.8)	+ 2.3 % (p<.05)	7	+ 6.4 (10)	+ 37.6 % (12)
	Male	28.5 (n/a)	27.3 (- 1.2)	27.8 (+ 0.5)	30.3 (+ 2.5)	33.4 (+ 3.1)	37.3 (+ 3.8)	+ 2.0 % (p<.05)			
	Female	6.6 (n/a)	6.4 (- 0.2)	7.5 (+ 1.1)	7.0 (- 0.5)	8.5 (+ 1.6)	10.3 (+ 1.8)	+ 2.9 % (p<.05)			
OR	Both	16.4 (n/a)	17.7 (+ 1.3)	17.7 (- 0.0)	18.6 (+ 0.9)	19.8 (+ 1.2)	21.1 (+ 1.3)	+ 1.6 % (p<.01)	13	+ 4.6 (18)	+ 28.2 % (28)
	Male	27.4 (n/a)	29.5 (+ 2.1)	28.5 (- 0.9)	29.5 (+ 1.0)	31.4 (+ 1.8)	33.0 (+ 1.6)	+ 1.1 % (p<.01)			
	Female	6.5 (n/a)	7.1 (+ 0.6)	7.7 (+ 0.6)	8.4 (+ 0.7)	8.8 (+ 0.4)	9.8 (+ 0.9)	+ 2.7 % (p<.01)			
PA	Both	12.1 (n/a)	12.5 (+ 0.4)	12.8 (+ 0.3)	13.9 (+ 1.1)	15.0 (+ 1.1)	16.3 (+ 1.2)	+ 2.0 % (p<.01)	30	+ 4.1 (22)	+ 34.3 % (21)
	Male	21.0 (n/a)	21.3 (+ 0.3)	21.9 (+ 0.6)	23.1 (+ 1.2)	24.7 (+ 1.7)	26.1 (+ 1.3)	+ 1.5 % (p<.01)			
	Female	4.2 (n/a)	4.6 (+ 0.3)	4.6 (+ 0.0)	5.4 (+ 0.9)	6.0 (+ 0.6)	7.1 (+ 1.1)	+ 3.5 % (p<.01)			



1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47

Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, National Vital Statistics System, 1999 – 2016											
State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
RI	Both	9.4 (n/a)	9.0 (- 0.3)	9.0 (- 0.0)	12.8 (+ 3.8)	11.9 (- 0.9)	12.6 (+ 0.7)	+ 2.6 % (p<.05)	43	+ 3.2 (30 ¶¶)	+ 34.1 % (23 ¶¶)
	Male	15.4 (n/a)	15.2 (- 0.2)	14.8 (- 0.3)	21.2 (+ 6.4)	19.2 (- 2.0)	19.6 (+ 0.4)	+ 2.2 % n/s			
	Female	4.0 (n/a)	3.3 (- 0.7)	3.8 (+ 0.4)	5.1 (+ 1.3)	5.1 (+ 0.0)	6.1 (+ 1.0)	+ 3.7 % (p<.05)			
SC	Both	12.8 (n/a)	13.0 (+ 0.2)	13.7 (+ 0.7)	14.9 (+ 1.2)	16.0 (+ 1.1)	17.7 (+ 1.7)	+ 2.3 % (p<.01)	23	+ 4.9 (17)	+ 38.3 % (10)
	Male	21.3 (n/a)	22.5 (+ 1.2)	22.3 (- 0.1)	24.6 (+ 2.2)	26.1 (+ 1.5)	28.0 (+ 1.9)	+ 1.8 % (p<.01)			
	Female	5.4 (n/a)	4.7 (- 0.7)	6.0 (+ 1.3)	6.2 (+ 0.2)	7.0 (+ 0.8)	8.4 (+ 1.4)	+ 3.4 % (p<.05)			
SD	Both	15.7 (n/a)	15.8 (+ 0.1)	17.1 (+ 1.3)	19.3 (+ 2.2)	19.7 (+ 0.4)	22.6 (+ 2.9)	+ 2.5 % (p<.01)	10	+ 7.0 ( 7)	+ 44.5 % ( 6)
	Male	27.6 (n/a)	26.3 (- 1.3)	27.9 (+ 1.6)	30.1 (+ 2.2)	32.0 (+ 1.9)	33.6 (+ 1.6)	+ 1.6 % (p<.01)			
	Female	4.2 (n/a)	5.8 (+ 1.6)	6.4 (+ 0.6)	8.3 (+ 2.0)	7.3 (- 1.0)	11.3 (+ 4.0)	+ 5.8 % (p<.01)			
TN	Both	14.6 (n/a)	15.2 (+ 0.6)	16.1 (+ 0.8)	17.2 (+ 1.1)	17.2 (+ 0.0)	18.2 (+ 1.0)	+ 1.4 % (p<.01)	22	+ 3.5 (28)	+ 24.2 % (31)
	Male	25.1 (n/a)	25.4 (+ 0.3)	26.8 (+ 1.3)	28.0 (+ 1.2)	28.6 (+ 0.6)	29.8 (+ 1.2)	+ 1.2 % (p<.01)			
	Female	5.4 (n/a)	6.3 (+ 0.9)	6.7 (+ 0.4)	7.5 (+ 0.8)	6.9 (- 0.6)	7.6 (+ 0.7)	+ 1.9 % (p<.05)			
TX	Both	12.2 (n/a)	12.7 (+ 0.6)	12.3 (- 0.4)	13.2 (+ 0.9)	13.6 (+ 0.3)	14.5 (+ 0.9)	+ 1.1 % (p<.01)	41	+ 2.3 (37)	+ 18.9 % (36)
	Male	20.4 (n/a)	20.9 (+ 0.5)	20.4 (- 0.6)	22.0 (+ 1.6)	22.2 (+ 0.3)	23.1 (+ 0.9)	+ 0.9 % (p<.05)			
	Female	4.8 (n/a)	5.4 (+ 0.6)	5.0 (- 0.4)	5.2 (+ 0.2)	5.6 (+ 0.4)	6.4 (+ 0.8)	+ 1.6 % (p<.05)			
UT	Both	17.2 (n/a)	19.0 (+ 1.8)	18.2 (- 0.7)	20.2 (+ 2.0)	24.0 (+ 3.8)	25.2 (+ 1.2)	+ 2.7 % (p<.01)	5	+ 8.0 ( 3 ¶¶)	+ 46.5 % ( 4 ¶¶)
	Male	28.2 (n/a)	31.1 (+ 2.9)	29.4 (- 1.7)	32.1 (+ 2.7)	37.8 (+ 5.7)	38.0 (+ 0.2)	+ 2.1 % (p<.05)			
	Female	6.8 (n/a)	7.4 (+ 0.6)	7.5 (+ 0.1)	8.5 (+ 1.0)	10.6 (+ 2.1)	12.6 (+ 2.0)	+ 4.4 % (p<.01)			
VT	Both	13.2 (n/a)	16.2 (+ 3.0)	14.9 (- 1.3)	16.6 (+ 1.7)	18.7 (+ 2.1)	19.7 (+ 1.0)	+ 2.4 % (p<.01)	18	+ 6.4 ( 9)	+ 48.6 % ( 2)
	Male	23.6 (n/a)	28.3 (+ 4.6)	24.3 (- 4.0)	27.3 (+ 3.0)	31.0 (+ 3.7)	32.5 (+ 1.5)	+ 1.9 % (p<.05)			
	Female	4.3 (n/a)	5.2 (+ 0.9)	6.4 (+ 1.3)	6.6 (+ 0.2)	7.3 (+ 0.7)	7.6 (+ 0.3)	+ 3.8 % (p<.01)			
VA	Both	12.8 (n/a)	12.7 (- 0.1)	12.9 (+ 0.3)	13.6 (+ 0.7)	14.6 (+ 0.9)	15.0 (+ 0.5)	+ 1.2 % (p<.01)	37	+ 2.2 (39)	+ 17.4 % (41)
	Male	21.6 (n/a)	21.3 (- 0.2)	21.0 (- 0.4)	22.5 (+ 1.5)	23.6 (+ 1.2)	23.9 (+ 0.2)	+ 0.9 % (p<.05)			
	Female	5.3 (n/a)	5.2 (- 0.1)	5.9 (+ 0.7)	5.6 (- 0.3)	6.4 (+ 0.8)	6.9 (+ 0.5)	+ 1.8 % (p<.05)			



**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, National Vital Statistics System, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
WA	Both	14.8 (n/a)	15.4 (+ 0.5)	14.8 (- 0.6)	15.7 (+ 0.9)	16.6 (+ 0.9)	17.6 (+ 1.0)	+ 1.1 % (p<.05)	24	+ 2.8 (33)	+ 18.8 % (37)
	Male	24.7 (n/a)	25.2 (+ 0.5)	24.1 (- 1.1)	25.1 (+ 1.0)	26.0 (+ 0.9)	27.1 (+ 1.1)	+ 0.6 % n/s			
	Female	5.9 (n/a)	6.4 (+ 0.6)	6.2 (- 0.2)	6.9 (+ 0.7)	7.7 (+ 0.8)	8.5 (+ 0.8)	+ 2.5 % (p<.01)			
WV	Both	15.6 (n/a)	17.2 (+ 1.6)	16.7 (- 0.5)	16.0 (- 0.7)	19.2 (+ 3.2)	21.4 (+ 2.2)	+ 1.8 % n/s	11	+ 5.8 (13)	+ 37.1 % (14)
	Male	27.2 (n/a)	30.1 (+ 2.9)	28.6 (- 1.5)	27.6 (- 1.0)	31.5 (+ 3.9)	33.5 (+ 2.0)	+ 1.1 % n/s			
	Female	5.3 (n/a)	5.5 (+ 0.1)	5.8 (+ 0.3)	5.3 (- 0.5)	7.6 (+ 2.3)	9.8 (+ 2.2)	+ 3.7 % n/s			
WI	Both	13.1 (n/a)	13.5 (+ 0.4)	14.0 (+ 0.5)	15.0 (+ 1.0)	15.3 (+ 0.3)	16.5 (+ 1.2)	+ 1.5 % (p<.01)	28	+ 3.4 (29)	+ 25.8 % (30)
	Male	21.7 (n/a)	22.2 (+ 0.5)	22.7 (+ 0.5)	24.0 (+ 1.2)	24.4 (+ 0.4)	25.7 (+ 1.3)	+ 1.1 % (p<.01)			
	Female	5.1 (n/a)	5.3 (+ 0.2)	5.6 (+ 0.4)	6.4 (+ 0.7)	6.5 (+ 0.1)	7.5 (+ 1.0)	+ 2.5 % (p<.01)			
WY	Both	20.7 (n/a)	23.4 (+ 2.7)	22.5 (- 0.9)	25.4 (+ 2.8)	28.9 (+ 3.5)	28.8 (- 0.1)	+ 2.3 % (p<.01)	3	+ 8.1 ( 1)	+ 39.0 % ( 9)
	Male	34.8 (n/a)	39.3 (+ 4.5)	36.3 (- 3.0)	41.5 (+ 5.2)	47.1 (+ 5.6)	44.6 (- 2.4)	+ 1.8 % (p<.05)			
	Female	7.7 (n/a)	8.2 (+ 0.6)	9.2 (+ 0.9)	9.4 (+ 0.2)	10.7 (+ 1.4)	12.6 (+ 1.9)	+ 3.2 % (p<.01)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.



**Table 2. Select Demographic and Descriptive Characteristics of Suicides among Decedents  $\geq 10$  years of age with and without Known Mental Health Problems--National Violent Death Reporting System, 27 states\*, 2015**

Characteristics	Total (n=20,446)	Mental Health Problem <sup>†</sup> (n=9,407)	No Known Mental Health Problem (n=11,039)	Chi- Square	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>  </sup> (95% CI)
<b>Sex</b>						
Male	15,702(76.8)	6,469(68.8)	9,233(83.6)	p<.01	2.3(2.2-2.5)	
Female	4,744(23.2)	2,938(31.2)	1,806(16.4)	p<.01	0.4(0.4-0.5)	
<b>Age**</b>						
10-24	2,804(13.7)	1,211(12.9)	1,593(14.4)	p<.01	1.1(1.1-1.2)	
25-44	6,456(31.6)	3,036(32.3)	3,420(31.0)	p<.05	0.9(0.9-1.0)	
45-64	7,718(37.7)	3,820(40.6)	3,898(35.3)	p<.01	0.8(0.8-0.8)	
65+	3,468(17.0)	1,340(14.2)	2,128(19.3)	p<.01	1.4(1.3-1.5)	
<b>Race/ethnicity</b>						
White, non-Hispanic	17,102(83.6)	8,165(86.8)	8,937(81.0)	p<.01	0.6(0.6-0.7)	
Black, non-Hispanic	1,228(6.0)	411(4.4)	817(7.4)	p<.01	1.7(1.5-2.0)	
American Indian/Alaska Native, non-Hispanic	378(1.8)	112(1.2)	266(2.4)	p<.01	2.0(1.6-2.6)	
Asian, non-Hispanic	576(2.8)	235(2.5)	341(3.1)	p<.05	1.2(1.1-1.5)	
Hispanic	1,096(5.4)	463(4.9)	633(5.7)	p<.05	1.2(1.0-1.3)	
Other	66(0.3)	21(0.2)	45(0.4)	p<.05	1.8(1.1-3.1)	
<b>Extended demographics</b>						
Ever served in military <sup>††</sup>	3,429(17.8)	1,354(15.3)	2,075(20.1)	p<.01	1.4(1.3-1.5)	1.1(1.0-1.1)
Homeless	240(1.2)	104(1.1)	136(1.3)		1.1(0.9-1.5)	1.2(0.9-1.5)
<b>Incident Type</b>						
Single suicide	20,063(98.2)	9,318(99.1)	10,745(97.4)	p<.01	0.3(0.3-0.4)	0.4(0.3-0.5)
Homicide followed by suicide	319(1.6)	64(0.7)	255(2.3)	p<.01	3.5(2.6-4.5)	2.9(2.2-3.8)
Multiple suicides	64(0.3)	25(0.3)	39(0.4)		1.3(0.8-2.2)	1.6(0.9-2.6)
<b>Method</b>						
Firearm	9,909(48.5)	3,821(40.6)	6,088(55.3)	p<.01	1.8(1.7-1.9)	1.6(1.5-1.7)
Hanging/Strangulation/Suffocation	5,907(28.9)	2,940(31.3)	2,967(26.9)	p<.01	0.8(0.8-0.9)	0.8(0.7-0.8)
Poisoning	3,003(14.7)	1,861(19.8)	1,142(10.4)	p<.01	0.5(0.4-0.5)	0.6(0.6-0.7)



Substance class causing death<sup>§§</sup>

Other (e.g., over-the-counter)	1,021(34.0)	666(35.8)	355(31.1)	p<.01	0.8(0.7-0.9)	0.9(0.7-1.0)
Opioids	944(31.4)	608(32.7)	336(29.4)		0.9(0.7-1.0)	0.9(0.8-1.1)
Antidepressants	800(26.6)	644(34.6)	156(13.7)	p<.01	0.3(0.2-0.4)	0.3(0.3-0.4)
Benzodiazepines	624(20.8)	468(25.1)	156(13.7)	p<.01	0.5(0.4-0.6)	0.5(0.4-0.6)
Antipsychotics	219(7.3)	195(10.5)	24(2.1)	p<.01	0.2(0.1-0.3)	0.2(0.1-0.3)
Other	1,595(7.8)	780(8.3)	815(7.4)	p<.05	0.9(0.8-1.0)	0.9(0.8-1.0)

**Toxicology Results**

Any toxicology testing	13,317(65.1)	6,658(70.8)	6,659(60.3)	p<.01	0.6(0.6-0.7)	0.7(0.6-0.7)
<b>Positive for ≥ 1 substance<sup>¶¶</sup></b>	9,913(74.4)	5,192(78.0)	4,721(70.9)	p<.01	0.7(0.6-0.7)	0.8(0.7-0.8)
Substance detected***						
Alcohol						
Tested	10,950(53.6)	5,409(57.5)	5,541(50.2)	p<.01	0.7(0.7-0.8)	0.8(0.7-0.8)
Positive	4,442(40.6)	2,115(39.1)	2,327(42.0)	p<.01	1.1(1.0-1.2)	1.2(1.1-1.3)
Opioids						
Tested	8,554(41.8)	4,258(45.3)	4,296(38.9)	p<.01	0.8(0.7-0.8)	0.8(0.8-0.9)
Positive	2,279(26.6)	1,238(29.1)	1,041(24.2)	p<.01	0.8(0.7-0.9)	0.9(0.8-1.0)
Benzodiazepines						
Tested	8,124(39.7)	4,226(44.9)	3,898(35.3)	p<.01	0.7(0.6-0.7)	0.7(0.7-0.8)
Positive	2,464(30.3)	1,639(38.8)	825(21.2)	p<.01	0.4(0.4-0.5)	0.5(0.5-0.6)
Cocaine						
Tested	7,978(39.0)	3,866(41.1)	4,112(37.2)	p<.01	0.9(0.8-0.9)	0.9(0.9-1.0)
Positive	499(6.3)	216(5.6)	283(6.9)	p<.05	1.2(1.0-1.5)	1.2(1.0-1.5)
Amphetamines						
Tested	7,615(37.2)	3,696(39.3)	3,919(35.5)	p<.01	0.9(0.8-0.9)	0.9(0.8-0.9)
Positive	736(9.7)	376(10.2)	360(9.2)		0.9(0.8-1.0)	1.0(0.8-1.1)
Marijuana						
Tested	6,569(32.1)	3,127(33.2)	3,442(31.2)	p<.01	0.9(0.9-1.0)	0.9(0.9-1.0)
Positive	1,471(22.4)	710(22.7)	761(22.1)		1.0(0.9-1.1)	0.9(0.8-1.0)
Antidepressants						
Tested	5,425(26.5)	3,103(33.0)	2,322(21.0)	p<.01	0.5(0.5-0.6)	0.6(0.6-0.7)
Positive	2,214(40.8)	1,735(55.9)	479(20.6)	p<.01	0.2(0.2-0.2)	0.2(0.2-0.3)

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.



<sup>†</sup> Decedent had been identified as having a current diagnosis of mental health problem in coroner/medical examiner or law enforcement reports.

<sup>§</sup> Odds ratio reflects the risk among those without known mental health problem relative to those with known MHP.

<sup>¶</sup> Logistic regression was used to estimate adjusted odds ratio with 95% CIs after controlling for age, sex, race and ethnicity. Known MHP was used as the reference group.

<sup>\*\*</sup> Decedents were aged 10 years and older, as per standard in the suicide prevention literature.

<sup>††</sup> Denominator is decedents aged 18 years of age and older with reported military service status.

<sup>§§</sup> Denominator is decedents who died by poisoning, including overdose.

<sup>¶¶</sup> Denominator is decedents with any toxicology tested.

<sup>\*\*\*</sup> Denominator for each positive group is the number tested for the substance in that group.

---

For Review Only



**Table 3. Circumstances Preceding Suicide among Decedents  $\geq 10$  years of age with and without Known Mental Health Problems--National Violent Death Reporting System, 27 states\*, 2015**

Characteristics	Total	Mental Health Problem <sup>†</sup>	No Known Mental Health Problem	Chi-Square	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>¶</sup> (95% CI)
Suicide with known circumstances	18,764(91.8)	9,407(100)	9,357(84.8)	p<.01		
<b>Mental Health</b>						
Any Current Diagnosed Mental Health Problem**						
Depression/dysthymia		7,076(75.2)				
Anxiety disorder		1,579(16.8)				
Bipolar disorder		1,431(15.2)				
Schizophrenia		509(5.4)				
PTSD		424(4.5)				
ADD/ADHD		226(2.4)				
Unknown		760(8.1)				
Current depressed mood		3,962(42.1)	3,076(32.9)	p<.01	0.7(0.6-0.7)	0.7(0.6-0.7)
<b>Substance Problems</b>						
Any Current substance problem	5,319(28.3)	2,976(31.6)	2,343(25.0)	p<.01	0.7(0.7-0.8)	0.7(0.7-0.8)
Alcohol problem	3,268(17.4)	1,862(19.8)	1,406(15.0)	p<.01	0.7(0.7-0.8)	0.7(0.7-0.8)
Other substance problem	3,084(16.4)	1,768(18.8)	1,316(14.1)	p<.01	0.7(0.7-0.8)	0.7(0.7-0.8)
<b>Treatment</b>						
Current mental health/substance abuse treatment	5,141(27.4)	5,077(54.0)	64(0.7)	p<.01	0.01(0.01-0.01)	0.01(0.01-0.01)
Ever treated for mental health/substance problem	6,717(35.8)	6,323(67.2)	394(4.2)	p<.01	0.02(0.02-0.02)	0.02(0.02-0.03)
<b>Relationship Problems/Loss</b>						
Any relationship problem/loss	7,948(42.4)	3,726(39.6)	4,222(45.1)	p<.01	1.3(1.2-1.3)	1.3(1.2-1.4)
Intimate partner problem	5,098(27.2)	2,270(24.1)	2,828(30.2)	p<.01	1.4(1.3-1.5)	1.4(1.3-1.5)
Perpetrator of interpersonal violence past month	414(2.2)	131(1.4)	283(3.0)	p<.01	2.2(1.8-2.7)	2.0(1.6-2.4)
Victim of interpersonal violence within past month	84(0.4)	53(0.6)	31(0.3)	p<.05	0.6(0.4-0.9)	0.8(0.5-1.2)
Family relationship problem	1,671(8.9)	873(9.3)	798(8.5)		0.9(0.8-1.0)	1.0(0.9-1.1)
Other relationship problem (non-intimate)	403(2.1)	202(2.1)	201(2.1)		1.0(0.8-1.2)	1.1(0.9-1.3)
Argument or conflict (not specified)	2,914(15.5)	1,278(13.6)	1,636(17.5)	p<.01	1.3(1.2-1.5)	1.4(1.3-1.5)
Death of a loved one (any)	1,497(8.0)	826(8.8)	671(7.2)	p<.01	0.8(0.7-0.9)	0.9(0.8-0.9)



1							
2	Non-suicide death	1,181(6.3)	647(6.9)	534(5.7)	p<.01	0.8(0.7-0.9)	0.9(0.8-1.0)
3	Suicide of family or friend	379(2.0)	217(2.3)	162(1.7)	p<.01	0.7(0.6-0.9)	0.8(0.7-1.0)
4	Other Life Stressors						
5	Any life stressor	9,743(51.9)	4,675(49.7)	5,068(54.2)	p<.01	1.2(1.1-1.3)	1.1(1.1-1.2)
6	Recent criminal legal problem	1,588(8.5)	586(6.2)	1,002(10.7)	p<.01	1.8(1.6-2.0)	1.7(1.5-1.9)
7	Other legal problem	748(4.0)	378(4.0)	370(4.0)		1.0(0.8-1.1)	1.0(0.9-1.2)
8	Physical health problem	4,179(22.3)	2,012(21.4)	2,167(23.2)	p<.01	1.1(1.0-1.2)	1.0(1.0-1.1)
9	Job/Financial problem <sup>††</sup>	2941(16.2)	1530(16.8)	1411(15.6)	p<.05	0.9(0.8-1.0)	0.9(0.8-1.0)
10	Eviction or loss of home	722(3.8)	317(3.4)	405(4.3)	p<.01	1.3(1.1-1.5)	1.4(1.2-1.6)
11	School problem <sup>§§</sup>	162(19.9)	70(17.8)	92(21.9)		1.3(0.9-1.8)	1.3(0.9-1.9)
12	Recent release from an institution <sup>¶¶</sup>	1,412(7.6)	941(10.2)	471(5.1)	p<.01	0.5(0.4-0.5)	0.5(0.4-0.5)
13	Jail/prison/detention facility	203(14.4)	82(8.7)	121(25.7)	p<.01	3.6(2.7-4.9)	4.5(3.2-6.4)
14	Hospital	517(36.6)	311(33.0)	206(43.7)	p<.01	1.6(1.3-2.0)	1.3(1.0-1.7)
15	Psychiatric hospital/institution	469(33.2)	439(46.7)	30(6.4)	p<.01	0.1(0.1-0.1)	0.1(0.1-0.1)
16	Other (includes alc/SA treatment facilities)	223(15.8)	109(11.6)	114(24.2)	p<.01	2.4(1.8-3.3)	2.5(1.8-3.3)
17	Recent or Impending Crisis						
18	Crisis within past or upcoming two weeks***	5,525(29.4)	2,444(26.0)	3,081(32.9)	p<.01	1.4(1.3-1.5)	1.4(1.3-1.5)
19	Intimate partner problem crisis	1968(35.6)	854(34.9)	1114(36.2)		1.1(0.9-1.2)	1.1(0.9-1.2)
20	Physical health problem crisis	739(13.4)	315(12.9)	424(13.8)		1.1(0.9-1.3)	1.0(0.8-1.2)
21	Criminal legal problem crisis	621(11.2)	203(8.3)	418(13.6)	p<.01	1.7(1.5-2.1)	1.6(1.3-1.9)
22	Family relationship problem crisis	430(7.8)	212(8.7)	218(7.1)	p<.05	0.8(0.7-1.0)	0.9(0.7-1.1)
23	Job problem crisis	354(6.4)	191(7.8)	163(5.3)	p<.01	0.7(0.5-0.8)	0.7(0.5-0.8)
24	Suicide Event/History						
25	Left a note	6,468(34.5)	3,182(33.8)	3,286(35.1)		1.1(1.0-1.1)	1.2(1.1-1.2)
26	Disclosed suicide intent	4,405(23.5)	2,306(24.5)	2,099(22.4)	p<.01	0.9(0.8-1.0)	0.9(0.8-0.9)
27	History of ideation	5,990(31.9)	3,838(40.8)	2,152(23.0)	p<.01	0.4(0.4-0.5)	0.4(0.4-0.5)
28	History of attempts	3,732(19.9)	2,770(29.4)	962(10.3)	p<.01	0.3(0.3-0.3)	0.3(0.3-0.3)

\*Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

<sup>†</sup> Decedent had been identified as having a current diagnosis of mental health problem in coroner/medical examiner or law enforcement reports.

<sup>§</sup> Odds ratio reflects the risk among those without known mental health problem relative to those with known MHP.

<sup>¶</sup> Logistic regression was used to estimate adjusted odds ratio with 95% CIs after controlling for age, sex, race and ethnicity. Known MHP was used as the reference group.

<sup>\*\*</sup> Includes decedents with one or more diagnosed current mental health problems, which are not mutually exclusive. Therefore sums of percentages for the diagnosed conditions exceed 100%. Denominator includes the number of decedents with one or more current diagnosed mental health problems.

<sup>††</sup> Denominator is decedents aged 18 years of age and older.

<sup>§§</sup> Denominator is decedents aged 10-18 years.

<sup>\*\*</sup> Denominator of institution subgroup is decedents with recent release from an institution. Recent release from an institution is defined as having occurred within the past month.

<sup>\*\*\*</sup> Denominator of crisis subgroup is decedents with any crisis within past or upcoming two weeks. Crises depicted here represent the most commonly occurring categories.

---





MMWR Author Submission Checklist

Proprietary Considerations	
<input checked="" type="checkbox"/>	Authors acknowledge that if their report is accepted for publication in the <a href="#">Morbidity and Mortality Weekly Report (MMWR)</a> , CDC will commit the report to the public domain and will allow its contents to be used and reprinted without permission. Citation as to source, however, is appreciated.
<input checked="" type="checkbox"/>	To the extent allowed by law, authors agree that they have obtained all appropriate written permissions to allow the submitted report to be published by the United States Government in <i>MMWR</i> and committed to the public domain. This includes written permission from publishers of any copyrighted text boxes, figures or tables that will be reprinted or adapted in an <i>MMWR</i> report.
<input checked="" type="checkbox"/>	Authors agree to obtain appropriate written permissions from any persons identifiable in photographs, case descriptions, or pedigrees for the use of their information and/or image in the report to be published and committed to the public domain.
<input checked="" type="checkbox"/>	Authors agree to obtain appropriate written permissions from persons named in personal communications (oral or written), stating that they agree to be named in the report to be published and committed to the public domain and that the information cited is accurate and (as applicable) retrievable. Such written permissions should be uploaded to <i>MMWR</i> ScholarOne Manuscripts as part of the report submission.
<input checked="" type="checkbox"/>	This report (or one with substantially similar content written by the authors) has not been published and is not being considered for publication elsewhere.
<input checked="" type="checkbox"/>	The <a href="#">Instructions for Authors</a> for <i>MMWR</i> Weekly have been carefully reviewed, with particular attention to Clearance requirements. For reports with CDC authors, <a href="#">Evidence of Clearance</a> has been included with submission. For reports with only non-CDC authors, <i>MMWR</i> will facilitate and confirm clearance by the appropriate CDC center(s) before publication.
<input checked="" type="checkbox"/>	Non-CDC authors have advised the state epidemiologist or the Ministry of Health, as appropriate, of their submission.
<input checked="" type="checkbox"/>	The <a href="#">International Committee of Medical Journal Editors (ICMJE) Conflict of Interest Form</a> has been completed for each author and uploaded to <i>MMWR</i> ScholarOne Manuscripts as part of the submission. All potential conflicts of interest described in the ICMJE form are disclosed in the report's Acknowledgments.
<input checked="" type="checkbox"/>	Authors have disclosed all funding, other financial and material support, and the funder's role (e.g., development of report, analysis and involvement in the publication process) in the report's Acknowledgments.
<input checked="" type="checkbox"/>	Corresponding author is the primary contact for approving the report prior to publication, as well as reviewing, and responding to the comments in the edited drafts and proofs provided by <i>MMWR</i> editors, and responding to CDC Media Relations.



<input checked="" type="checkbox"/>	If errata are identified after publication, the corresponding author will notify <i>MMWR</i> and provide cleared content for publication in a timely manner.
<input checked="" type="checkbox"/>	Corresponding author has ensured that all authors have identified and addressed ethical considerations (e.g., IRB review, disclosure of conflicts, reporting of relevant financial considerations, and review of report to identify possible research misconduct). In general, <i>MMWR</i> follows guidance from the Committee on Publication Ethics (COPE), <a href="#">Guidelines on Good Publication Practice</a> and ICMJE's <a href="#">Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly work in Medical Journals</a> . If you have any questions about ethical considerations or reporting disclosures (conflicts of interest or funding sources/ funder role), please contact the Executive Editor prior to submitting your report.
<b>Authorship and Acknowledgments</b>	
<input checked="" type="checkbox"/>	All authors and contributors meet criteria for <a href="#">CDC Authorship Policy</a> and guidance from <a href="#">ICMJE</a> , and all persons who made substantial contributions to this work but who did not fulfill the authorship criteria are named in the Acknowledgments. <i>MMWR</i> follows <a href="#">U.S. National Library of Medicine</a> guidance for designating authorship and other contributions in MEDLINE.
<input checked="" type="checkbox"/>	Written permission has been obtained and archived from all persons listed in the Acknowledgments that they agree to be named in the report to be published and committed to the public domain.
<input checked="" type="checkbox"/>	Written permission has been obtained and archived from all persons listed as authors of this report that they agree to be named in the report to be published and committed to the public domain.
<input checked="" type="checkbox"/>	All author contact information is up-to-date in <i>MMWR</i> ScholarOne Manuscripts.
<b>Formatting, References, Figures, Word Count, Units of Measure</b>	
<input checked="" type="checkbox"/>	If authors have previously discussed the proposed report with the <i>MMWR</i> editors, this is described in the cover letter.
<input checked="" type="checkbox"/>	Authors have complied with guidance provided in the <a href="#">Instructions for Authors</a> .
<input checked="" type="checkbox"/>	Authors have reviewed recent <a href="#">MMWR Weekly reports</a> on the same or similar topics for basic format and styles.
<input checked="" type="checkbox"/>	The report meets specified word count for the type of report submitted, or the rationale to exceed the word count is provided in the cover letter.
<input checked="" type="checkbox"/>	All pages are double-spaced, numbered, and left justified (ragged right margin).
<input checked="" type="checkbox"/>	All references are cited in the text in sequential order, comply with <a href="#">ICMJE Uniform Requirements</a> , and have been checked for accuracy and completeness. Reference "callouts" in text must be indicated by an italic number in parentheses. Number of references do not exceed the maximum for the type of submission.
	Ex.: "Advances in water management and sanitation have substantially reduced waterborne disease in the United States, although outbreaks continue to occur (1)."



<input checked="" type="checkbox"/>	<p>Author names have been provided in the format shown in the following example. Only the highest academic degrees (not certifications) have been listed, at the master's level or higher. When an author has two degrees at the same level (e.g., MD, PhD, or MS, MPH) both have been listed. Degrees have been followed by a superscripted numeral corresponding to the affiliation. Numerals are listed in sequential order.</p> <p>Ex.: "Karlyn D. Beer, PhD<sup>1,2</sup>; Julia W. Gargano, PhD<sup>2</sup>; Preeta K. Kutty, MD<sup>3</sup>; Elizabeth D. Hilborn, DVM<sup>4</sup>; Jonathan S. Yoder, MPH, MSW<sup>2</sup>"</p>
<input checked="" type="checkbox"/>	<p>Affiliations for authors have been provided in the format shown in the following example. No more than two affiliation sublevels (e.g., division, center) have been listed. The corresponding author is listed in the appropriate location and format.</p> <p>Ex.: "<sup>1</sup>Epidemic Intelligence Service, CDC; <sup>2</sup>Division of Foodborne, Waterborne, and Environmental Diseases, National Center for Emerging and Zoonotic Infectious Diseases, CDC; <sup>3</sup>Division of Bacterial Diseases, National Center for Immunization and Respiratory Diseases, CDC; <sup>4</sup>U.S. Environmental Protection Agency. Corresponding author: Karlyn Beer, kbeer@cdc.gov, 404-718-1151."</p>
<input checked="" type="checkbox"/>	<p>Footnote "callouts" have been indicated in the text with the correct sequential symbols. Footnotes are grouped as "plain text" endnotes beneath the references in the submission. No reference manager or footnote/endnote programs or Word features are included in the submission.</p>
<input checked="" type="checkbox"/>	<p>Tables have been submitted in the formats described in the <a href="#">Instructions for Authors</a>. Tables should be sent in separate files and not embedded in the text.</p>
<input checked="" type="checkbox"/>	<p>In tables, confidence intervals have been headed with (95% CI), and parentheses also placed around each value in the column. Footnote symbols are placed sequentially in the table, beginning with the title and then moving from left to right, row by row in the table.</p>
<input checked="" type="checkbox"/>	<p>Each table and figure has a "complete" title, such that a reader can have a general understanding of what the data represent without reading the text.</p> <p>Ex.: "TABLE 1. Waterborne disease outbreaks associated with drinking water (N = 32), by state/jurisdiction and month of first case onset — Waterborne Disease and Outbreak Surveillance System, United States, 2011–2012"</p>
<input checked="" type="checkbox"/>	<p>Figures have been submitted in the formats described in the <a href="#">Instructions for Authors</a>. Maps have been submitted in one of the proper editable formats.</p>
<input checked="" type="checkbox"/>	<p>For figures, all footnote symbols have been placed in the title. New process requirements do not permit placement of footnote symbols within figures</p>
<input checked="" type="checkbox"/>	<p>The number of figures, tables, and/or boxes included with submission do not exceed the maximum number for the type of submission.</p>

4.25.18

**Vital Signs: ~~Contributing Circumstances to Suicide and Increasing~~ Trends in State Suicide Rates — United States, 1999–2016 and Circumstances Contributing to Suicide — 27 States, 2015**

Deborah M. Stone, ScD<sup>1</sup>; Thomas R. Simon PhD<sup>1</sup>; Katherine A. Fowler, PhD<sup>1</sup>; Scott R. Kegler, PhD<sup>2</sup>; Keming Yuan, MS<sup>1</sup>; Kristin M. Holland, PhD<sup>1</sup>; Asha Z. Ivey-Stephenson, PhD<sup>1</sup>; Alex E. Crosby, MD<sup>1</sup>

**Background:** Suicide rates in the United States have risen nearly 30% since 1999, ~~and m-~~ Mental health problems ~~(MHP)~~ are just one factor contributing to suicide. Examining state-level trends in, and the multiple ~~contributing~~ circumstances ~~contributing~~ to, suicide can inform comprehensive state suicide prevention planning.

**Methods:** Trends in age-adjusted suicide rates among persons aged  $\geq 10$  years, by state and sex, across six consecutive three-year periods (1999–2016), were assessed using data from the National Vital Statistics System for 50 states and ~~the District of Columbia (DC) Washington, D.C.~~ Data from the National Violent Death Reporting System, covering 27 states in 2015, were used to examine contributing circumstances among decedents with and without known mental health problems ~~(MHP)~~.

**Results:** ~~From During~~ 1999–2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases of more than 30%. Rates increased significantly among males and females in 34 and 43 states, respectively. In 2015, more than half (54%) of decedents in 27 states did not have a known ~~MHP~~ mental health problem. Among persons with circumstance information, several circumstances ~~were significantly more likely among those without a known mental health problems than among decedents with mental health problems~~, including relationship problems/loss (45.1% vs 39.6%), life stressors (54.2% vs 49.7%), and recent/impending crises (32.9% vs 26.0%) ~~were~~



1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

4.25.18

~~significantly more likely among those without a known MHP than decedents with MHP~~, but ~~these~~  
~~circumstances~~ were common across groups.

**Conclusions:** Suicide rates increased significantly across most states ~~from during~~ 1999–2016.

Various circumstances contributed to suicides among persons with and without known ~~MHP~~mental  
health problems.

**Implications for Public Health Practice:** States can use a comprehensive evidence-based public  
health approach to prevent suicide risk before it occurs, identify and support persons at risk, prevent  
re-attempts, and help friends/family after a suicide occurs.

INTRODUCTION

BACKGROUND AND PURPOSE

In 2016, nearly 45,000 suicides (15.6/100,000 population [age-adjusted]) occurred in the United  
States ~~(U.S.)~~, among persons aged ≥10 years ~~old~~ (1). Between 1999 and 2015, suicide rates increased  
~~among both across~~ sexes, all racial/ethnic groups, and all urbanization levels (2,3). Suicide is the 10<sup>th</sup>  
leading cause of death and is one of just three leading causes that are increasing (1,4). Additionally,  
rates of emergency department visits for nonfatal self-harm, a key risk factor for suicide, increased  
nearly 45% between 2001 and 2015 (1). Together, suicides and self-harm injuries cost the nation  
more than \$69 billion in direct medical and work loss costs (1).

The *National Strategy for Suicide Prevention* (NSSP) (5) calls for a public health approach to suicide  
prevention with efforts spanning ~~across~~ multiple levels (i.e., individual, family/relationship,  
community, and societal). Such a comprehensive approach underscores that suicide is rarely caused  
by any single factor, but rather, is determined by multiple factors ~~determined~~. Despite the NSSP  
guidance, suicide prevention largely focuses on identifying suicidal persons, providing treatment for  
mental health problems ~~(MHP)~~ and preventing re-attempts (6). In addition to ~~MHP~~mental health

Formatted: Font: Not Italic

4.25.18

problems and prior attempts, other contributing circumstances contributing to suicide include social and economic problems, access to lethal means (e.g., substances, firearms) among persons at risk, and poor coping and problem-solving skills (5). Expanded awareness of these additional circumstances contributing to suicide risk and action to address them can help reach the nation's goal of reducing suicide rates 20% by 2025 (7). To assist states in achieving this goal, this study analyzed CDC analyzed state-specific trends in suicide rates, assessed the multiple contributing factors to suicide, and presents options for multi-level comprehensive suicide prevention based on the best available evidence.

## METHODS

Suicide rates were analyzed for persons aged  $\geq 10$  years only, as determining suicidal intent in younger children can be difficult (8). Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases 10<sup>th</sup> Revision*, underlying-cause-of death codes X60–X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods spanning 1999–2016 (1999–2001, 2002–2004, 2005–2007, 2008–2010, 2011–2013, and 2014–2016). Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Formatted: Left



1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

4.25.18

Characteristics and circumstances of ~~suicide decedents~~persons aged  $\geq 10$  years who died by suicide ~~old~~, with and without known ~~MHP~~mental health problems, were compared in the 27 states with complete data participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines ~~MHP~~mental health problems as disorders and syndromes listed in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (9), with the exception of alcohol and other substance dependence, which are captured separately in NVDRS. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known ~~MHP~~mental health problems were compared using Chi-square tests. Logistic regression analyses estimated adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and race/ethnicity.

RESULTS

The most recent overall suicide rates (representing 2014–2016) varied four-fold, from 6.9 (D.C.) to 29.2 (Montana) per 100,000 persons per year (Table 1). Across the study period, rates increased in all states, except Nevada (which had a consistently high rate throughout), with absolute increases ranging from +0.8 ~~per 100,000~~ (Delaware) to +8.1 (Wyoming) ~~per 100,000~~. Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with increases of more than 30% observed in 25 states (Table 1) ~~(, Figure 1)~~.

Modeled suicide rate trends indicated significant increases ~~for in~~ 44 states, ~~for among~~ males (34 states) and females (43 states), as well as for the ~~United States~~ overall (Table 1). Nationally, the model-estimated AAPC for the overall suicide rate was +1.5%. By sex, estimated national rate trends further indicated significant increases for males (AAPC +1.1%) and females (AAPC +2.6%).

Suicide decedents without known ~~MHP~~mental health problems ( $N=11,039$ ) were compared ~~to~~ with those with known mental health problems ( $N=9,407$ ) in 27 states. ~~Whereas~~ all

**Comment [GJ(1):** Suggest including this table in CDC Stacks with a link; it is 7 pages long and too long for an MMWR report. That would change your current table 2 to table 1 and your current table 3 to table 2.

4.25.18

decedents were predominately male (76.8%) (Table 2; 76.8%) and non-Hispanic white (83.6%), those without known ~~MHP~~mental health problems, relative to those with ~~MHP~~mental health problems, were more likely male (83.6% ~~versus~~ 68.8%; odds ratio (OR) = 2.3, 95% CI = 2.2–2.5) and racial/ethnic minorities (OR range: 1.2–2.0). Suicide decedents without known ~~MHP~~mental health problems also had significantly ~~greater~~ higher odds of perpetrating homicide-suicide (adjusted odds ratio (aOR) = 2.9, 95% CI = 2.2–3.8). Among adult decedents, 20.1% of those without known ~~MHP~~mental health problems and 15.3% of those with ~~MHP~~mental health problems had ever served, or were currently serving, in the U.S. military.

Comment [GJ(2): ?aged ≥18 years?]

~~While-Whereas~~ firearms were the most common method of suicide ~~used~~ overall (48.5%) and for decedents with and without mental health problems ~~both groups~~, decedents without known ~~MHP~~mental health problems were more likely to die by firearm (55.3% ~~versus~~ 40.6%) and less likely to die by hanging/strangulation/suffocation (26.9% ~~versus~~ 31.3%) or poisoning (10.4% ~~versus~~ 19.8%) than ~~were~~ those with known ~~MHP~~mental health problems. These differences remained significant in the adjusted models.

Decedents without known ~~MHP~~mental health problems were less likely to receive toxicology testing. Among those with toxicology results, decedents without known ~~MHP~~mental health problems were less likely to test positive for any substance overall (aOR = 0.8, 95% CI = 0.7–0.8), ~~such as including~~ opioids (aOR = 0.90 95% CI = 0.81–0.99), but ~~were~~ more likely to test positive for alcohol (aOR = 1.2, 95% CI = 1.1–1.3).

~~Information on circumstances surrounding suicide were available for a-~~All suicide decedents with ~~MHP~~mental health problems (N = 9,407) and approximately 85% of those without known ~~MHP~~mental health problems (N = 9,357) ~~had available circumstances information~~ (Table 3).

Persons without known ~~MHP~~mental health problems were less likely to have any substance abuse



1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

4.25.18

problems (aOR= 0.7, 95% CI= 0.7–0.8). Whereas two thirds of those decedents with known MHPmental health problems had a history of mental health or substance abuse treatment (67.2%), just over half (54.0%) were in current treatment.

Decedents without, versus those with, known MHPmental health problems, had a significantly greater-higher likelihood of any relationship problem/loss (45.1%) than did those with known mental healthproblems (-vs- 39.6%), specifically intimate partner problems (30.2% versus: 24.1%), arguments/conflicts (17.5% versus: 13.6%), and recently perpetrating interpersonal violence (3.0% versus: 1.4%). Decedents without known mental health problems They also were also more likely than those without known mental health problems to have experienced any life stressors (54.2% versus 49.7%); such as criminal-legal problems (10.7% versus: 6.2%); or eviction/loss of home (4.3% versus: 3.4%) and were more likely to have had a crisis within the preceding or upcoming two weeks (32.9% versus: 26.0%). All of these differences remained significant in the adjusted models.

Among all persons with recent crises, intimate partner problems were the most common types and did not differ by group. Similarly, physical health problems and job/financial problems were commonly experienced among both persons without versus with MHPmental health problems (23.2% and 15.6%, respectively) and those with mental health problems, physical health problems (23.2% and 21.4%) and job/financial problems (15.6% and and -16.8%, respectively) were commonly experienced by both groups.

Decedents without known MHPmental health problems had significantly lower odds of recent release from any institution (aOR= 0.5, 95% CI= 0.4–0.5), but among those who were recently released (5.1%), they were significantly more likely to have been released from a correctional facility (25.7% vs-versus 8.7%), hospital (43.7% vs-versus 33.0%), or other facility (e.g., alcohol/substance treatment) (aOR= 2.5 95% CI= 1.8–3.3), than those with a known MHPmental health

Comment [GJ(3)]: How is this defined?

Comment [GJ(4)]: Unclear what this means, if they were already dead. Do you mean an impending crisis?

4.25.18

problems. Among decedents with known MHPmental health problems who were recently released from an institution (10.2%), 46.7% of this group were released from psychiatric facilities.

Decedents without known MHPmental health problems; compared to those with MHP, were significantly less likely to have a history of suicidal ideation (23.0%) or prior suicide attempts (10.3%) compared with those with known mental health problems (-vs. 40.8% and 29.4%, respectively) and prior suicide attempts (10.3% vs. 29.4%). Suicide intent was disclosed by 22.4% and 24.5% of More than one in five persons without and with known mental health problems, respectively in both groups disclosed suicide intent (22.4% vs. 24.5%).

#### Conclusions and Comments

From During 1999–2016, suicide rates increased significantly in 44 states, and saw significant increases in suicide rates and 25 states experienced substantial increases in suicide rates of more than 30%. Rates increased significantly among males; in 34 states, and females, in 43 states. This finding is consistent with prior research showing a decreasing gender gap in male-female suicide rates between during 1999–2014 (3). Additional research into the specific causes of these trends is necessary. Fortunately, data from the 27 states participating in NVDRS provides important insight into circumstances surrounding suicide circumstances and can help states identify prevention priorities.

Suicidologists regularly state that suicide is not caused by a single factor; (5); however, suicide prevention is often oriented towards downstream identification of suicidal persons, treatment of MHPmental health problems and prevention of reattempts. This study found that more than half of suicide decedents in NVDRS did not have a known mental health problems, indicating that aAdditional focus on non-mental health factors, further upstream, is essential to a public health approach (10); as the current study found that more than half of suicide decedents in NVDRS did



4.25.18

~~not have a known MHP~~. This group suffered more from relationship problems and other life stressors such as criminal-legal matters, eviction/loss of home, and recent or impending crises.

Similarly, persons with ~~MHP~~mental health problems often experienced relationship problems and other life stressors such as job/financial and/or physical health problems. These findings point to the need to both help persons manage the conditions associated with mental health problems in the first place, and to support persons with known ~~MHP~~mental health problems to decrease their risk of poor outcomes (11). Two thirds of this group had a history of any mental health and/or substance abuse treatment, with over half in treatment when they died. This suggests the need for additional safety supports, including broader implementation of affordable and effective treatment modalities such as doctor-patient collaborative care models and proven cognitive-behavioral therapies.

Additionally, ~~greater~~increased access to behavioral health providers in underserved areas is needed, as is expansion of health care systems ~~needed~~ that integrates physical and behavioral health, with a priority on suicide prevention and patient safety, especially through care transitions (12).

Comprehensive statewide suicide prevention activities are needed to address the full range of factors contributing to suicide. Prevention strategies include: strengthening economic supports (e.g., housing stabilization policies, household financial support); teaching coping and problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in life; promoting social connectedness to increase a sense of belonging~~ness~~ and access to informational, tangible, emotional, and social support; and identifying and better supporting persons at risk (e.g., ~~military v~~veterans, persons with physical/mental health problems) (12). Other strategies include creating protective environments (e.g., reducing access to lethal means among persons at risk, creating organizational and workplace policies to promote help-seeking, easing transitions into and out of work for persons with ~~MHP~~mental health problems and other life challenges), supporting family and friends after a suicide, and assuring safe reporting by the media in order to prevent

Formatted: Font: Not Italic

4.25.18

suicide contagion (12). Some states, such as Colorado, are planning to implement such a comprehensive approach to suicide prevention (10).

Formatted: Font: Italic

The ~~se~~ findings in this report are subject to ~~have~~ at least three limitations. In the state-level analysis, rankings for four states (~~Maryland, Massachusetts, Rhode Island, and Utah~~, MA, RI, UT) might have been ~~impacted-affected~~ by large proportions of injury deaths of undetermined intent (potentially biasing reported suicide rates downward), or decreased percentages of such deaths over time (potentially biasing estimated rate trends upward). Second, NVDRS is not yet nationally representative; the 27 states included represent 49.6% of the population

(<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml>).

~~Third~~Finally, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the extent of informant knowledge can ~~impact-affect~~ data completeness and accuracy. Studies including more in-depth interviews with next-of-kin often ~~see-identify~~ greater attributions to mental disorders (13); however, many methodological variations across studies exist (14). It is likely that some persons without known ~~MHP~~mental health problems in the current study were experiencing mental health challenges that were unknown, and hence underreported by key informants. Nonetheless, the high prevalence of diverse contributing circumstances among those with and without known ~~MHP~~mental health problems suggests the importance of addressing the broad range of factors that contribute to suicide.

Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are available. States and communities can use data from NVDRS and resources such as CDC's *Preventing Suicide: a Technical Package of Policies, Programs, and Practices* (12) to better understand their suicide problem, prioritize evidence-based comprehensive suicide prevention, and save lives.

#### Acknowledgments



1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

4.25.18

Robert Anderson, Holly Hedegaard, and Margaret Warner, Division of Vital Statistics, National Center for Health Statistics, CDC.

**Conflict of Interest** No conflicts of interest were reported.

<sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC;

<sup>2</sup>Division of Analysis, Research, and Practice Integration, National Center for Injury Prevention and Control, CDC. Corresponding author: Deborah M. Stone, dstone3@cdc.gov , 770-488-3942

**References:**

- Centers for Disease Control and Prevention. Web-based Injury Statistics Query and Reporting System (WISQARS). Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018. In.
- Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide Trends Among and Within Urbanization Levels by Sex, Race/Ethnicity, Age Group, and Mechanism of Death—United States, 2001–2015. *MMWR Surveill Summ* 2017;66:1–16.
- Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999–2014. In: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics Hyattsville, MD; 2016.
- Kochanek K, Murphy S, Xu J, Arias E. Mortality in the United States, 2016. NCHS Data Brief, no 293. National Center for Health Statistics 2017.
- Office of the Surgeon General, National Action Alliance for Suicide Prevention. 2012 National strategy for suicide prevention: Goals and objectives for action: a report of the US Surgeon General and of the National Action Alliance for Suicide Prevention. 2012.

4.25.18

6. Zalsman G, Hawton K, Wasserman D, et al. Suicide prevention strategies revisited: 10-year systematic review. *Lancet Psychiatry* 2016;3:646–59.
7. Torguson K, O'Brien A. Leading Suicide Prevention Efforts Unite to Address Rising National Suicide Rate. In. Washington, D.C.; 2017.
8. Crepeau-Hobson F. The psychological autopsy and determination of child suicides: a survey of medical examiners. *Arch Suicide Res* 2010;14:24–34.
9. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5®): American Psychiatric Pub; 2013.
10. Caine ED, Reed J, Hindman J, Quinlan K. Comprehensive, integrated approaches to suicide prevention: practical guidance. *Inj Prev* 2017;injuryprev-2017-042366.
11. World Health Organization. Risks to mental health: An overview of vulnerabilities and risk factors. Geneva: WHO 2012.
12. Stone DM, Holland KM, Bartholow BN, Crosby AE, Davis SP, Wilkins N. Preventing suicide: A technical package of policies, programs, and practice. 2017.
13. Milner A, Svetcic J, De Leo D. Suicide in the absence of mental disorder? A review of psychological autopsy studies across countries. *Int J Soc Psychiatry* 2013;59:545–54.
14. Pouliot L, De Leo D. Critical issues in psychological autopsy studies. *Suicide Life Threat Behav* 2006;36:491–510.

**Comment [GJ(5)]:** Vital Signs reports now require a summary box like other MMWR full reports. The summary should address, in 100 words or less (not counting headings), the following 3 questions:

1. What is already known about this topic?
2. What is added by this report?
3. What are the implications for public health practice?



TABLE 2. Select demographic and descriptive characteristics of suicides aged ≥10 years with and without known mental health problems — National Violent Death Reporting System, 27 states,\* 2015

Characteristics	Total (n = 20,446)	Known mental health problem† (n = 9,407)	No known mental health problem (n = 11,039)	Chi-Square	OR§ (95% CI)	Adjusted OR¶ (95% CI)
<b>Sex</b>						
Male	15,702 (76.8)	6,469 (68.8)	9,233 (83.6)	p<0.01	2.3 (2.2–2.5)	—
Female	4,744 (23.2)	2,938 (31.2)	1,806 (16.4)	p<0.01	0.4 (0.4–0.5)	—
<b>Age (yrs)**</b>						
10–24	2,804 (13.7)	1,211 (12.9)	1,593 (14.4)	p<0.01	1.1 (1.1–1.2)	—
25–44	6,456 (31.6)	3,036 (32.3)	3,420 (31.0)	p<0.05	0.9 (0.9–1.0)	—
45–64	7,718 (37.7)	3,820 (40.6)	3,898 (35.3)	p<0.01	0.8 (0.8–0.8)	—
≥65	3,468 (17.0)	1,340 (14.2)	2,128 (19.3)	p<0.01	1.4 (1.3–1.5)	—
<b>Race/ethnicity</b>						
White, non-Hispanic	17,102 (83.6)	8,165 (86.8)	8,937 (81.0)	p<0.01	0.6 (0.6–0.7)	—
Black, non-Hispanic	1,228 (6.0)	411 (4.4)	817 (7.4)	p<0.01	1.7 (1.5–2.0)	—
American Indian/Alaska Native, non-Hispanic	378 (1.8)	112 (1.2)	266 (2.4)	p<0.01	2.0 (1.6–2.6)	—
Asian, non-Hispanic	576 (2.8)	235 (2.5)	341 (3.1)	p<0.05	1.2 (1.1–1.5)	—
Hispanic	1,096 (5.4)	463 (4.9)	633 (5.7)	p<0.05	1.2 (1.0–1.3)	—
Other	66 (0.3)	21 (0.2)	45 (0.4)	p<0.05	1.8 (1.1–3.1)	—
<b>Extended demographics</b>						
Ever served in military††	3,429 (17.8)	1,354 (15.3)	2,075 (20.1)	p<0.01	1.4 (1.3–1.5)	1.1 (1.0–1.1)
Homeless	240 (1.2)	104 (1.1)	136 (1.3)		1.1 (0.9–1.5)	1.2 (0.9–1.5)
<b>Incident Type</b>						
Single suicide	20,063 (98.2)	9,318 (99.1)	10,745 (97.4)	p<0.01	0.3 (0.3–0.4)	0.4 (0.3–0.5)
Homicide followed by suicide	319 (1.6)	64 (0.7)	255 (2.3)	p<0.01	3.5 (2.6–4.5)	2.9 (2.2–3.8)
Multiple suicides	64 (0.3)	25 (0.3)	39 (0.4)	—	1.3 (0.8–2.2)	1.6 (0.9–2.6)
<b>Method</b>						
Firearm	9,909 (48.5)	3,821 (40.6)	6,088 (55.3)	p<0.01	1.8 (1.7–1.9)	1.6 (1.5–1.7)
Hanging/Strangulation/Suffocation	5,907 (28.9)	2,940 (31.3)	2,967 (26.9)	p<0.01	0.8 (0.8–0.9)	0.8 (0.7–0.8)
Poisoning	3,003 (14.7)	1,861 (19.8)	1,142 (10.4)	p<0.01	0.5 (0.4–0.5)	0.6 (0.6–0.7)
<b>Substance class causing death§§</b>						
Other (e.g., over-the-counter)	1,021 (34.0)	666 (35.8)	355 (31.1)	p<0.01	0.8 (0.7–0.9)	0.9 (0.7–1.0)
Opioids	944 (31.4)	608 (32.7)	336 (29.4)	—	0.9 (0.7–1.0)	0.9 (0.8–1.1)
Antidepressants	800 (26.6)	644 (34.6)	156 (13.7)	p<0.01	0.3 (0.2–0.4)	0.3 (0.3–0.4)
Benzodiazepines	624 (20.8)	468 (25.1)	156 (13.7)	p<0.01	0.5 (0.4–0.6)	0.5 (0.4–0.6)
Antipsychotics	219 (7.3)	195 (10.5)	24 (2.1)	p<0.01	0.2 (0.1–0.3)	0.2 (0.1–0.3)
Other	1,595 (7.8)	780 (8.3)	815 (7.4)	p<0.05	0.9 (0.8–1.0)	0.9 (0.8–1.0)
<b>Toxicology Results</b>						
Any toxicology testing	13,317 (65.1)	6,658 (70.8)	6,659 (60.3)	p<0.01	0.6 (0.6–0.7)	0.7 (0.6–0.7)
Positive for ≥1 substance¶¶	9,913 (74.4)	5,192 (78.0)	4,721 (70.9)	p<0.01	0.7 (0.6–0.7)	0.8 (0.7–0.8)
<b>Substance detected***</b>						
Alcohol						
Tested	10,950 (53.6)	5,409 (57.5)	5,541 (50.2)	p<0.01	0.7 (0.7–0.8)	0.8 (0.7–0.8)
Positive	4,442 (40.6)	2,115 (39.1)	2,327 (42.0)	p<0.01	1.1 (1.0–1.2)	1.2 (1.1–1.3)
Opioids						
Tested	8,554 (41.8)	4,258 (45.3)	4,296 (38.9)	p<0.01	0.8 (0.7–0.8)	0.8 (0.8–0.9)
Positive	2,279 (26.6)	1,238 (29.1)	1,041 (24.2)	p<0.01	0.8 (0.7–0.9)	0.9 (0.8–1.0)
Benzodiazepines						
Tested	8,124 (39.7)	4,226 (44.9)	3,898 (35.3)	p<0.01	0.7 (0.6–0.7)	0.7 (0.7–0.8)
Positive	2,464 (30.3)	1,639 (38.8)	825 (21.2)	p<0.01	0.4 (0.4–0.5)	0.5 (0.5–0.6)
Cocaine						
Tested	7,978 (39.0)	3,866 (41.1)	4,112 (37.2)	p<0.01	0.9 (0.8–0.9)	0.9 (0.9–1.0)
Positive	499 (6.3)	216 (5.6)	283 (6.9)	p<0.05	1.2 (1.0–1.5)	1.2 (1.0–1.5)
Amphetamines						
Tested	7,615 (37.2)	3,696 (39.3)	3,919 (35.5)	p<0.01	0.9 (0.8–0.9)	0.9 (0.8–0.9)
Positive	736 (9.7)	376 (10.2)	360 (9.2)	—	0.9 (0.8–1.0)	1.0 (0.8–1.1)
Marijuana						
Tested	6,569 (32.1)	3,127 (33.2)	3,442 (31.2)	p<0.01	0.9 (0.9–1.0)	0.9 (0.9–1.0)
Positive	1,471 (22.4)	710 (22.7)	761 (22.1)	—	1.0 (0.9–1.1)	0.9 (0.8–1.0)
Antidepressants						
Tested	5,425 (26.5)	3,103 (33.0)	2,322 (21.0)	p<0.01	0.5 (0.5–0.6)	0.6 (0.6–0.7)
Positive	2,214 (40.8)	1,735 (55.9)	479 (20.6)	p<0.01	0.2 (0.2–0.2)	0.2 (0.2–0.3)

Abbreviation: CI = confidence interval.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

<sup>†</sup> Decedent had been identified as having a current diagnosis of mental health problem in coroner/medical examiner or law enforcement reports.

<sup>§</sup> Odds ratio reflects the risk among those without known mental health problem relative to those with known mental health problem.

<sup>¶</sup> Logistic regression was used to estimate adjusted odds ratio with 95% CIs after controlling for age, sex, race and ethnicity. Known mental health problem was used as the reference group.

<sup>\*\*</sup> Decedents were aged  $\geq 10$  years, as per standard in the suicide prevention literature.

<sup>††</sup> Denominator is decedents aged  $\geq 18$  years with reported military service status.

<sup>§§</sup> Denominator is decedents who died by poisoning, including overdose.

<sup>¶¶</sup> Denominator is decedents with any toxicology tested.

<sup>\*\*\*</sup> Denominator for each positive group is the number tested for the substance in that group.



TABLE 3. Circumstances Preceding Suicide among Decedents Aged >10 years with and without known mental health problems — National Violent Death Reporting System, 27 states,\* 2015

Characteristics	Total	Known mental health problem†, no. (%)	No known mental health problem, no. (%)	Chi-Square	OR‡ (95% CI)	Adjusted OR‡ (95% CI)
Suicide with known circumstances	18,764 (91.8)	9,407 (100)	9,357 (84.8)	p<0.01	—	—
<b>Mental Health</b>						
Any Current Diagnosed Mental Health Problem**						
Depression/dysthymia		7,076 (75.2)	—	—	—	—
Anxiety disorder		1,579 (16.8)	—	—	—	—
Bipolar disorder		1,431 (15.2)	—	—	—	—
Schizophrenia		509 (5.4)	—	—	—	—
PTSD		424 (4.5)	—	—	—	—
ADD/ADHD		226 (2.4)	—	—	—	—
Unknown		760 (8.1)	—	—	—	—
Current depressed mood		3,962 (42.1)	3,076 (32.9)	p<0.01	0.7 (0.6–0.7)	0.7 (0.6–0.7)
<b>Substance Problems</b>						
Any Current substance problem	5,319 (28.3)	2,976 (31.6)	2,343 (25.0)	p<0.01	0.7 (0.7–0.8)	0.7 (0.7–0.8)
Alcohol problem	3,268 (17.4)	1,862 (19.8)	1,406 (15.0)	p<0.01	0.7 (0.7–0.8)	0.7 (0.7–0.8)
Other substance problem	3,084 (16.4)	1,768 (18.8)	1,316 (14.1)	p<0.01	0.7 (0.7–0.8)	0.7 (0.7–0.8)
<b>Treatment</b>						
Current mental health/substance abuse treatment	5,141 (27.4)	5,077 (54.0)	64 (0.7)	p<0.01	0.01 (0.01–0.01)	0.01 (0.01–0.01)
Ever treated for mental health/substance problem	6,717 (35.8)	6,323 (67.2)	394 (4.2)	p<0.01	0.02 (0.02–0.02)	0.02 (0.02–0.03)
<b>Relationship Problems/Loss</b>						
Any relationship problem/loss	7,948 (42.4)	3,726 (39.6)	4,222 (45.1)	p<0.01	1.3 (1.2–1.3)	1.3 (1.2–1.4)
Intimate partner problem	5,098 (27.2)	2,270 (24.1)	2,828 (30.2)	p<0.01	1.4 (1.3–1.5)	1.4 (1.3–1.5)
Perpetrator of interpersonal violence in past month	414 (2.2)	131 (1.4)	283 (3.0)	p<0.01	2.2 (1.8–2.7)	2.0 (1.6–2.4)
Victim of interpersonal violence in past month	84 (0.4)	53 (0.6)	31 (0.3)	p<0.05	0.6 (0.4–0.9)	0.8 (0.5–1.2)
Family relationship problem	1,671 (8.9)	873 (9.3)	798 (8.5)	—	0.9 (0.8–1.0)	1.0 (0.9–1.1)
Other relationship problem (non-intimate)	403 (2.1)	202 (2.1)	201 (2.1)	—	1.0 (0.8–1.2)	1.1 (0.9–1.3)
Argument or conflict (not specified)	2,914 (15.5)	1,278 (13.6)	1,636 (17.5)	p<0.01	1.3 (1.2–1.5)	1.4 (1.3–1.5)
<b>Death of a loved one (any)</b>	1,497 (8.0)	826 (8.8)	671 (7.2)	p<0.01	0.8 (0.7–0.9)	0.9 (0.8–0.9)
Non-suicide death	1,181 (6.3)	647 (6.9)	534 (5.7)	p<0.01	0.8 (0.7–0.9)	0.9 (0.8–1.0)
Suicide of family or friend	379 (2.0)	217 (2.3)	162 (1.7)	p<0.01	0.7 (0.6–0.9)	0.8 (0.7–1.0)
<b>Other Life Stressors</b>						
Any life stressor	9,743 (51.9)	4,675 (49.7)	5,068 (54.2)	p<0.01	1.2 (1.1–1.3)	1.1 (1.1–1.2)
Recent criminal legal problem	1,588 (8.5)	586 (6.2)	1,002 (10.7)	p<0.01	1.8 (1.6–2.0)	1.7 (1.5–1.9)
Other legal problem	748 (4.0)	378 (4.0)	370 (4.0)	—	1.0 (0.8–1.1)	1.0 (0.9–1.2)
Physical health problem	4,179 (22.3)	2,012 (21.4)	2,167 (23.2)	p<0.01	1.1 (1.0–1.2)	1.0 (1.0–1.1)
Job/Financial problem††	2941 (16.2)	1530 (16.8)	1411 (15.6)	p<0.05	0.9 (0.8–1.0)	0.9 (0.8–1.0)
Eviction or loss of home	722 (3.8)	317 (3.4)	405 (4.3)	p<0.01	1.3 (1.1–1.5)	1.4 (1.2–1.6)
School problem§§	162 (19.9)	70 (17.8)	92 (21.9)	—	1.3 (0.9–1.8)	1.3 (0.9–1.9)
Recent release from an institution¶¶	1,412 (7.6)	941 (10.2)	471 (5.1)	p<0.01	0.5 (0.4–0.5)	0.5 (0.4–0.5)
Jail/prison/detention facility	203 (14.4)	82 (8.7)	121 (25.7)	p<0.01	3.6 (2.7–4.9)	4.5 (3.2–6.4)
Hospital	517 (36.6)	311 (33.0)	206 (43.7)	p<0.01	1.6 (1.3–2.0)	1.3 (1.0–1.7)
Psychiatric hospital/institution	469 (33.2)	439 (46.7)	30 (6.4)	p<0.01	0.1 (0.1–0.1)	0.1 (0.1–0.1)
Other (includes alcohol/SA treatment facilities)	223 (15.8)	109 (11.6)	114 (24.2)	p<0.01	2.4 (1.8–3.3)	2.5 (1.8–3.3)
<b>Recent or Impending Crisis</b>						
Crisis within past or upcoming 2 weeks***	5,525 (29.4)	2,444 (26.0)	3,081 (32.9)	p<0.01	1.4 (1.3–1.5)	1.4 (1.3–1.5)
Intimate partner problem crisis	1968 (35.6)	854 (34.9)	1114 (36.2)	—	1.1 (0.9–1.2)	1.1 (0.9–1.2)
Physical health problem crisis	739 (13.4)	315 (12.9)	424 (13.8)	—	1.1 (0.9–1.3)	1.0 (0.8–1.2)
Criminal legal problem crisis	621 (11.2)	203 (8.3)	418 (13.6)	p<0.01	1.7 (1.5–2.1)	1.6 (1.3–1.9)
Family relationship problem crisis	430 (7.8)	212 (8.7)	218 (7.1)	p<0.05	0.8 (0.7–1.0)	0.9 (0.7–1.1)
Job problem crisis	354 (6.4)	191 (7.8)	163 (5.3)	p<0.01	0.7 (0.5–0.8)	0.7 (0.5–0.8)
<b>Suicide Event/History</b>						
Left a note	6,468 (34.5)	3,182 (33.8)	3,286 (35.1)	—	1.1 (1.0–1.1)	1.2 (1.1–1.2)
Disclosed suicide intent	4,405 (23.5)	2,306 (24.5)	2,099 (22.4)	p<0.01	0.9 (0.8–1.0)	0.9 (0.8–0.9)
History of ideation	5,990 (31.9)	3,838 (40.8)	2,152 (23.0)	p<0.01	0.4 (0.4–0.5)	0.4 (0.4–0.5)
History of attempts	3,732 (19.9)	2,770 (29.4)	962 (10.3)	p<0.01	0.3 (0.3–0.3)	0.3 (0.3–0.3)

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

† Decedent had been identified as having a current diagnosis of mental health problem in coroner/medical examiner or law enforcement reports.

‡ Odds ratio reflects the risk among those without known mental health problem relative to those with known mental health problem.

§ Logistic regression was used to estimate adjusted odds ratio with 95% CIs after controlling for age, sex, race and ethnicity. Known mental health problem was the reference group.

¶ Includes decedents with one or more diagnosed current mental health problems, which are not mutually exclusive. Therefore, sums of percentages for the diagnosed conditions exceed 100%. Denominator includes the number of decedents with one or more current diagnosed mental health problems.

†† Denominator is decedents aged ≥18 years.

§§ Denominator is decedents aged 10–18 years.

¶ Denominator of institution subgroup is decedents with recent release from an institution. Recent release from an institution is defined as having occurred within the past month.

\*\*\* Denominator of crisis subgroup is decedents with any crisis within past or upcoming 2 weeks. Crises depicted here represent the most commonly occurring categories.



## Morbidity and Mortality Weekly Report

### Contributing Circumstances to Suicide and Increasing Trends in State Suicide Rates

Journal:	<i>Morbidity and Mortality Weekly Report</i>
Manuscript ID	CDC-2018-0112
Manuscript Type:	Manuscript – CDC author
Date Submitted by the Author:	25-Apr-2018
Complete List of Authors:	Stone, Deborah; National Center for Injury Prevention and Control, Division of Violence Prevention Simon, Thomas; CDC, NCIPC Fowler, Katherine; Centers for Disease Control and Prevention, Division of Violence Prevention Kegler, Scott; Centers for Disease Control and Prevention, National Center for Injury Prevention and Control Yuan, Keming; National Center for Injury Prevention and Control, Division of Violence Prevention Holland, Kristin; Centers for Disease Control and Prevention, National Center for Injury Prevention and Control Ivey-Stephenson, Asha; Centers for Disease Control and Prevention, DVP Crosby, Alexander; National Center for Injury Prevention and Control
Jurisdiction – Country (select all that apply):	United States
Multistate – >15 states:	Yes
Jurisdiction – States and U.S. Territories (if ≤ 15 states, select all that apply):	N/A
Note: The following files were submitted by the author for peer review, but cannot be converted to PDF. You must view these files (e.g. movies) online.	
DStone_Figure 1.emf	

SCHOLARONE<sup>®</sup>  
Manuscripts

4.25.18

**Title:** Vital Signs: Contributing Circumstances to Suicide and Increasing Trends in State Suicide Rates

Deborah M. Stone, ScD;<sup>1</sup> Thomas R. Simon PhD;<sup>1</sup> Katherine A. Fowler, PhD;<sup>1</sup> Scott R. Kegler, PhD;<sup>2</sup> Keming Yuan, MS;<sup>1</sup> Kristin M. Holland, PhD;<sup>1</sup> Asha Z. Ivey-Stephenson, PhD;<sup>1</sup> Alex E. Crosby, MD<sup>1</sup>

**Background:** Suicide rates in the United States have risen nearly 30% since 1999. Mental health problems (MHP) are just one factor contributing to suicide. Examining state-level trends in, and the multiple contributing circumstances to, suicide can inform comprehensive state suicide prevention planning.

**Methods:** Trends in age-adjusted suicide rates among people aged ≥10 years, by state and sex, across six consecutive three-year periods (1999–2016), were assessed using data from the National Vital Statistics System for 50 states and Washington, D.C. Data from the National Violent Death Reporting System, covering 27 states in 2015, were used to examine contributing circumstances among decedents with and without known mental health problems (MHP).

**Results:** From 1999–2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases of more than 30%. Rates increased significantly among males and females in 34 and 43 states, respectively. In 2015, more than half (54%) of decedents in 27 states did not have a known MHP. Among people with circumstance information, several circumstances, including relationship problems/loss (45.1% vs 39.6%), life stressors (54.2% vs 49.7%), and recent/impending crises (32.9% vs 26.0%) were significantly more likely among those without a known MHP than decedents with MHP, but were common across groups.

**Conclusions:** Suicide rates increased significantly across most states from 1999–2016. Various circumstances contributed to suicides among people with and without known MHP.

**Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach to prevent suicide risk before it occurs, identify and support people at risk, prevent reattempts, and help friends/family after a suicide occurs.

**INTRODUCTION**

**BACKGROUND AND PURPOSE**

In 2016, nearly 45,000 suicides (15.6/100,000 [age-adjusted]) occurred in the United States (U.S.), among people ≥10 years old (1). Between 1999 and 2015, suicide rates increased across sexes, racial/ethnic groups, and urbanization levels (2, 3). Suicide is the 10<sup>th</sup> leading cause of death and is one of just three leading causes that are *increasing* (1, 4). Additionally, rates of emergency department visits for nonfatal self-harm, a key risk factor for suicide, increased nearly 45% between 2001 and 2015 (1). Together, suicides and self-harm injuries cost the nation more than \$69 billion in direct medical and work loss costs (1).

The *National Strategy for Suicide Prevention (NSSP)* (5) calls for a public health approach to suicide prevention with efforts spanning across multiple levels (i.e., individual, family/relationship, community, and societal). Such a comprehensive approach underscores that suicide is rarely caused by any single factor, but rather, is multi-determined. Despite the NSSP guidance, suicide prevention largely focuses on identifying suicidal people, providing treatment for mental health problems (MHP) and preventing re-attempts (6). In addition to MHP and prior attempts, other contributing circumstances to suicide include social and economic problems, access to lethal means (e.g., substances, firearms) among people at risk, and poor coping and problem-solving skills (5). Expanded awareness of these additional circumstances contributing to suicide risk and action to address them,



4.25.18

can help reach the nation's goal of reducing suicide rates 20% by 2025 (7). To assist states in achieving this goal, this study analyzes state-specific trends in suicide rates, assesses the multiple contributing factors to suicide, and provides options for multi-level comprehensive suicide prevention based on the best available evidence.

## METHODS

Suicide rates were analyzed for people aged  $\geq 10$  years only, as determining suicidal intent in younger children can be difficult (8). Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases 10<sup>th</sup> Revision*, underlying-cause-of death codes X60-X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods spanning 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Characteristics and circumstances of suicide decedents  $\geq 10$  years old, with and without known MHP, were compared in the 27 states with complete data participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines MHP as disorders and syndromes listed in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (9), with the exception of alcohol and other substance dependence, which are captured separately in NVDRS. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known MHP were compared using Chi-square tests. Logistic regression analyses estimated adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and race/ethnicity.

## RESULTS

The most recent overall suicide rates (representing 2014-2016) varied four-fold, from 6.9 (D.C.) to 29.2 (Montana) per 100,000 persons per year (Table 1). Across the study period, rates increased in all states, except Nevada (which had a consistently high rate throughout), with absolute increases ranging from +0.8 (Delaware) to +8.1 (Wyoming) per 100,000. Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with increases of more than 30% observed in 25 states (Table 1, Figure 1).

Modeled suicide rate trends indicated significant increases for 44 states, for males (34 states) and females (43 states), as well as for the U.S. overall (Table 1). Nationally, the model-estimated AAPC for the overall suicide rate was +1.5%. By sex, estimated national rate trends further indicated significant increases for males (AAPC +1.1%) and females (AAPC +2.6%).

Suicide decedents without known MHP (N=11,039) were compared to those with MHP (N=9,407) in 27 states. While all decedents were predominately male (Table 2; 76.8%) and non-Hispanic white (83.6%), those without known MHP, relative to those with MHP, were more likely male (83.6% vs. 68.8%; odds ratio (OR)=2.3, 95% CI = 2.2-2.5) and racial/ethnic minorities (OR range: 1.2-2.0). Suicide decedents without known MHP also had significantly greater odds of perpetrating homicide-suicide (adjusted odds ratio aOR = 2.9, 95% CI = 2.2-3.8).



4.25.18

Among adult decedents, 20.1% of those without known MHP and 15.3% of those with MPH ever served, or were currently serving, in the U.S. military.

While firearms were the most common method of suicide used overall (48.5%) and for both groups, decedents without known MHP were more likely to die by firearm (55.3% vs. 40.6%) and less likely to die by hanging/strangulation/suffocation (26.9% vs 31.3%) or poisoning (10.4% vs 19.8%) than those with known MHP. These differences remained significant in the adjusted models.

Decedents without known MHP were less likely to receive toxicology testing. Among those with toxicology results, decedents without known MHP were less likely to test positive for any substance overall (aOR=0.8, 95% CI=0.7-0.8), such as opioids (aOR=.90 95% CI=0.81-.99) but more likely to test positive for alcohol (aOR=1.2, 95% CI=1.1-1.3).

All suicide decedents with MHP (N=9,407) and approximately 85% without known MHP (N=9,357) had available circumstances information (Table 3). People without known MHP were less likely to have any substance abuse problems (aOR=0.7, 95% CI=0.7-0.8). While two-thirds of those with known MHP had a history of mental health or substance abuse treatment (67.2%), just over half (54.0%) were in current treatment.

Decedents without, versus those with, known MHP, had significantly greater likelihood of any relationship problem/loss (45.1% vs. 39.6%), specifically intimate partner problems (30.2% vs. 24.1%), arguments/conflicts (17.5% vs. 13.6%), and recently perpetrating interpersonal violence (3.0% vs. 1.4%). They also were more likely to have experienced any life stressors (54.2% vs 49.7%), such as criminal-legal problems (10.7% vs. 6.2%), or eviction/loss of home (4.3% vs. 3.4%) and were more likely to have had a crisis within the preceding or upcoming two weeks (32.9% vs. 26.0%). All of these differences remained significant in the adjusted models. Among all people with crises, intimate partner problems were the most common types and did not differ by group. Similarly, among people without versus with MHP, physical health problems (23.2% and 21.4%) and job/financial problems (15.6% and 16.8%) were commonly experienced by both groups.

Decedents without known MHP had significantly lower odds of recent release from any institution (aOR=0.5, 95% CI=0.4-0.5), but among those who were recently released (5.1%), they were significantly more likely to be released from a correctional facility (25.7% vs. 8.7%), hospital (43.7% vs. 33.0%), or other facility (e.g., alcohol/substance treatment) (aOR=2.5 95% CI=1.8-3.3), than those with a known MHP. Among decedents with known MHP who were recently released from an institution (10.2%), 46.7% of this group were released from psychiatric facilities.

Decedents without known MHP, compared to those with MHP, were significantly less likely to have a history of suicidal ideation (23.0% vs. 40.8%) and prior suicide attempts (10.3% vs. 29.4%). More than one in five people in both groups disclosed suicide intent (22.4% vs. 24.5%).

Conclusions and Comments

From 1999-2016, 44 states saw significant increases in suicide rates and 25 states experienced substantial increases in suicide rates of more than 30%. Rates increased significantly among males, in 34 states, and females, in 43 states. This finding is consistent with prior research showing a decreasing gender gap in male-female suicide rates between 1999-2014 (3). Additional research into the specific causes of these trends is necessary. Fortunately, data from the 27 states participating in NVDRS provides important insight into suicide circumstances and can help states identify prevention priorities.



4.25.18

Suicidologists regularly state that suicide is not caused by a single factor; (5) however, suicide prevention is often oriented towards downstream identification of suicidal people, treatment of MHP and prevention of reattempts. Additional focus on non-mental health factors, further upstream, is essential to a public health approach (10), as the current study found that more than half of suicide decedents in NVDRS did *not* have a known MHP. This group suffered more from relationship problems and other life stressors such as criminal-legal matters, eviction/loss of home, and recent or impending crises.

Similarly, people with MHP often experienced relationship problems and other life stressors such as job/financial and/or physical health problems. These findings point to the need to both help people manage the conditions associated with mental health problems in the first place, and to support people with known MHP to decrease their risk of poor outcomes (11). Two-thirds of this group had a history of any mental health and/or substance abuse treatment, with over half in treatment when they died. This suggests the need for additional safety supports, including broader implementation of affordable and effective treatment modalities such as doctor-patient collaborative care models and proven cognitive-behavioral therapies. Additionally, greater access to behavioral health providers in underserved areas is needed, as is expansion of healthcare systems needed that integrates physical and behavioral health with a priority on suicide prevention and patient safety, especially through care transitions (12).

Comprehensive statewide suicide prevention activities are needed to address the full range of factors contributing to suicide. Prevention strategies include: strengthening economic supports (e.g., housing stabilization policies, household financial support); teaching coping and problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in life; promoting social connectedness to increase a sense of belongingness and access to informational, tangible, emotional, and social support; and identifying and better supporting people at risk (e.g., Veterans, people with physical/mental health problems) (12). Other strategies include creating protective environments (e.g., reducing access to lethal means among people at risk, creating organizational and workplace policies to promote help-seeking, easing transitions into and out of work for people with MHP and other life challenges), supporting family and friends after a suicide, and assuring safe reporting by the media in order to prevent suicide contagion (12). Some states, such as Colorado, are planning to implement such a comprehensive approach to suicide prevention (10).

These findings have at least three limitations. In the state-level analysis, rankings for four states (MD, MA, RI, UT) might have been impacted by large proportions of injury deaths of undetermined intent (potentially biasing reported suicide rates downward), or decreased percentages of such deaths over time (potentially biasing estimated rate trends upward). Second, NVDRS is not yet nationally representative; the 27 states included represent 49.6% of the population (<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml>).

Third, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the extent of informant knowledge can impact data completeness and accuracy. Studies including more in-depth interviews with next-of-kin often see greater attributions to mental disorders (13), however many methodological variations across studies exist (14). It is likely that some people without known MHP in the current study were experiencing mental health challenges that were unknown, and hence underreported by key informants. Nonetheless, the high prevalence of diverse contributing circumstances among those with and without known MHP suggests the importance of addressing the broad range of factors that contribute to suicide.

Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are available. States and communities can use data from NVDRS and resources such as CDC's *Preventing Suicide: a Technical Package of Policies, Programs, and Practices* (12) to better understand their suicide problem, prioritize evidence-based comprehensive suicide prevention, and save lives.



4.25.18

**Acknowledgments**

The authors acknowledge Robert Anderson, Holly Hedegaard, and Margaret Warner from the Division of Vital Statistics, National Center for Health Statistics, CDC, for their statistical consultation.

**Conflict of Interest** No conflicts of interest were reported.

**Corresponding author:** Deborah M. Stone, [dstone3@cdc.gov](mailto:dstone3@cdc.gov) , 770-488-3942

**Author Affiliations:**

<sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis, Research, and Practice Integration, National Center for Injury Prevention and Control, CDC

**References:**

- Centers for Disease Control and Prevention. Web-based Injury Statistics Query and Reporting System (WISQARS). Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018. In.
- Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide Trends Among and Within Urbanization Levels by Sex, Race/Ethnicity, Age Group, and Mechanism of Death - United States, 2001-2015. *MMWR Surveill Summ* 2017;66(18):1-16.
- Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999-2014. In: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics Hyattsville, MD; 2016.
- Kochanek K, Murphy S, Xu J, Arias E. Mortality in the United States, 2016. *NCHS Data Brief*, no 293. National Center for Health Statistics 2017.
- Office of the Surgeon General, National Action Alliance for Suicide Prevention. 2012 National strategy for suicide prevention: Goals and objectives for action: a report of the US Surgeon General and of the National Action Alliance for Suicide Prevention. 2012.
- Zalsman G, Hawton K, Wasserman D, van Heeringen K, Arensman E, Sarchiapone M, et al. Suicide prevention strategies revisited: 10-year systematic review. *The Lancet Psychiatry* 2016;3(7):646-659.
- Torguson K, O'Brien A. Leading Suicide Prevention Efforts Unite to Address Rising National Suicide Rate. In. Washington, D.C.; 2017.
- Crepeau-Hobson F. The Psychological Autopsy and Determination of Child Suicides: A Survey of Medical Examiners. *Archives of Suicide Research* 2010;14(1):24-34.
- American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5®): American Psychiatric Pub; 2013.
- Caine ED, Reed J, Hindman J, Quinlan K. Comprehensive, integrated approaches to suicide prevention: practical guidance. *Injury prevention* 2017;injuryprev-2017-042366.
- World Health Organization. Risks to mental health: An overview of vulnerabilities and risk factors. Geneva: WHO 2012.
- Stone DM, Holland KM, Bartholow BN, Crosby AE, Davis SP, Wilkins N. Preventing suicide: A technical package of policies, programs, and practice. 2017.
- Milner A, Sveticic J, De Leo D. Suicide in the absence of mental disorder? A review of psychological autopsy studies across countries. *Int J Soc Psychiatry* 2013;59(6):545-54.
- Pouliot L, De Leo D. Critical issues in psychological autopsy studies. *Suicide Life Threat Behav* 2006;36(5):491-510.

**Word Count:** 1904/1800



**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, National Vital Statistics System, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
U.S.	Both	12.3 (n/a)	12.7 (+ 0.4)	12.9 (+ 0.2)	13.8 (+ 0.9)	14.5 (+ 0.8)	15.4 (+ 0.9)	+ 1.5 % (p<.01)	n/a	+ 3.1 (n/a)	+ 25.4 % (n/a)
	Male	20.9 (n/a)	21.2 (+ 0.4)	21.3 (+ 0.0)	22.5 (+1.3)	23.5 (+ 1.0)	24.5 (+ 1.0)	+ 1.1 % (p<.01)			
	Female	4.7 (n/a)	5.0 (+ 0.3)	5.3 (+ 0.2)	5.7 (+ 0.4)	6.2 (+ 0.5)	6.9 (+ 0.7)	+ 2.6 % (p<.01)			
AL	Both	14.3 (n/a)	13.4 (- 0.9)	14.1 (+ 0.6)	15.6 (+ 1.6)	16.4 (+ 0.7)	17.5 (+ 1.1)	+ 1.6 % (p<.05)	25	+ 3.1 (31)	+ 21.9 % (33)
	Male	25.1 (n/a)	23.4 (- 1.7)	24.4 (+ 1.0)	26.4 (+ 2.0)	27.6 (+ 1.1)	29.1 (+ 1.5)	+ 1.3 % (p<.05)			
	Female	5.1 (n/a)	4.8 (- 0.3)	5.0 (+ 0.2)	6.1 (+ 1.1)	6.4 (+ 0.3)	7.0 (+ 0.7)	+ 2.6 % (p<.01)			
AK	Both	21.0 (n/a)	24.8 (+ 3.8)	24.2 (- 0.6)	26.0 (+ 1.7)	25.4 (- 0.5)	28.8 (+ 3.4)	+ 1.7 % (p<.05)	2	+ 7.8 ( 4)	+ 37.4 % (13)
	Male	33.2 (n/a)	38.1 (+ 4.9)	38.9 (+ 0.8)	40.1 (+ 1.2)	40.1 (- 0.1)	42.9 (+ 2.8)	+ 1.4 % (p<.01)			
	Female	8.6 (n/a)	11.4 (+ 2.9)	9.8 (- 1.6)	11.1 (+ 1.2)	9.9 (- 1.2)	13.2 (+ 3.4)	+ 1.7 % n/s			
AZ	Both	17.8 (n/a)	18.5 (+ 0.7)	19.1 (+ 0.5)	19.1 (- 0.0)	20.4 (+ 1.3)	20.9 (+ 0.5)	+ 1.0 % (p<.01)	15	+ 3.1 (32)	+ 17.3 % (42)
	Male	29.3 (n/a)	30.2 (+ 1.0)	30.6 (+ 0.4)	30.2 (- 0.5)	32.0 (+ 1.9)	32.4 (+ 0.4)	+ 0.6 % (p<.05)			
	Female	7.1 (n/a)	7.5 (+ 0.4)	8.2 (+ 0.7)	8.6 (+ 0.5)	9.2 (+ 0.6)	9.9 (+ 0.6)	+ 2.2 % (p<.01)			
AR	Both	15.5 (n/a)	15.8 (+ 0.3)	16.2 (+ 0.5)	17.6 (+ 1.4)	19.2 (+ 1.6)	21.2 (+ 2.0)	+ 2.2 % (p<.01)	12	+ 5.7 (14)	+ 36.8 % (15)
	Male	26.7 (n/a)	26.7 (+ 0.0)	27.2 (+ 0.5)	28.2 (+ 1.0)	31.7 (+ 3.5)	33.5 (+ 1.9)	+ 1.6 % (p<.05)			
	Female	5.6 (n/a)	5.9 (+ 0.3)	6.2 (+ 0.4)	7.9 (+ 1.7)	7.5 (- 0.4)	9.6 (+ 2.1)	+ 3.6 % (p<.01)			
CA	Both	10.6 (n/a)	11.3 (+ 0.7)	11.0 (- 0.3)	12.0 (+ 1.0)	11.8 (- 0.1)	12.1 (+ 0.3)	+ 0.9 % (p<.05)	45	+ 1.6 (46)	+ 14.8 % (46)
	Male	17.9 (n/a)	18.4 (+ 0.5)	17.7 (- 0.7)	19.1 (+ 1.4)	18.9 (- 0.2)	19.2 (+ 0.3)	+ 0.5 % n/s			
	Female	4.1 (n/a)	5.0 (+ 0.9)	4.9 (- 0.1)	5.4 (+ 0.5)	5.3 (- 0.1)	5.6 (+ 0.3)	+ 1.7 % (p<.05)			
CO	Both	17.3 (n/a)	19.2 (+ 1.9)	19.0 (- 0.2)	20.0 (+ 1.0)	21.6 (+ 1.5)	23.2 (+ 1.6)	+ 1.8 % (p<.01)	8	+ 5.9 (12)	+ 34.1 % (22)
	Male	28.6 (n/a)	30.9 (+ 2.3)	30.5 (- 0.4)	31.5 (+ 1.0)	33.4 (+ 1.9)	36.3 (+ 2.9)	+ 1.4 % (p<.01)			
	Female	7.0 (n/a)	8.2 (+ 1.3)	8.2 (+ 0.0)	9.1 (+ 0.9)	10.1 (+ 1.0)	10.4 (+ 0.3)	+ 2.6 % (p<.01)			
CT	Both	9.6 (n/a)	8.9 (- 0.7)	9.1 (+ 0.2)	10.2 (+ 1.1)	11.0 (+ 0.8)	11.5 (+ 0.5)	+ 1.6 % (p<.05)	46	+ 1.9 (43)	+ 19.2 % (34)
	Male	16.4 (n/a)	14.6 (- 1.8)	15.0 (+ 0.4)	16.6 (+ 1.6)	17.6 (+ 1.0)	17.3 (- 0.3)	+ 0.9 % n/s			
	Female	3.6 (n/a)	3.8 (+ 0.2)	3.7 (- 0.2)	4.4 (+ 0.7)	4.9 (+ 0.5)	6.2 (+ 1.3)	+ 3.5 % (p<.05)			



**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, National Vital Statistics System, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
DE	Both	13.6 (n/a)	12.2 (- 1.4)	11.9 (- 0.3)	13.6 (+ 1.7)	14.2 (+ 0.6)	14.4 (+ 0.2)	+ 0.9 % n/s	42	+ 0.8 (50)	+ 5.9 % (50)
	Male	23.0 (n/a)	20.3 (- 2.7)	19.9 (- 0.4)	23.1 (+ 3.2)	22.7 (- 0.4)	23.5 (+ 0.8)	+ 0.6 % n/s			
	Female	5.3 (n/a)	5.0 (- 0.2)	4.6 (- 0.4)	4.9 (+ 0.3)	6.4 (+ 1.5)	6.2 (- 0.2)	+ 1.6 % n/s			
DC	Both	5.9 (n/a)	6.4 (+ 0.5)	6.4 (- 0.0)	7.3 (+ 0.8)	6.6 (- 0.7)	6.9 (+ 0.3)	+ 0.9 % n/s	51	+ 1.0 (48)	+ 16.1 % (45)
	Male	10.7 (n/a)	11.1 (+ 0.4)	10.3 (- 0.8)	12.7 (+ 2.4)	10.0 (- 2.6)	11.7 (+ 1.7)	+ 0.3 % n/s			
	Female	1.7 (n/a) ††	2.3 (+ 0.6) ††	3.3 (+ 1.0)	2.6 (- 0.7)	3.6 (+ 1.0)	2.8 (- 0.8)	+ 3.5 % n/s			
FL	Both	14.8 (n/a)	15.2 (+ 0.4)	14.9 (- 0.3)	16.3 (+ 1.4)	16.3 (- 0.0)	16.4 (+ 0.1)	+ 0.8 % (p<.05)	29	+ 1.6 (45)	+ 10.6 % (48)
	Male	24.3 (n/a)	24.4 (+ 0.1)	23.6 (- 0.8)	26.2 (+ 2.6)	25.6 (- 0.6)	25.6 (- 0.1)	+ 0.5 % n/s			
	Female	6.3 (n/a)	6.8 (+ 0.5)	6.8 (+ 0.0)	7.1 (+ 0.3)	7.6 (+ 0.5)	7.8 (+ 0.3)	+ 1.4 % (p<.01)			
GA	Both	12.9 (n/a)	13.2 (+ 0.3)	12.3 (- 0.9)	13.2 (+ 0.9)	13.7 (+ 0.5)	15.0 (+ 1.3)	+ 0.9 % n/s	39	+ 2.1 (40)	+ 16.2 % (44)
	Male	22.1 (n/a)	23.1 (+ 1.0)	21.3 (- 1.8)	21.9 (+ 0.6)	22.6 (+ 0.7)	24.4 (+ 1.7)	+ 0.5 % n/s			
	Female	5.0 (n/a)	4.8 (- 0.2)	4.6 (- 0.2)	5.5 (+ 0.9)	5.8 (+ 0.3)	6.6 (+ 0.8)	+ 2.1 % (p<.05)			
HI	Both	12.9 (n/a)	11.1 (- 1.8)	10.3 (- 0.7)	14.5 (+ 4.1)	14.4 (- 0.1)	15.2 (+ 0.8)	+ 2.0 % n/s	35	+ 2.4 (35)	+ 18.3 % (38)
	Male	20.4 (n/a)	17.2 (- 3.1)	15.3 (- 1.9)	21.9 (+ 6.7)	22.5 (+ 0.5)	24.3 (+ 1.8)	+ 2.1 % n/s			
	Female	5.4 (n/a)	5.0 (- 0.4)	5.5 (+ 0.5)	7.1 (+ 1.5)	6.2 (- 0.9)	5.9 (- 0.3)	+ 1.2 % n/s			
ID	Both	17.3 (n/a)	19.2 (+ 2.0)	18.3 (- 0.9)	21.6 (+ 3.3)	21.9 (+ 0.3)	24.7 (+ 2.8)	+ 2.3 % (p<.01)	6	+ 7.5 ( 6)	+ 43.2 % ( 7)
	Male	28.4 (n/a)	33.1 (+ 4.7)	31.1 (- 2.0)	34.9 (+ 3.8)	34.7 (- 0.2)	38.0 (+ 3.3)	+ 1.6 % (p<.05)			
	Female	7.2 (n/a)	6.1 (- 1.1)	6.1 (+ 0.0)	9.0 (+ 2.9)	9.5 (+ 0.5)	11.8 (+ 2.3)	+ 4.4 % (p<.05)			
IL	Both	9.9 (n/a)	9.8 (- 0.1)	9.7 (- 0.1)	10.6 (+ 0.8)	11.2 (+ 0.6)	12.2 (+ 1.0)	+ 1.5 % (p<.05)	44	+ 2.3 (38)	+ 22.8 % (32)
	Male	17.1 (n/a)	16.7 (- 0.4)	16.2 (- 0.4)	17.6 (+ 1.4)	18.5 (+ 0.9)	19.8 (+ 1.3)	+ 1.1 % (p<.05)			
	Female	3.7 (n/a)	3.6 (- 0.0)	3.8 (+ 0.2)	4.2 (+ 0.4)	4.5 (+ 0.4)	5.2 (+ 0.6)	+ 2.4 % (p<.01)			
IN	Both	13.0 (n/a)	13.7 (+ 0.7)	14.4 (+ 0.7)	14.9 (+ 0.5)	16.4 (+ 1.4)	17.1 (+ 0.7)	+ 1.9 % (p<.01)	26	+ 4.1 (23)	+ 31.9 % (25)
	Male	22.4 (n/a)	23.2 (+ 0.8)	24.4 (+ 1.2)	24.7 (+ 0.4)	26.7 (+ 2.0)	28.3 (+ 1.6)	+ 1.5 % (p<.01)			
	Female	4.6 (n/a)	5.0 (+ 0.4)	5.3 (+ 0.2)	5.9 (+ 0.6)	6.8 (+ 0.9)	6.6 (- 0.2)	+ 2.7 % (p<.01)			



**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, National Vital Statistics System, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
IA	Both	11.8 (n/a)	13.2 (+ 1.4)	12.8 (- 0.4)	14.2 (+ 1.4)	15.9 (+ 1.7)	16.0 (+ 0.1)	+ 2.1 % (p<.01)	31	+ 4.3 (20)	+ 36.2 % (18)
	Male	20.6 (n/a)	22.1 (+ 1.5)	20.8 (- 1.4)	23.3 (+ 2.5)	26.0 (+ 2.7)	25.7 (- 0.3)	+ 1.6 % (p<.05)			
	Female	3.7 (n/a)	4.7 (+ 1.0)	5.3 (+ 0.6)	5.5 (+ 0.2)	6.1 (+ 0.6)	6.7 (+ 0.6)	+ 3.8 % (p<.01)			
KS	Both	13.3 (n/a)	15.1 (+ 1.8)	15.8 (+ 0.7)	15.3 (- 0.5)	17.7 (+ 2.4)	19.4 (+ 1.6)	+ 2.2 % (p<.01)	19	+ 6.0 (11)	+ 45.0 % ( 5)
	Male	22.7 (n/a)	25.0 (+ 2.3)	26.5 (+ 1.5)	25.6 (- 0.9)	29.1 (+ 3.5)	30.7 (+ 1.6)	+ 1.9 % (p<.01)			
	Female	4.6 (n/a)	6.0 (+ 1.4)	5.7 (- 0.3)	5.4 (- 0.3)	6.8 (+ 1.4)	8.4 (+ 1.6)	+ 3.2 % (p<.05)			
KY	Both	14.1 (n/a)	15.4 (+ 1.3)	16.7 (+ 1.3)	16.2 (- 0.5)	18.2 (+ 2.0)	19.3 (+ 1.1)	+ 1.9 % (p<.01)	20	+ 5.2 (16)	+ 36.6 % (16)
	Male	25.0 (n/a)	26.8 (+ 1.9)	28.3 (+ 1.4)	27.2 (- 1.0)	30.1 (+ 2.9)	31.7 (+ 1.6)	+ 1.4 % (p<.01)			
	Female	4.8 (n/a)	5.2 (+ 0.4)	6.1 (+ 0.8)	6.1 (+ 0.1)	7.1 (+ 0.9)	7.7 (+ 0.6)	+ 3.2 % (p<.01)			
LA	Both	13.1 (n/a)	12.9 (- 0.2)	13.4 (+ 0.4)	13.6 (+ 0.3)	14.4 (+ 0.8)	17.0 (+ 2.5)	+ 1.6 % (p<.05)	27	+ 3.8 (27)	+ 29.3 % (26)
	Male	22.9 (n/a)	22.3 (- 0.6)	22.4 (+ 0.1)	23.3 (+ 0.8)	23.7 (+ 0.5)	27.3 (+ 3.6)	+ 1.1 % n/s			
	Female	4.8 (n/a)	4.7 (- 0.1)	5.2 (+ 0.5)	4.9 (- 0.2)	6.1 (+ 1.2)	7.5 (+ 1.4)	+ 2.8 % (p<.05)			
ME	Both	14.5 (n/a)	13.6 (- 0.9)	14.4 (+ 0.8)	15.4 (+ 1.0)	18.9 (+ 3.5)	18.5 (- 0.4)	+ 2.2 % (p<.05)	21	+ 4.0 (25)	+ 27.4 % (29)
	Male	25.0 (n/a)	22.9 (- 2.1)	24.6 (+ 1.7)	25.7 (+ 1.1)	31.1 (+ 5.4)	29.8 (- 1.3)	+ 1.8 % (p<.05)			
	Female	5.3 (n/a)	5.3 (- 0.0)	5.2 (- 0.1)	6.0 (+ 0.7)	7.6 (+ 1.6)	7.9 (+ 0.3)	+ 3.1 % (p<.05)			
MD	Both	10.0 (n/a)	10.3 (+ 0.3)	10.1 (- 0.2)	10.2 (+ 0.1)	10.7 (+ 0.5)	10.8 (+ 0.1)	+ 0.5 % (p<.05)	47 §§	+ 0.8 (49 §§)	+ 8.5 % (49 §§)
	Male	17.6 (n/a)	17.8 (+ 0.1)	17.3 (- 0.5)	17.7 (+ 0.4)	18.2 (+ 0.5)	18.0 (- 0.2)	+ 0.2 % n/s			
	Female	3.5 (n/a)	3.8 (+ 0.4)	3.9 (+ 0.0)	3.7 (- 0.2)	4.1 (+ 0.4)	4.5 (+ 0.4)	+ 1.3 % (p<.05)			
MA	Both	7.4 (n/a)	7.6 (+ 0.2)	8.4 (+ 0.8)	9.3 (+ 1.0)	9.8 (+ 0.4)	10.0 (+ 0.3)	+ 2.3 % (p<.01)	48	+ 2.6 (34 ¶¶)	+ 35.3 % (20 ¶¶)
	Male	12.1 (n/a)	12.8 (+ 0.7)	13.3 (+ 0.5)	15.4 (+ 2.1)	15.2 (- 0.2)	16.0 (+ 0.8)	+ 2.0 % (p<.01)			
	Female	3.3 (n/a)	2.9 (- 0.4)	4.0 (+ 1.0)	3.8 (- 0.1)	4.8 (+ 1.0)	4.6 (- 0.2)	+ 3.0 % (p<.05)			
MI	Both	11.8 (n/a)	12.5 (+ 0.7)	12.9 (+ 0.4)	13.9 (+ 1.0)	14.5 (+ 0.7)	15.6 (+ 1.1)	+ 1.9 % (p<.01)	33	+ 3.9 (26)	+ 32.9 % (24)
	Male	20.0 (n/a)	20.9 (+ 0.9)	21.6 (+ 0.7)	22.8 (+ 1.3)	23.9 (+ 1.0)	25.0 (+ 1.2)	+ 1.5 % (p<.01)			
	Female	4.4 (n/a)	4.8 (+ 0.4)	5.0 (+ 0.2)	5.6 (+ 0.6)	5.9 (+ 0.3)	6.7 (+ 0.9)	+ 2.8 % (p<.01)			



**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, National Vital Statistics System, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
MN	Both	10.7 (n/a)	11.5 (+ 0.9)	12.4 (+ 0.8)	12.9 (+ 0.5)	14.2 (+ 1.3)	15.0 (+ 0.9)	+ 2.3 % (p<.01)	38	+ 4.3 (19)	+ 40.6 % ( 8)
	Male	18.3 (n/a)	19.3 (+ 1.1)	20.4 (+ 1.0)	20.9 (+ 0.6)	22.9 (+ 1.9)	23.3 (+ 0.4)	+ 1.7 % (p<.01)			
	Female	3.6 (n/a)	4.2 (+ 0.6)	4.8 (+ 0.6)	5.1 (+ 0.4)	5.8 (+ 0.6)	6.9 (+ 1.2)	+ 4.2 % (p<.01)			
MS	Both	12.9 (n/a)	14.1 (+ 1.2)	14.7 (+ 0.6)	15.5 (+ 0.8)	15.6 (+ 0.1)	15.2 (- 0.3)	+ 1.1 % (p<.05)	36	+ 2.3 (36)	+ 17.8 % (40)
	Male	22.9 (n/a)	24.6 (+ 1.7)	25.1 (+ 0.6)	26.8 (+ 1.7)	25.9 (- 0.9)	25.3 (- 0.6)	+ 0.7 % n/s			
	Female	4.3 (n/a)	5.0 (+ 0.7)	5.5 (+ 0.5)	5.5 (- 0.0)	6.4 (+ 0.9)	6.2 (- 0.2)	+ 2.4 % (p<.01)			
MO	Both	14.7 (n/a)	14.1 (- 0.6)	15.4 (+ 1.3)	16.0 (+ 0.7)	17.8 (+ 1.7)	20.0 (+ 2.3)	+ 2.2 % (p<.01)	16	+ 5.3 (15)	+ 36.4 % (17)
	Male	25.3 (n/a)	23.7 (- 1.6)	25.6 (+ 1.9)	26.6 (+ 1.0)	28.9 (+ 2.3)	32.2 (+ 3.3)	+ 1.8 % (p<.05)			
	Female	5.4 (n/a)	5.4 (+ 0.1)	6.1 (+ 0.7)	6.3 (+ 0.2)	7.4 (+ 1.1)	8.6 (+ 1.2)	+ 3.2 % (p<.01)			
MT	Both	21.1 (n/a)	22.6 (+ 1.4)	23.6 (+ 1.0)	24.7 (+ 1.1)	26.7 (+ 2.0)	29.2 (+ 2.5)	+ 2.1 % (p<.01)	1	+ 8.0 ( 2)	+ 38.0 % (11)
	Male	36.9 (n/a)	37.3 (+ 0.4)	39.8 (+ 2.5)	39.7 (- 0.1)	41.0 (+ 1.4)	45.5 (+ 4.4)	+ 1.3 % (p<.01)			
	Female	6.7 (n/a)	8.4 (+ 1.8)	8.4 (- 0.1)	10.0 (+ 1.6)	12.6 (+ 2.6)	13.1 (+ 0.5)	+ 4.6 % (p<.01)			
NE	Both	12.7 (n/a)	12.2 (- 0.5)	12.6 (+ 0.4)	11.7 (- 0.8)	13.5 (+ 1.8)	14.8 (+ 1.3)	+ 1.0 % n/s	40	+ 2.1 (42)	+ 16.2 % (43)
	Male	22.2 (n/a)	20.7 (- 1.5)	20.3 (- 0.4)	19.8 (- 0.5)	22.0 (+ 2.2)	23.9 (+ 1.9)	+ 0.6 % n/s			
	Female	3.8 (n/a)	4.2 (+ 0.4)	5.1 (+ 0.9)	4.0 (- 1.1)	5.5 (+ 1.4)	5.8 (+ 0.3)	+ 2.6 % n/s			
NV	Both	23.3 (n/a)	22.6 (- 0.6)	22.1 (- 0.5)	22.6 (+ 0.5)	21.4 (- 1.2)	23.1 (+ 1.6)	- 0.2 % n/s	9	- 0.2 (51)	- 1.0 % (51)
	Male	38.3 (n/a)	36.7 (- 1.7)	35.1 (- 1.6)	35.6 (+ 0.5)	32.5 (- 3.0)	35.4 (+ 2.8)	- 0.7 % n/s			
	Female	8.9 (n/a)	9.5 (+ 0.5)	9.6 (+ 0.1)	10.0 (+ 0.4)	10.6 (+ 0.6)	11.2 (+ 0.6)	+ 1.5 % (p<.01)			
NH	Both	13.5 (n/a)	12.5 (- 1.0)	13.3 (+ 0.8)	15.2 (+ 1.9)	15.8 (+ 0.6)	20.0 (+ 4.2)	+ 2.7 % (p<.05)	17	+ 6.5 ( 8)	+ 48.3 % ( 3)
	Male	22.5 (n/a)	21.1 (- 1.4)	21.7 (+ 0.6)	24.8 (+ 3.1)	25.4 (+ 0.6)	30.6 (+ 5.2)	+ 2.2 % (p<.05)			
	Female	5.3 (n/a)	4.8 (- 0.5)	5.9 (+ 1.0)	6.2 (+ 0.4)	6.6 (+ 0.4)	9.8 (+ 3.2)	+ 3.9 % (p<.05)			
NJ	Both	7.8 (n/a)	7.7 (- 0.1)	7.5 (- 0.2)	8.0 (+ 0.5)	8.9 (+ 0.9)	9.2 (+ 0.4)	+ 1.3 % (p<.05)	50	+ 1.5 (47)	+ 19.2 % (35)
	Male	13.0 (n/a)	13.1 (+ 0.0)	12.6 (- 0.5)	13.7 (+ 1.1)	14.5 (+ 0.8)	14.6 (+ 0.1)	+ 0.9 % (p<.05)			
	Female	3.2 (n/a)	2.9 (- 0.3)	3.0 (+ 0.0)	2.9 (- 0.1)	3.8 (+ 0.9)	4.4 (+ 0.6)	+ 2.3 % n/s			



**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, National Vital Statistics System, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
NM	Both	22.0 (n/a)	22.0 (- 0.1)	21.8 (- 0.2)	23.0 (+ 1.2)	24.1 (+ 1.1)	26.0 (+ 1.9)	+ 1.1 % (p<.05)	4	+ 4.0 (24)	+ 18.3 % (39)
	Male	36.8 (n/a)	37.7 (+ 0.9)	36.4 (- 1.2)	35.8 (- 0.6)	37.1 (+ 1.3)	40.7 (+ 3.6)	+ 0.4 % n/s			
	Female	8.5 (n/a)	7.4 (- 1.1)	8.2 (+ 0.7)	10.7 (+ 2.6)	11.7 (+ 0.9)	12.0 (+ 0.3)	+ 3.3 % (p<.05)			
NY	Both	7.2 (n/a)	7.1 (- 0.1)	7.7 (+ 0.6)	8.4 (+ 0.8)	9.5 (+ 1.1)	9.3 (- 0.1)	+ 2.1 % (p<.01)	49	+ 2.1 (41)	+ 28.8 % (27)
	Male	12.5 (n/a)	12.2 (- 0.3)	12.9 (+ 0.7)	13.9 (+ 1.0)	15.4 (+ 1.4)	14.5 (- 0.9)	+ 1.4 % (p<.05)			
	Female	2.7 (n/a)	2.6 (- 0.1)	3.0 (+ 0.3)	3.5 (+ 0.5)	4.2 (+ 0.7)	4.6 (+ 0.5)	+ 4.2 % (p<.01)			
NC	Both	13.6 (n/a)	13.5 (- 0.1)	13.7 (+ 0.1)	14.2 (+ 0.5)	14.5 (+ 0.4)	15.3 (+ 0.8)	+ 0.8 % (p<.01)	34	+ 1.7 (44)	+ 12.7 % (47)
	Male	22.7 (n/a)	22.7 (+ 0.0)	22.2 (- 0.6)	23.3 (+ 1.1)	23.3 (+ 0.0)	23.9 (+ 0.6)	+ 0.4 % n/s			
	Female	5.6 (n/a)	5.5 (- 0.2)	6.2 (+ 0.8)	6.0 (- 0.2)	6.7 (+ 0.7)	7.6 (+ 0.9)	+ 2.0 % (p<.05)			
ND	Both	13.3 (n/a)	14.6 (+ 1.3)	16.0 (+ 1.4)	16.6 (+ 0.6)	18.4 (+ 1.9)	20.9 (+ 2.5)	+ 2.9 % (p<.01)	14	+ 7.6 ( 5)	+ 57.6 % ( 1)
	Male	21.4 (n/a)	24.6 (+ 3.2)	28.0 (+ 3.4)	27.1 (- 0.9)	29.6 (+ 2.5)	32.7 (+ 3.0)	+ 2.5 % (p<.01)			
	Female	5.6 (n/a)	4.5 (- 1.0)	3.7 (- 0.8)	5.7 (+ 2.0)	6.7 (+ 1.0)	8.5 (+ 1.8)	+ 3.9 % n/s			
OH	Both	11.6 (n/a)	12.3 (+ 0.8)	13.1 (+ 0.8)	13.4 (+ 0.2)	14.8 (+ 1.4)	15.8 (+ 1.0)	+ 2.0 % (p<.01)	32	+ 4.2 (21)	+ 36.0 % (19)
	Male	20.4 (n/a)	20.9 (+ 0.5)	22.2 (+ 1.3)	22.1 (- 0.1)	24.2 (+ 2.1)	25.5 (+ 1.3)	+ 1.5 % (p<.01)			
	Female	4.0 (n/a)	4.7 (+ 0.7)	4.9 (+ 0.1)	5.3 (+ 0.5)	6.2 (+ 0.9)	6.7 (+ 0.6)	+ 3.4 % (p<.01)			
OK	Both	17.0 (n/a)	16.5 (- 0.6)	17.2 (+ 0.8)	18.4 (+ 1.1)	20.7 (+ 2.3)	23.5 (+ 2.8)	+ 2.3 % (p<.05)	7	+ 6.4 (10)	+ 37.6 % (12)
	Male	28.5 (n/a)	27.3 (- 1.2)	27.8 (+ 0.5)	30.3 (+ 2.5)	33.4 (+ 3.1)	37.3 (+ 3.8)	+ 2.0 % (p<.05)			
	Female	6.6 (n/a)	6.4 (- 0.2)	7.5 (+ 1.1)	7.0 (- 0.5)	8.5 (+ 1.6)	10.3 (+ 1.8)	+ 2.9 % (p<.05)			
OR	Both	16.4 (n/a)	17.7 (+ 1.3)	17.7 (- 0.0)	18.6 (+ 0.9)	19.8 (+ 1.2)	21.1 (+ 1.3)	+ 1.6 % (p<.01)	13	+ 4.6 (18)	+ 28.2 % (28)
	Male	27.4 (n/a)	29.5 (+ 2.1)	28.5 (- 0.9)	29.5 (+ 1.0)	31.4 (+ 1.8)	33.0 (+ 1.6)	+ 1.1 % (p<.01)			
	Female	6.5 (n/a)	7.1 (+ 0.6)	7.7 (+ 0.6)	8.4 (+ 0.7)	8.8 (+ 0.4)	9.8 (+ 0.9)	+ 2.7 % (p<.01)			
PA	Both	12.1 (n/a)	12.5 (+ 0.4)	12.8 (+ 0.3)	13.9 (+ 1.1)	15.0 (+ 1.1)	16.3 (+ 1.2)	+ 2.0 % (p<.01)	30	+ 4.1 (22)	+ 34.3 % (21)
	Male	21.0 (n/a)	21.3 (+ 0.3)	21.9 (+ 0.6)	23.1 (+ 1.2)	24.7 (+ 1.7)	26.1 (+ 1.3)	+ 1.5 % (p<.01)			
	Female	4.2 (n/a)	4.6 (+ 0.3)	4.6 (+ 0.0)	5.4 (+ 0.9)	6.0 (+ 0.6)	7.1 (+ 1.1)	+ 3.5 % (p<.01)			



**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, National Vital Statistics System, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
RI	Both	9.4 (n/a)	9.0 (- 0.3)	9.0 (- 0.0)	12.8 (+ 3.8)	11.9 (- 0.9)	12.6 (+ 0.7)	+ 2.6 % (p<.05)	43	+ 3.2 (30 ¶¶)	+ 34.1 % (23 ¶¶)
	Male	15.4 (n/a)	15.2 (- 0.2)	14.8 (- 0.3)	21.2 (+ 6.4)	19.2 (- 2.0)	19.6 (+ 0.4)	+ 2.2 % n/s			
	Female	4.0 (n/a)	3.3 (- 0.7)	3.8 (+ 0.4)	5.1 (+ 1.3)	5.1 (+ 0.0)	6.1 (+ 1.0)	+ 3.7 % (p<.05)			
SC	Both	12.8 (n/a)	13.0 (+ 0.2)	13.7 (+ 0.7)	14.9 (+ 1.2)	16.0 (+ 1.1)	17.7 (+ 1.7)	+ 2.3 % (p<.01)	23	+ 4.9 (17)	+ 38.3 % (10)
	Male	21.3 (n/a)	22.5 (+ 1.2)	22.3 (- 0.1)	24.6 (+ 2.2)	26.1 (+ 1.5)	28.0 (+ 1.9)	+ 1.8 % (p<.01)			
	Female	5.4 (n/a)	4.7 (- 0.7)	6.0 (+ 1.3)	6.2 (+ 0.2)	7.0 (+ 0.8)	8.4 (+ 1.4)	+ 3.4 % (p<.05)			
SD	Both	15.7 (n/a)	15.8 (+ 0.1)	17.1 (+ 1.3)	19.3 (+ 2.2)	19.7 (+ 0.4)	22.6 (+ 2.9)	+ 2.5 % (p<.01)	10	+ 7.0 ( 7)	+ 44.5 % ( 6)
	Male	27.6 (n/a)	26.3 (- 1.3)	27.9 (+ 1.6)	30.1 (+ 2.2)	32.0 (+ 1.9)	33.6 (+ 1.6)	+ 1.6 % (p<.01)			
	Female	4.2 (n/a)	5.8 (+ 1.6)	6.4 (+ 0.6)	8.3 (+ 2.0)	7.3 (- 1.0)	11.3 (+ 4.0)	+ 5.8 % (p<.01)			
TN	Both	14.6 (n/a)	15.2 (+ 0.6)	16.1 (+ 0.8)	17.2 (+ 1.1)	17.2 (+ 0.0)	18.2 (+ 1.0)	+ 1.4 % (p<.01)	22	+ 3.5 (28)	+ 24.2 % (31)
	Male	25.1 (n/a)	25.4 (+ 0.3)	26.8 (+ 1.3)	28.0 (+ 1.2)	28.6 (+ 0.6)	29.8 (+ 1.2)	+ 1.2 % (p<.01)			
	Female	5.4 (n/a)	6.3 (+ 0.9)	6.7 (+ 0.4)	7.5 (+ 0.8)	6.9 (- 0.6)	7.6 (+ 0.7)	+ 1.9 % (p<.05)			
TX	Both	12.2 (n/a)	12.7 (+ 0.6)	12.3 (- 0.4)	13.2 (+ 0.9)	13.6 (+ 0.3)	14.5 (+ 0.9)	+ 1.1 % (p<.01)	41	+ 2.3 (37)	+ 18.9 % (36)
	Male	20.4 (n/a)	20.9 (+ 0.5)	20.4 (- 0.6)	22.0 (+ 1.6)	22.2 (+ 0.3)	23.1 (+ 0.9)	+ 0.9 % (p<.05)			
	Female	4.8 (n/a)	5.4 (+ 0.6)	5.0 (- 0.4)	5.2 (+ 0.2)	5.6 (+ 0.4)	6.4 (+ 0.8)	+ 1.6 % (p<.05)			
UT	Both	17.2 (n/a)	19.0 (+ 1.8)	18.2 (- 0.7)	20.2 (+ 2.0)	24.0 (+ 3.8)	25.2 (+ 1.2)	+ 2.7 % (p<.01)	5	+ 8.0 ( 3 ¶¶)	+ 46.5 % ( 4 ¶¶)
	Male	28.2 (n/a)	31.1 (+ 2.9)	29.4 (- 1.7)	32.1 (+ 2.7)	37.8 (+ 5.7)	38.0 (+ 0.2)	+ 2.1 % (p<.05)			
	Female	6.8 (n/a)	7.4 (+ 0.6)	7.5 (+ 0.1)	8.5 (+ 1.0)	10.6 (+ 2.1)	12.6 (+ 2.0)	+ 4.4 % (p<.01)			
VT	Both	13.2 (n/a)	16.2 (+ 3.0)	14.9 (- 1.3)	16.6 (+ 1.7)	18.7 (+ 2.1)	19.7 (+ 1.0)	+ 2.4 % (p<.01)	18	+ 6.4 ( 9)	+ 48.6 % ( 2)
	Male	23.6 (n/a)	28.3 (+ 4.6)	24.3 (- 4.0)	27.3 (+ 3.0)	31.0 (+ 3.7)	32.5 (+ 1.5)	+ 1.9 % (p<.05)			
	Female	4.3 (n/a)	5.2 (+ 0.9)	6.4 (+ 1.3)	6.6 (+ 0.2)	7.3 (+ 0.7)	7.6 (+ 0.3)	+ 3.8 % (p<.01)			
VA	Both	12.8 (n/a)	12.7 (- 0.1)	12.9 (+ 0.3)	13.6 (+ 0.7)	14.6 (+ 0.9)	15.0 (+ 0.5)	+ 1.2 % (p<.01)	37	+ 2.2 (39)	+ 17.4 % (41)
	Male	21.6 (n/a)	21.3 (- 0.2)	21.0 (- 0.4)	22.5 (+ 1.5)	23.6 (+ 1.2)	23.9 (+ 0.2)	+ 0.9 % (p<.05)			
	Female	5.3 (n/a)	5.2 (- 0.1)	5.9 (+ 0.7)	5.6 (- 0.3)	6.4 (+ 0.8)	6.9 (+ 0.5)	+ 1.8 % (p<.05)			



**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, National Vital Statistics System, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
WA	Both	14.8 (n/a)	15.4 (+ 0.5)	14.8 (- 0.6)	15.7 (+ 0.9)	16.6 (+ 0.9)	17.6 (+ 1.0)	+ 1.1 % (p<.05)	24	+ 2.8 (33)	+ 18.8 % (37)
	Male	24.7 (n/a)	25.2 (+ 0.5)	24.1 (- 1.1)	25.1 (+ 1.0)	26.0 (+ 0.9)	27.1 (+ 1.1)	+ 0.6 % n/s			
	Female	5.9 (n/a)	6.4 (+ 0.6)	6.2 (- 0.2)	6.9 (+ 0.7)	7.7 (+ 0.8)	8.5 (+ 0.8)	+ 2.5 % (p<.01)			
WV	Both	15.6 (n/a)	17.2 (+ 1.6)	16.7 (- 0.5)	16.0 (- 0.7)	19.2 (+ 3.2)	21.4 (+ 2.2)	+ 1.8 % n/s	11	+ 5.8 (13)	+ 37.1 % (14)
	Male	27.2 (n/a)	30.1 (+ 2.9)	28.6 (- 1.5)	27.6 (- 1.0)	31.5 (+ 3.9)	33.5 (+ 2.0)	+ 1.1 % n/s			
	Female	5.3 (n/a)	5.5 (+ 0.1)	5.8 (+ 0.3)	5.3 (- 0.5)	7.6 (+ 2.3)	9.8 (+ 2.2)	+ 3.7 % n/s			
WI	Both	13.1 (n/a)	13.5 (+ 0.4)	14.0 (+ 0.5)	15.0 (+ 1.0)	15.3 (+ 0.3)	16.5 (+ 1.2)	+ 1.5 % (p<.01)	28	+ 3.4 (29)	+ 25.8 % (30)
	Male	21.7 (n/a)	22.2 (+ 0.5)	22.7 (+ 0.5)	24.0 (+ 1.2)	24.4 (+ 0.4)	25.7 (+ 1.3)	+ 1.1 % (p<.01)			
	Female	5.1 (n/a)	5.3 (+ 0.2)	5.6 (+ 0.4)	6.4 (+ 0.7)	6.5 (+ 0.1)	7.5 (+ 1.0)	+ 2.5 % (p<.01)			
WY	Both	20.7 (n/a)	23.4 (+ 2.7)	22.5 (- 0.9)	25.4 (+ 2.8)	28.9 (+ 3.5)	28.8 (- 0.1)	+ 2.3 % (p<.01)	3	+ 8.1 ( 1)	+ 39.0 % ( 9)
	Male	34.8 (n/a)	39.3 (+ 4.5)	36.3 (- 3.0)	41.5 (+ 5.2)	47.1 (+ 5.6)	44.6 (- 2.4)	+ 1.8 % (p<.05)			
	Female	7.7 (n/a)	8.2 (+ 0.6)	9.2 (+ 0.9)	9.4 (+ 0.2)	10.7 (+ 1.4)	12.6 (+ 1.9)	+ 3.2 % (p<.01)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.

**Table 2. Select Demographic and Descriptive Characteristics of Suicides among Decedents  $\geq 10$  years of age with and without Known Mental Health Problems--National Violent Death Reporting System, 27 states\*, 2015**

Characteristics	Total (n=20,446)	Mental Health Problem <sup>†</sup> (n=9,407)	No Known Mental Health Problem (n=11,039)	Chi- Square	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>  </sup> (95% CI)
<b>Sex</b>						
Male	15,702(76.8)	6,469(68.8)	9,233(83.6)	p<.01	2.3(2.2-2.5)	
Female	4,744(23.2)	2,938(31.2)	1,806(16.4)	p<.01	0.4(0.4-0.5)	
<b>Age**</b>						
10-24	2,804(13.7)	1,211(12.9)	1,593(14.4)	p<.01	1.1(1.1-1.2)	
25-44	6,456(31.6)	3,036(32.3)	3,420(31.0)	p<.05	0.9(0.9-1.0)	
45-64	7,718(37.7)	3,820(40.6)	3,898(35.3)	p<.01	0.8(0.8-0.8)	
65+	3,468(17.0)	1,340(14.2)	2,128(19.3)	p<.01	1.4(1.3-1.5)	
<b>Race/ethnicity</b>						
White, non-Hispanic	17,102(83.6)	8,165(86.8)	8,937(81.0)	p<.01	0.6(0.6-0.7)	
Black, non-Hispanic	1,228(6.0)	411(4.4)	817(7.4)	p<.01	1.7(1.5-2.0)	
American Indian/Alaska Native, non-Hispanic	378(1.8)	112(1.2)	266(2.4)	p<.01	2.0(1.6-2.6)	
Asian, non-Hispanic	576(2.8)	235(2.5)	341(3.1)	p<.05	1.2(1.1-1.5)	
Hispanic	1,096(5.4)	463(4.9)	633(5.7)	p<.05	1.2(1.0-1.3)	
Other	66(0.3)	21(0.2)	45(0.4)	p<.05	1.8(1.1-3.1)	
<b>Extended demographics</b>						
Ever served in military <sup>††</sup>	3,429(17.8)	1,354(15.3)	2,075(20.1)	p<.01	1.4(1.3-1.5)	1.1(1.0-1.1)
Homeless	240(1.2)	104(1.1)	136(1.3)		1.1(0.9-1.5)	1.2(0.9-1.5)
<b>Incident Type</b>						
Single suicide	20,063(98.2)	9,318(99.1)	10,745(97.4)	p<.01	0.3(0.3-0.4)	0.4(0.3-0.5)
Homicide followed by suicide	319(1.6)	64(0.7)	255(2.3)	p<.01	3.5(2.6-4.5)	2.9(2.2-3.8)
Multiple suicides	64(0.3)	25(0.3)	39(0.4)		1.3(0.8-2.2)	1.6(0.9-2.6)
<b>Method</b>						
Firearm	9,909(48.5)	3,821(40.6)	6,088(55.3)	p<.01	1.8(1.7-1.9)	1.6(1.5-1.7)
Hanging/Strangulation/Suffocation	5,907(28.9)	2,940(31.3)	2,967(26.9)	p<.01	0.8(0.8-0.9)	0.8(0.7-0.8)
Poisoning	3,003(14.7)	1,861(19.8)	1,142(10.4)	p<.01	0.5(0.4-0.5)	0.6(0.6-0.7)



Substance class causing death<sup>§§</sup>

Other (e.g., over-the-counter)	1,021(34.0)	666(35.8)	355(31.1)	p<.01	0.8(0.7-0.9)	0.9(0.7-1.0)
Opioids	944(31.4)	608(32.7)	336(29.4)		0.9(0.7-1.0)	0.9(0.8-1.1)
Antidepressants	800(26.6)	644(34.6)	156(13.7)	p<.01	0.3(0.2-0.4)	0.3(0.3-0.4)
Benzodiazepines	624(20.8)	468(25.1)	156(13.7)	p<.01	0.5(0.4-0.6)	0.5(0.4-0.6)
Antipsychotics	219(7.3)	195(10.5)	24(2.1)	p<.01	0.2(0.1-0.3)	0.2(0.1-0.3)
Other	1,595(7.8)	780(8.3)	815(7.4)	p<.05	0.9(0.8-1.0)	0.9(0.8-1.0)

**Toxicology Results**

Any toxicology testing	13,317(65.1)	6,658(70.8)	6,659(60.3)	p<.01	0.6(0.6-0.7)	0.7(0.6-0.7)
<b>Positive for ≥ 1 substance<sup>¶¶</sup></b>	9,913(74.4)	5,192(78.0)	4,721(70.9)	p<.01	0.7(0.6-0.7)	0.8(0.7-0.8)
Substance detected***						
Alcohol						
Tested	10,950(53.6)	5,409(57.5)	5,541(50.2)	p<.01	0.7(0.7-0.8)	0.8(0.7-0.8)
Positive	4,442(40.6)	2,115(39.1)	2,327(42.0)	p<.01	1.1(1.0-1.2)	1.2(1.1-1.3)
Opioids						
Tested	8,554(41.8)	4,258(45.3)	4,296(38.9)	p<.01	0.8(0.7-0.8)	0.8(0.8-0.9)
Positive	2,279(26.6)	1,238(29.1)	1,041(24.2)	p<.01	0.8(0.7-0.9)	0.9(0.8-1.0)
Benzodiazepines						
Tested	8,124(39.7)	4,226(44.9)	3,898(35.3)	p<.01	0.7(0.6-0.7)	0.7(0.7-0.8)
Positive	2,464(30.3)	1,639(38.8)	825(21.2)	p<.01	0.4(0.4-0.5)	0.5(0.5-0.6)
Cocaine						
Tested	7,978(39.0)	3,866(41.1)	4,112(37.2)	p<.01	0.9(0.8-0.9)	0.9(0.9-1.0)
Positive	499(6.3)	216(5.6)	283(6.9)	p<.05	1.2(1.0-1.5)	1.2(1.0-1.5)
Amphetamines						
Tested	7,615(37.2)	3,696(39.3)	3,919(35.5)	p<.01	0.9(0.8-0.9)	0.9(0.8-0.9)
Positive	736(9.7)	376(10.2)	360(9.2)		0.9(0.8-1.0)	1.0(0.8-1.1)
Marijuana						
Tested	6,569(32.1)	3,127(33.2)	3,442(31.2)	p<.01	0.9(0.9-1.0)	0.9(0.9-1.0)
Positive	1,471(22.4)	710(22.7)	761(22.1)		1.0(0.9-1.1)	0.9(0.8-1.0)
Antidepressants						
Tested	5,425(26.5)	3,103(33.0)	2,322(21.0)	p<.01	0.5(0.5-0.6)	0.6(0.6-0.7)
Positive	2,214(40.8)	1,735(55.9)	479(20.6)	p<.01	0.2(0.2-0.2)	0.2(0.2-0.3)

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

<sup>†</sup> Decedent had been identified as having a current diagnosis of mental health problem in coroner/medical examiner or law enforcement reports.

<sup>§</sup> Odds ratio reflects the risk among those without known mental health problem relative to those with known MHP.

<sup>¶</sup> Logistic regression was used to estimate adjusted odds ratio with 95% CIs after controlling for age, sex, race and ethnicity. Known MHP was used as the reference group.

<sup>\*\*</sup> Decedents were aged 10 years and older, as per standard in the suicide prevention literature.

<sup>††</sup> Denominator is decedents aged 18 years of age and older with reported military service status.

<sup>§§</sup> Denominator is decedents who died by poisoning, including overdose.

<sup>¶¶</sup> Denominator is decedents with any toxicology tested.

<sup>\*\*\*</sup> Denominator for each positive group is the number tested for the substance in that group.

---



**Table 3. Circumstances Preceding Suicide among Decedents  $\geq 10$  years of age with and without Known Mental Health Problems--National Violent Death Reporting System, 27 states\*, 2015**

Characteristics	Total	Mental Health Problem <sup>†</sup>	No Known Mental Health Problem	Chi-Square	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>¶</sup> (95% CI)
Suicide with known circumstances	18,764(91.8)	9,407(100)	9,357(84.8)	p<.01		
<b>Mental Health</b>						
Any Current Diagnosed Mental Health Problem**						
Depression/dysthymia		7,076(75.2)				
Anxiety disorder		1,579(16.8)				
Bipolar disorder		1,431(15.2)				
Schizophrenia		509(5.4)				
PTSD		424(4.5)				
ADD/ADHD		226(2.4)				
Unknown		760(8.1)				
Current depressed mood		3,962(42.1)	3,076(32.9)	p<.01	0.7(0.6-0.7)	0.7(0.6-0.7)
<b>Substance Problems</b>						
Any Current substance problem	5,319(28.3)	2,976(31.6)	2,343(25.0)	p<.01	0.7(0.7-0.8)	0.7(0.7-0.8)
Alcohol problem	3,268(17.4)	1,862(19.8)	1,406(15.0)	p<.01	0.7(0.7-0.8)	0.7(0.7-0.8)
Other substance problem	3,084(16.4)	1,768(18.8)	1,316(14.1)	p<.01	0.7(0.7-0.8)	0.7(0.7-0.8)
<b>Treatment</b>						
Current mental health/substance abuse treatment	5,141(27.4)	5,077(54.0)	64(0.7)	p<.01	0.01(0.01-0.01)	0.01(0.01-0.01)
Ever treated for mental health/substance problem	6,717(35.8)	6,323(67.2)	394(4.2)	p<.01	0.02(0.02-0.02)	0.02(0.02-0.03)
<b>Relationship Problems/Loss</b>						
Any relationship problem/loss	7,948(42.4)	3,726(39.6)	4,222(45.1)	p<.01	1.3(1.2-1.3)	1.3(1.2-1.4)
Intimate partner problem	5,098(27.2)	2,270(24.1)	2,828(30.2)	p<.01	1.4(1.3-1.5)	1.4(1.3-1.5)
Perpetrator of interpersonal violence past month	414(2.2)	131(1.4)	283(3.0)	p<.01	2.2(1.8-2.7)	2.0(1.6-2.4)
Victim of interpersonal violence within past month	84(0.4)	53(0.6)	31(0.3)	p<.05	0.6(0.4-0.9)	0.8(0.5-1.2)
Family relationship problem	1,671(8.9)	873(9.3)	798(8.5)		0.9(0.8-1.0)	1.0(0.9-1.1)
Other relationship problem (non-intimate)	403(2.1)	202(2.1)	201(2.1)		1.0(0.8-1.2)	1.1(0.9-1.3)
Argument or conflict (not specified)	2,914(15.5)	1,278(13.6)	1,636(17.5)	p<.01	1.3(1.2-1.5)	1.4(1.3-1.5)
Death of a loved one (any)	1,497(8.0)	826(8.8)	671(7.2)	p<.01	0.8(0.7-0.9)	0.9(0.8-0.9)

1							
2	Non-suicide death	1,181(6.3)	647(6.9)	534(5.7)	p<.01	0.8(0.7-0.9)	0.9(0.8-1.0)
3	Suicide of family or friend	379(2.0)	217(2.3)	162(1.7)	p<.01	0.7(0.6-0.9)	0.8(0.7-1.0)
4	Other Life Stressors						
5	Any life stressor	9,743(51.9)	4,675(49.7)	5,068(54.2)	p<.01	1.2(1.1-1.3)	1.1(1.1-1.2)
6	Recent criminal legal problem	1,588(8.5)	586(6.2)	1,002(10.7)	p<.01	1.8(1.6-2.0)	1.7(1.5-1.9)
7	Other legal problem	748(4.0)	378(4.0)	370(4.0)		1.0(0.8-1.1)	1.0(0.9-1.2)
8	Physical health problem	4,179(22.3)	2,012(21.4)	2,167(23.2)	p<.01	1.1(1.0-1.2)	1.0(1.0-1.1)
9	Job/Financial problem <sup>††</sup>	2941(16.2)	1530(16.8)	1411(15.6)	p<.05	0.9(0.8-1.0)	0.9(0.8-1.0)
10	Eviction or loss of home	722(3.8)	317(3.4)	405(4.3)	p<.01	1.3(1.1-1.5)	1.4(1.2-1.6)
11	School problem <sup>§§</sup>	162(19.9)	70(17.8)	92(21.9)		1.3(0.9-1.8)	1.3(0.9-1.9)
12	Recent release from an institution <sup>¶¶</sup>	1,412(7.6)	941(10.2)	471(5.1)	p<.01	0.5(0.4-0.5)	0.5(0.4-0.5)
13	Jail/prison/detention facility	203(14.4)	82(8.7)	121(25.7)	p<.01	3.6(2.7-4.9)	4.5(3.2-6.4)
14	Hospital	517(36.6)	311(33.0)	206(43.7)	p<.01	1.6(1.3-2.0)	1.3(1.0-1.7)
15	Psychiatric hospital/institution	469(33.2)	439(46.7)	30(6.4)	p<.01	0.1(0.1-0.1)	0.1(0.1-0.1)
16	Other (includes alc/SA treatment facilities)	223(15.8)	109(11.6)	114(24.2)	p<.01	2.4(1.8-3.3)	2.5(1.8-3.3)
17	Recent or Impending Crisis						
18	Crisis within past or upcoming two weeks***	5,525(29.4)	2,444(26.0)	3,081(32.9)	p<.01	1.4(1.3-1.5)	1.4(1.3-1.5)
19	Intimate partner problem crisis	1968(35.6)	854(34.9)	1114(36.2)		1.1(0.9-1.2)	1.1(0.9-1.2)
20	Physical health problem crisis	739(13.4)	315(12.9)	424(13.8)		1.1(0.9-1.3)	1.0(0.8-1.2)
21	Criminal legal problem crisis	621(11.2)	203(8.3)	418(13.6)	p<.01	1.7(1.5-2.1)	1.6(1.3-1.9)
22	Family relationship problem crisis	430(7.8)	212(8.7)	218(7.1)	p<.05	0.8(0.7-1.0)	0.9(0.7-1.1)
23	Job problem crisis	354(6.4)	191(7.8)	163(5.3)	p<.01	0.7(0.5-0.8)	0.7(0.5-0.8)
24	Suicide Event/History						
25	Left a note	6,468(34.5)	3,182(33.8)	3,286(35.1)		1.1(1.0-1.1)	1.2(1.1-1.2)
26	Disclosed suicide intent	4,405(23.5)	2,306(24.5)	2,099(22.4)	p<.01	0.9(0.8-1.0)	0.9(0.8-0.9)
27	History of ideation	5,990(31.9)	3,838(40.8)	2,152(23.0)	p<.01	0.4(0.4-0.5)	0.4(0.4-0.5)
28	History of attempts	3,732(19.9)	2,770(29.4)	962(10.3)	p<.01	0.3(0.3-0.3)	0.3(0.3-0.3)

\*Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

<sup>†</sup> Decedent had been identified as having a current diagnosis of mental health problem in coroner/medical examiner or law enforcement reports.

<sup>§</sup> Odds ratio reflects the risk among those without known mental health problem relative to those with known MHP.

<sup>¶</sup> Logistic regression was used to estimate adjusted odds ratio with 95% CIs after controlling for age, sex, race and ethnicity. Known MHP was used as the reference group.

<sup>\*\*</sup> Includes decedents with one or more diagnosed current mental health problems, which are not mutually exclusive. Therefore sums of percentages for the diagnosed conditions exceed 100%. Denominator includes the number of decedents with one or more current diagnosed mental health problems.



<sup>††</sup> Denominator is decedents aged 18 years of age and older.

<sup>§§</sup> Denominator is decedents aged 10-18 years.

<sup>\*\*</sup> Denominator of institution subgroup is decedents with recent release from an institution. Recent release from an institution is defined as having occurred within the past month.

<sup>\*\*\*</sup> Denominator of crisis subgroup is decedents with any crisis within past or upcoming two weeks. Crises depicted here represent the most commonly occurring categories.

---



MMWR Author Submission Checklist

Proprietary Considerations	
<input checked="" type="checkbox"/>	Authors acknowledge that if their report is accepted for publication in the <a href="#">Morbidity and Mortality Weekly Report (MMWR)</a> , CDC will commit the report to the public domain and will allow its contents to be used and reprinted without permission. Citation as to source, however, is appreciated.
<input checked="" type="checkbox"/>	To the extent allowed by law, authors agree that they have obtained all appropriate written permissions to allow the submitted report to be published by the United States Government in <i>MMWR</i> and committed to the public domain. This includes written permission from publishers of any copyrighted text boxes, figures or tables that will be reprinted or adapted in an <i>MMWR</i> report.
<input checked="" type="checkbox"/>	Authors agree to obtain appropriate written permissions from any persons identifiable in photographs, case descriptions, or pedigrees for the use of their information and/or image in the report to be published and committed to the public domain.
<input checked="" type="checkbox"/>	Authors agree to obtain appropriate written permissions from persons named in personal communications (oral or written), stating that they agree to be named in the report to be published and committed to the public domain and that the information cited is accurate and (as applicable) retrievable. Such written permissions should be uploaded to <i>MMWR</i> ScholarOne Manuscripts as part of the report submission.
<input checked="" type="checkbox"/>	This report (or one with substantially similar content written by the authors) has not been published and is not being considered for publication elsewhere.
<input checked="" type="checkbox"/>	The <a href="#">Instructions for Authors</a> for <i>MMWR</i> Weekly have been carefully reviewed, with particular attention to Clearance requirements. For reports with CDC authors, <a href="#">Evidence of Clearance</a> has been included with submission. For reports with only non-CDC authors, <i>MMWR</i> will facilitate and confirm clearance by the appropriate CDC center(s) before publication.
<input checked="" type="checkbox"/>	Non-CDC authors have advised the state epidemiologist or the Ministry of Health, as appropriate, of their submission.
<input checked="" type="checkbox"/>	The <a href="#">International Committee of Medical Journal Editors (ICMJE) Conflict of Interest Form</a> has been completed for each author and uploaded to <i>MMWR</i> ScholarOne Manuscripts as part of the submission. All potential conflicts of interest described in the ICMJE form are disclosed in the report's Acknowledgments.
<input checked="" type="checkbox"/>	Authors have disclosed all funding, other financial and material support, and the funder's role (e.g., development of report, analysis and involvement in the publication process) in the report's Acknowledgments.
<input checked="" type="checkbox"/>	Corresponding author is the primary contact for approving the report prior to publication, as well as reviewing, and responding to the comments in the edited drafts and proofs provided by <i>MMWR</i> editors, and responding to CDC Media Relations.



<input checked="" type="checkbox"/>	If errata are identified after publication, the corresponding author will notify <i>MMWR</i> and provide cleared content for publication in a timely manner.
<input checked="" type="checkbox"/>	Corresponding author has ensured that all authors have identified and addressed ethical considerations (e.g., IRB review, disclosure of conflicts, reporting of relevant financial considerations, and review of report to identify possible research misconduct). In general, <i>MMWR</i> follows guidance from the Committee on Publication Ethics (COPE), <a href="#">Guidelines on Good Publication Practice</a> and ICMJE's <a href="#">Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly work in Medical Journals</a> . If you have any questions about ethical considerations or reporting disclosures (conflicts of interest or funding sources/ funder role), please contact the Executive Editor prior to submitting your report.
<b>Authorship and Acknowledgments</b>	
<input checked="" type="checkbox"/>	All authors and contributors meet criteria for <a href="#">CDC Authorship Policy</a> and guidance from <a href="#">ICMJE</a> , and all persons who made substantial contributions to this work but who did not fulfill the authorship criteria are named in the Acknowledgments. <i>MMWR</i> follows <a href="#">U.S. National Library of Medicine</a> guidance for designating authorship and other contributions in MEDLINE.
<input checked="" type="checkbox"/>	Written permission has been obtained and archived from all persons listed in the Acknowledgments that they agree to be named in the report to be published and committed to the public domain.
<input checked="" type="checkbox"/>	Written permission has been obtained and archived from all persons listed as authors of this report that they agree to be named in the report to be published and committed to the public domain.
<input checked="" type="checkbox"/>	All author contact information is up-to-date in <i>MMWR</i> ScholarOne Manuscripts.
<b>Formatting, References, Figures, Word Count, Units of Measure</b>	
<input checked="" type="checkbox"/>	If authors have previously discussed the proposed report with the <i>MMWR</i> editors, this is described in the cover letter.
<input checked="" type="checkbox"/>	Authors have complied with guidance provided in the <a href="#">Instructions for Authors</a> .
<input checked="" type="checkbox"/>	Authors have reviewed recent <a href="#">MMWR Weekly reports</a> on the same or similar topics for basic format and styles.
<input checked="" type="checkbox"/>	The report meets specified word count for the type of report submitted, or the rationale to exceed the word count is provided in the cover letter.
<input checked="" type="checkbox"/>	All pages are double-spaced, numbered, and left justified (ragged right margin).
<input checked="" type="checkbox"/>	All references are cited in the text in sequential order, comply with <a href="#">ICMJE Uniform Requirements</a> , and have been checked for accuracy and completeness. Reference "callouts" in text must be indicated by an italic number in parentheses. Number of references do not exceed the maximum for the type of submission.
	Ex.: "Advances in water management and sanitation have substantially reduced waterborne disease in the United States, although outbreaks continue to occur (1)."



<input checked="" type="checkbox"/>	<p>Author names have been provided in the format shown in the following example. Only the highest academic degrees (not certifications) have been listed, at the master's level or higher. When an author has two degrees at the same level (e.g., MD, PhD, or MS, MPH) both have been listed. Degrees have been followed by a superscripted numeral corresponding to the affiliation. Numerals are listed in sequential order.</p> <p>Ex.: "Karlyn D. Beer, PhD<sup>1,2</sup>; Julia W. Gargano, PhD<sup>2</sup>; Preeta K. Kutty, MD<sup>3</sup>; Elizabeth D. Hilborn, DVM<sup>4</sup>; Jonathan S. Yoder, MPH, MSW<sup>2</sup>"</p>
<input checked="" type="checkbox"/>	<p>Affiliations for authors have been provided in the format shown in the following example. No more than two affiliation sublevels (e.g., division, center) have been listed. The corresponding author is listed in the appropriate location and format.</p> <p>Ex.: "<sup>1</sup>Epidemic Intelligence Service, CDC; <sup>2</sup>Division of Foodborne, Waterborne, and Environmental Diseases, National Center for Emerging and Zoonotic Infectious Diseases, CDC; <sup>3</sup>Division of Bacterial Diseases, National Center for Immunization and Respiratory Diseases, CDC; <sup>4</sup>U.S. Environmental Protection Agency. Corresponding author: Karlyn Beer, kbeer@cdc.gov, 404-718-1151."</p>
<input checked="" type="checkbox"/>	<p>Footnote "callouts" have been indicated in the text with the correct sequential symbols. Footnotes are grouped as "plain text" endnotes beneath the references in the submission. No reference manager or footnote/endnote programs or Word features are included in the submission.</p>
<input checked="" type="checkbox"/>	<p>Tables have been submitted in the formats described in the <a href="#">Instructions for Authors</a>. Tables should be sent in separate files and not embedded in the text.</p>
<input checked="" type="checkbox"/>	<p>In tables, confidence intervals have been headed with (95% CI), and parentheses also placed around each value in the column. Footnote symbols are placed sequentially in the table, beginning with the title and then moving from left to right, row by row in the table.</p>
<input checked="" type="checkbox"/>	<p>Each table and figure has a "complete" title, such that a reader can have a general understanding of what the data represent without reading the text.</p> <p>Ex.: "TABLE 1. Waterborne disease outbreaks associated with drinking water (N = 32), by state/jurisdiction and month of first case onset — Waterborne Disease and Outbreak Surveillance System, United States, 2011–2012"</p>
<input checked="" type="checkbox"/>	<p>Figures have been submitted in the formats described in the <a href="#">Instructions for Authors</a>. Maps have been submitted in one of the proper editable formats.</p>
<input checked="" type="checkbox"/>	<p>For figures, all footnote symbols have been placed in the title. New process requirements do not permit placement of footnote symbols within figures</p>
<input checked="" type="checkbox"/>	<p>The number of figures, tables, and/or boxes included with submission do not exceed the maximum number for the type of submission.</p>



## Vital Signs: Trends in State Suicide Rates — United States, 1999–2016 and Circumstances Contributing to Suicide — 27 States, 2015

Deborah M. Stone, ScD<sup>1</sup>; Thomas R. Simon PhD<sup>1</sup>; Katherine A. Fowler, PhD<sup>1</sup>; Scott R. Kegler, PhD<sup>2</sup>; Keming Yuan, MS<sup>1</sup>; Kristin M. Holland, PhD<sup>1</sup>; Asha Z. Ivey-Stephenson, PhD<sup>1</sup>; Alex E. Crosby, MD<sup>1</sup>

### Abstract

**Introduction:** Suicide rates in the United States have risen nearly 30% since 1999, and mental health conditions are one of several factors contributing to suicide. Examining state-level trends in suicide and the multiple circumstances contributing to it can inform comprehensive state suicide prevention planning.

**Methods:** Trends in age-adjusted suicide rates among persons aged  $\geq 10$  years, by state and sex, across six consecutive 3-year periods (1999–2016), were assessed using data from the National Vital Statistics System for 50 states and the District of Columbia. Data from the National Violent Death Reporting System, covering 27 states in 2015, were used to examine contributing circumstances among decedents with and without known mental health conditions.

**Results:** During 1999–2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases  $>30\%$ . Rates increased significantly among males and females in 34 and 43 states, respectively. Fifty-four percent of decedents in 27 states in 2015 did not have a known mental health condition.

Among decedents with available information, several circumstances were significantly more likely among those without known mental health conditions than among those with mental health conditions, including relationship problems/loss (45.1% versus 39.6%), life stressors (50.5% versus 47.2%), and recent/impending crises (32.9% versus 26.0%), but these circumstances were common across groups.

**Conclusions:** Suicide rates increased significantly across most states during 1999–2016. Various circumstances contributed to suicides among persons with and without known mental health conditions.

**Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach to prevent suicide risk before it occurs, identify and support persons at risk, prevent reattempts, and help friends and family members in the aftermath of a suicide.

### INSIDE

7 QuickStats

Continuing Education examination available at  
[https://www.cdc.gov/mmwr/cme/conted\\_info.html#weekly](https://www.cdc.gov/mmwr/cme/conted_info.html#weekly).



U.S. Department of Health and Human Services  
Centers for Disease Control and Prevention



## Introduction

In 2016, nearly 45,000 suicides (15.6/100,000 population [age-adjusted]) occurred in the United States among persons aged  $\geq 10$  years (1). From 1999 to 2015, suicide rates increased among both sexes, all racial/ethnic groups, and all urbanized areas (2,3). Suicide rates have also increased among persons in all age groups  $< 75$  years, with adults aged 45–64 having the largest percent increase (45%; from 13.2 per 100,000 persons [1999] to 19.2 per 100,000 [2016]) and the greatest number of suicides (32,108 from 1999 to 2016) (1,3). Suicide is the 10th leading cause of death and is one of just three leading causes that are increasing (1,4). In addition, rates of emergency department visits for nonfatal self-harm, a main risk factor for suicide, increased 42% from 2001 to 2016 (1). Together, suicides and self-harm injuries cost the nation approximately \$70 billion in direct medical and work loss costs (1).

The National Strategy for Suicide Prevention (NSSP) (5) calls for a public health approach to suicide prevention with efforts spanning multiple levels (individual, family/relationship, community, and societal). Such a comprehensive approach underscores that suicide is rarely caused by any single factor, but rather, is determined by multiple factors. Despite NSSP guidance, suicide prevention largely focuses on mental health conditions alone by identifying suicidal persons, providing treatment for mental health conditions, and preventing reattempts (6). In addition to mental health conditions and prior suicide attempts, other contributing circumstances

include social and economic problems, access to lethal means (e.g., substances, firearms) among persons at risk, and poor coping and problem-solving skills (5). Expanded awareness of these additional circumstances contributing to suicide risk and action to address them can help reach the national goal, established by the National Action Alliance of Suicide Prevention and the American Foundation for Suicide Prevention, of reducing the annual suicide rate 20% by 2025 (7). To assist states in achieving this goal, CDC analyzed state-specific trends in suicide rates and assessed the multiple contributing factors to suicide; this report presents options for strategies to include in comprehensive suicide prevention efforts that are based on the best available evidence.

## Methods

Suicide rates were analyzed for persons aged  $\geq 10$  years because determining suicidal intent in younger children can be difficult (8). Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases, Tenth Revision*, underlying-cause-of-death codes X60–X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive 3-year aggregate periods spanning 1999–2016 (1999–2001; 2002–2004; 2005–2007;

The *MMWR* series of publications is published by the Center for Surveillance, Epidemiology, and Laboratory Services, Centers for Disease Control and Prevention (CDC), U.S. Department of Health and Human Services, Atlanta, GA 30329-4027.

**Suggested citation:** [Author names; first three, then et al., if more than six.] [Report title]. *MMWR Morb Mortal Wkly Rep* 2018;67:[inclusive page numbers].

### Centers for Disease Control and Prevention

Robert R. Redfield, MD, *Director*  
Anne Schuchat, MD, *Principal Deputy Director*  
Leslie Dauphin, PhD, *Acting Associate Director for Science*  
Joanne Cono, MD, ScM, *Director, Office of Science Quality*  
Chesley L. Richards, MD, MPH, *Deputy Director for Public Health Scientific Services*  
Michael F. Iademarco, MD, MPH, *Director, Center for Surveillance, Epidemiology, and Laboratory Services*

### MMWR Editorial and Production Staff (Weekly)

Charlotte K. Kent, PhD, MPH, *Acting Editor in Chief, Executive Editor*  
Jacqueline Gindler, MD, *Editor*  
Mary Dott, MD, MPH, *Online Editor*  
Teresa F. Rutledge, *Managing Editor*  
Douglas W. Weatherwax, *Lead Technical Writer-Editor*  
Glenn Damon, Soumya Dunworth, PhD, Teresa M. Hood, MS, *Technical Writer-Editors*

Martha F. Boyd, *Lead Visual Information Specialist*  
Maureen A. Leahy, Julia C. Martinroe,  
Stephen R. Spriggs, Tong Yang, *Visual Information Specialists*  
Quang M. Doan, MBA, Phyllis H. King,  
Terraye M. Starr, Moua Yang, *Information Technology Specialists*

### MMWR Editorial Board

Timothy F. Jones, MD, *Chairman*  
Matthew L. Boulton, MD, MPH  
Virginia A. Caine, MD  
Katherine Lyon Daniel, PhD  
Jonathan E. Fielding, MD, MPH, MBA  
David W. Fleming, MD

William E. Halperin, MD, DrPH, MPH  
King K. Holmes, MD, PhD  
Robin Ikeda, MD, MPH  
Rima F. Khabbaz, MD  
Phyllis Meadows, PhD, MSN, RN  
Jewel Mullen, MD, MPH, MPA

Jeff Niederdeppe, PhD  
Patricia Quinlisk, MD, MPH  
Patrick L. Remington, MD, MPH  
Carlos Roig, MS, MA  
William L. Roper, MD, MPH  
William Schaffner, MD




# Summary of Comments on Morbidity and Mortality Weekly Report, Volume 66, Issue Number XX

---


Page: 2


---


 Number: 1      Author: tfh5      Subject: Sticky Note      Date: 5/30/2018 10:24:10 AM  
Could not make your change as written. We avoid using qualifiers such as just, only, considerably, particularly, which are often based on opinions.


Is this correct as written, that they had the largest increase? If not, can we just say having an increase of 45%?

Also, could not find this reported in tables. Is this a "data not shown" situation, in which case we should probably say that (Division or branch or program, data not shown, 201X).


 Author: zaf9      Subject: Sticky Note      Date: 5/30/2018 11:23:26 AM  
It's not correct to say that group has the largest increase but it has 'one of the largest percent increases and the greatest number of suicides.' This is not part of our analysis which is why it's not in the table. I think the references cited should suffice, no?

 Number: 2      Author: tfh5      Subject: Highlight      Date: 5/29/2018 7:53:44 PM


 Number: 3      Author: zaf9      Subject: Cross-Out      Date: 5/30/2018 10:30:07 AM

 Number: 4      Author: zaf9      Subject: Cross-Out      Date: 5/30/2018 10:30:01 AM

 Number: 5      Author: zaf9      Subject: Inserted Text      Date: 5/30/2018 10:30:14 AM

 Number: 6      Author: zaf9      Subject: Inserted Text      Date: 5/30/2018 10:30:42 AM  
, during the period,

 Number: 7      Author: zaf9      Subject: Inserted Text      Date: 5/30/2018 10:31:50 AM

 Number: 8      Author: zaf9      Subject: Inserted Text      Date: 5/30/2018 10:31:58 AM  
per year



2008–2010; 2011–2013; and 2014–2016). Rate estimates were age-adjusted to the U.S. 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same 3-year data aggregates, employing weighted least-squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes.

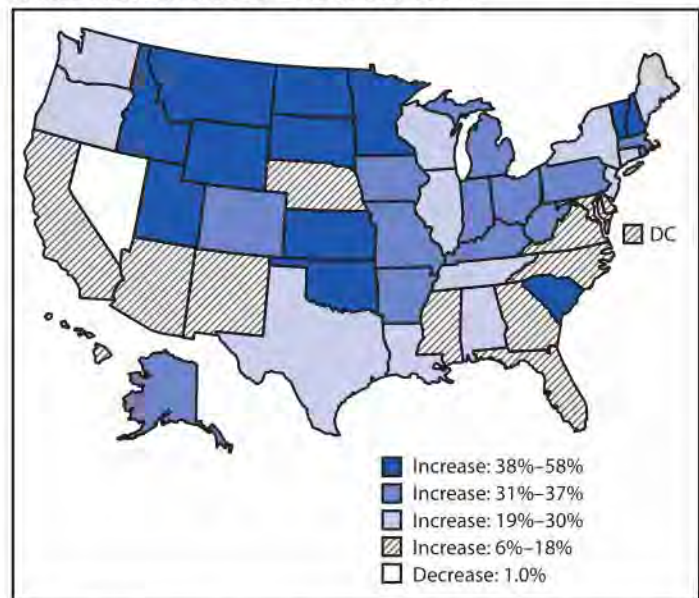
Characteristics of persons aged  $\geq 10$  years who died by suicide, with and without known mental health conditions, and the circumstances surrounding the suicides were compared in the 27 states\* with complete data participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines mental health conditions as disorders and syndromes listed in the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (9), with the exception of problematic alcohol and other substance use that is captured separately in NVDRS. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. A range of circumstances (relationship problems, life stressors, and recent or impending crises) have been identified as potential risk factors for suicide. Circumstances captured by NVDRS are those identified as contributing to suicide in coroner/medical examiner or law enforcement reports, which reflect information provided by family and friends. Decedents could have experienced multiple circumstances. Decedents with and without known mental health conditions were compared using  $\chi^2$ -square tests. Logistic regression analyses estimated adjusted odds ratios (aORs) with 95% confidence intervals (CIs), controlling for age group, sex, and race/ethnicity.

## Results

The most recent overall suicide rates (representing 2014–2016) varied fourfold, from 6.9 (District of Columbia) to 29.2 (Montana) per 100,000 persons per year (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>). Across the study period, rates increased in all states except Nevada (where the rate was consistently high throughout the study period), with absolute increases ranging from 0.8 per 100,000 (Delaware) to 8.1 (Wyoming). Percentage increases in rates ranged from 5.9% (Delaware) to 57.6% (North Dakota), with increases  $>30\%$  observed in 25 states (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>) (Figure).

Modeled suicide rate trends indicated significant increases in 44 states, among males (34 states) and females (43 states), as well as for the United States overall (Supplementary Table;

**FIGURE. Percent change in annual suicide rate,\* by state — United States, from 1999–2001 to 2014–2016**



\* Per 100,000 population, age-adjusted to the 2000 U.S. standard population.

<https://stacks.cdc.gov/view/cdc/53785>). Nationally, the model-estimated average annual percentage change for the overall suicide rate was an increase of 15%. By sex, estimated national rate trends further indicated significant average annual percentage change increases for males (13%) and females (14%) (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>).

Suicide decedents without known mental health conditions (12,039; 10%) were compared with those with known mental health conditions (91,507; 13%) in 14 states. Whereas all decedents were predominately male (76.8%) (Table 1) and non-Hispanic white (83.6%), those without known mental health conditions, relative to those with mental health conditions, were more likely to be male (83.6% versus 68.8%; odds ratio [OR] = 2.3, 95% CI = 2.2–2.5) and belong to a racial/ethnic minority (OR range = 1.2–2.0). Suicide decedents without known mental health conditions also had significantly higher odds of perpetrating homicide followed by suicide (aOR = 2.9, 95% CI = 2.2–3.8). Among decedents aged  $\geq 18$  years, 20.1% of those without known mental health conditions and 15.3% of those with mental health conditions had ever served in the U.S. military or were serving at the time of death.

Whereas firearms were the most common method of suicide overall (48.5%), decedents without known mental health conditions were more likely to die by firearm (55.3%) and less likely to die by hanging/strangulation/suffocation (26.9%) or poisoning (10.4%) than were those with known mental health conditions (40.6%, 31.3%, and 19.8%, respectively). These differences remained significant in the adjusted models.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.



## Page: 3

Number: 1	Author: zaf9	Subject: Sticky Note	Date: 5/30/2018 10:36:14 AM
There are two things being referenced here, problematic alcohol and problematic other substance use so should we say 'that are captured'?			
Number: 2	Author: zaf9	Subject: Inserted Text	Date: 5/30/2018 11:30:12 AM
+1.5% (this has been confirmed with the statistician that we need the + here and where indicated.			
Number: 3	Author: zaf9	Subject: Inserted Text	Date: 5/30/2018 11:30:48 AM
+			
Number: 4	Author: zaf9	Subject: Inserted Text	Date: 5/30/2018 11:31:01 AM
+			
Number: 5	Author: zaf9	Subject: Cross-Out	Date: 5/30/2018 11:26:26 AM
Number: 6	Author: zaf9	Subject: Inserted Text	Date: 5/30/2018 11:26:16 AM
were used to estimate			
Number: 7	Author: zaf9	Subject: Inserted Text	Date: 5/30/2018 10:37:21 AM
chi-square, no capitalization			
Number: 8	Author: tfh5	Subject: Sticky Note	Date: 5/29/2018 8:00:47 PM
These percentages are the only ones in report without decimal places, I think.			
Number: 9	Author: zaf9	Subject: Sticky Note	Date: 5/30/2018 10:40:00 AM
This should be 54.0% and 46.0%			
Number: 9	Author: zaf9	Subject: Cross-Out	Date: 5/30/2018 11:28:13 AM
Number: 10	Author: tfh5	Subject: Highlight	Date: 5/29/2018 7:59:57 PM
Number: 11	Author: zaf9	Subject: Inserted Text	Date: 5/30/2018 11:28:01 AM
reorder so it's sex, age group, and race/ethnicity. This will be commensurate with the order of how results are reported in the table.			
Number: 12	Author: zaf9	Subject: Inserted Text	Date: 5/30/2018 11:34:59 AM
n=			
Number: 13	Author: tfh5	Subject: Highlight	Date: 5/29/2018 8:00:03 PM
Number: 14	Author: zaf9	Subject: Inserted Text	Date: 5/30/2018 11:32:08 AM
for			
Number: 15	Author: zaf9	Subject: Inserted Text	Date: 5/30/2018 11:35:28 AM
n=			
Teresa, I'm adding these because in other parts of the paper (e.g. page 4) we include the n's.			
Number: 16	Author: zaf9	Subject: Inserted Text	Date: 5/30/2018 11:33:42 AM
previously			

**TABLE 1. Selected demographic and descriptive characteristics of suicides among persons aged ≥10 years with and without known mental health conditions — National Violent Death Reporting System, 27 states,\* 2015**

Characteristic	Total (N = 20,446)	Known mental health condition† (n = 9,407)	No known mental health condition (n = 11,039)	P-value	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>§</sup> (95% CI)
<b>Sex</b>						
Male	15,702 (76.8)	6,469 (68.8)	9,233 (83.6)	<0.01	2.3 (2.2–2.5)	NA
Female	4,744 (23.2)	2,938 (31.2)	1,806 (16.4)	<0.01	0.4 (0.4–0.5)	NA
<b>Age (yrs)**</b>						
10–24	2,804 (13.7)	1,211 (12.9)	1,593 (14.4)	<0.01	1.1 (1.1–1.2)	NA
25–44	6,456 (31.6)	3,036 (32.3)	3,420 (31.0)	<0.05	0.9 (0.9–1.0)	NA
45–64	7,718 (37.7)	3,820 (40.6)	3,898 (35.3)	<0.01	0.8 (0.8–0.8)	NA
≥65	3,468 (17.0)	1,340 (14.2)	2,128 (19.3)	<0.01	1.4 (1.3–1.5)	NA
<b>Race/Ethnicity</b>						
White, non-Hispanic	17,102 (83.6)	8,165 (86.8)	8,937 (81.0)	<0.01	0.6 (0.6–0.7)	NA
Black, non-Hispanic	1,228 (6.0)	411 (4.4)	817 (7.4)	<0.01	1.7 (1.5–2.0)	NA
American Indian/Alaska Native, non-Hispanic	378 (1.8)	112 (1.2)	266 (2.4)	<0.01	2.0 (1.6–2.6)	NA
Asian, non-Hispanic	576 (2.8)	235 (2.5)	341 (3.1)	<0.05	1.2 (1.1–1.5)	NA
Hispanic	1,096 (5.4)	463 (4.9)	633 (5.7)	<0.05	1.2 (1.0–1.3)	NA
Other	66 (0.3)	21 (0.2)	45 (0.4)	<0.05	1.8 (1.1–3.1)	NA
<b>Extended demographics</b>						
Ever served in military††	3,429 (17.8)	1,354 (15.3)	2,075 (20.1)	<0.01	1.4 (1.3–1.5)	1.1 (1.0–1.1)
Homeless	240 (1.2)	104 (1.1)	136 (1.3)	<0.01	1.1 (0.9–1.5)	1.2 (0.9–1.5)
<b>Incident type</b>						
Single suicide	20,063 (98.2)	9,318 (99.1)	10,745 (97.4)	<0.01	0.3 (0.3–0.4)	0.4 (0.3–0.5)
Homicide followed by suicide	319 (1.6)	64 (0.7)	255 (2.3)	<0.01	3.5 (2.6–4.5)	2.9 (2.2–3.8)
Multiple suicides	64 (0.3)	25 (0.3)	39 (0.4)	NS	1.3 (0.8–2.2)	1.6 (0.9–2.6)
<b>Method</b>						
Firearm	9,909 (48.5)	3,821 (40.6)	6,088 (55.3)	<0.01	1.8 (1.7–1.9)	1.6 (1.5–1.7)
Hanging/Strangulation/Suffocation	5,907 (28.9)	2,940 (31.3)	2,967 (26.9)	<0.01	0.8 (0.8–0.9)	0.8 (0.7–0.8)
Poisoning	3,003 (14.7)	1,861 (19.8)	1,142 (10.4)	<0.01	0.5 (0.4–0.5)	0.6 (0.6–0.7)
<b>Substance class causing death<sup>§§</sup></b>						
Other (e.g., over-the-counter)	1,021 (34.0)	666 (35.8)	355 (31.1)	<0.01	0.8 (0.7–0.9)	0.9 (0.7–1.0)
Opioids	944 (31.4)	608 (32.7)	336 (29.4)	NS	0.9 (0.7–1.0)	0.9 (0.8–1.1)
Antidepressants	800 (26.6)	644 (34.6)	156 (13.7)	<0.01	0.3 (0.2–0.4)	0.3 (0.3–0.4)
Benzodiazepines	624 (20.8)	468 (25.1)	156 (13.7)	<0.01	0.5 (0.4–0.6)	0.5 (0.4–0.6)
Antipsychotics	219 (7.3)	195 (10.5)	24 (2.1)	<0.01	0.2 (0.1–0.3)	0.2 (0.1–0.3)
Other	1,595 (7.8)	780 (8.3)	815 (7.4)	<0.05	0.9 (0.8–1.0)	0.9 (0.8–1.0)

See table footnotes on next page.

Toxicology testing was less likely to be performed for decedents without known mental health conditions. Among those with toxicology results, decedents without known mental health conditions were less likely to test positive for any substance overall (aOR = 0.8, 95% CI = 0.7–0.8), including opioids (aOR = 0.90, 95% CI = 0.81–0.99), but were more likely to test positive for alcohol (aOR = 1.2, 95% CI = 1.1–1.3).

Information on circumstances surrounding suicide were available for all decedents with mental health conditions (n = 9,407) and approximately 85% of those without known mental health conditions (n = 9,357) in 27 states (Table 2). Persons without known mental health conditions were less likely to have any problematic substance use (aOR = 0.7, 95% CI = 0.7–0.8) than were persons with known mental health conditions. Whereas two thirds of decedents with known mental health conditions had a history of mental health or substance use treatment (67.2%), just over half (54.0%) were in treatment at the time of death.

Decedents without known mental health conditions had a significantly higher likelihood of any relationship problem/loss (45.1%) than did those with known mental health conditions (39.6%), specifically intimate partner problems (30.2% versus 24.1%), arguments/conflicts (17.5% versus 13.6%), and perpetrating interpersonal violence in the past month (3.0% versus 1.4%). Decedents without known mental health conditions were also more likely than were those with known mental health conditions to have experienced any life stressors (50.5% versus 47.2%) such as criminal legal problems (10.7% versus 6.2%) or eviction/loss of home (4.3% versus 3.4%) and were more likely to have had a recent or impending (within the preceding or upcoming 2 weeks, respectively) crisis (a current or acute event thought to contribute to the suicide) (32.9% versus 26.0%). All of these differences remained significant in the adjusted models. Physical health problems and job/financial problems were commonly contributing stressors among both persons without mental health conditions (23.2% and





**TABLE 1. (Continued) Selected demographic and descriptive characteristics of suicides among persons aged ≥10 years with and without known mental health conditions — National Violent Death Reporting System, 27 states,\* 2015**

Characteristic	Total (N = 20,446)	Known mental health condition† (n = 9,407)	No known mental health condition (n = 11,039)	P-value	OR§ (95% CI)	Adjusted OR¶ (95% CI)
<b>Toxicology results</b>						
Any toxicology testing	13,317 (65.1)	6,658 (70.8)	6,659 (60.3)	<0.01	0.6 (0.6–0.7)	0.7 (0.6–0.7)
Positive for ≥1 substance¶¶	9,913 (74.4)	5,192 (78.0)	4,721 (70.9)	<0.01	0.7 (0.6–0.7)	0.8 (0.7–0.8)
<b>Substance detected***</b>						
Alcohol						
Tested	10,950 (53.6)	5,409 (57.5)	5,541 (50.2)	<0.01	0.7 (0.7–0.8)	0.8 (0.7–0.8)
Positive	4,442 (40.6)	2,115 (39.1)	2,327 (42.0)	<0.01	1.1 (1.0–1.2)	1.2 (1.1–1.3)
Opioids						
Tested	8,554 (41.8)	4,258 (45.3)	4,296 (38.9)	<0.01	0.8 (0.7–0.8)	0.8 (0.8–0.9)
Positive	2,279 (26.6)	1,238 (29.1)	1,041 (24.2)	<0.01	0.8 (0.7–0.9)	0.9 (0.8–1.0)
Benzodiazepines						
Tested	8,124 (39.7)	4,226 (44.9)	3,898 (35.3)	<0.01	0.7 (0.6–0.7)	0.7 (0.7–0.8)
Positive	2,464 (30.3)	1,639 (38.8)	825 (21.2)	<0.01	0.4 (0.4–0.5)	0.5 (0.5–0.6)
Cocaine						
Tested	7,978 (39.0)	3,866 (41.1)	4,112 (37.2)	<0.01	0.9 (0.8–0.9)	0.9 (0.9–1.0)
Positive	499 (6.3)	216 (5.6)	283 (6.9)	<0.05	1.2 (1.0–1.5)	1.2 (1.0–1.5)
Amphetamines						
Tested	7,615 (37.2)	3,696 (39.3)	3,919 (35.5)	<0.01	0.9 (0.8–0.9)	0.9 (0.8–0.9)
Positive	736 (9.7)	376 (10.2)	360 (9.2)	NS	0.9 (0.8–1.0)	1.0 (0.8–1.1)
Marijuana						
Tested	6,569 (32.1)	3,127 (33.2)	3,442 (31.2)	<0.01	0.9 (0.9–1.0)	0.9 (0.9–1.0)
Positive	1,471 (22.4)	710 (22.7)	761 (22.1)	NS	1.0 (0.9–1.1)	0.9 (0.8–1.0)
Antidepressants						
Tested	5,425 (26.5)	3,103 (33.0)	2,322 (21.0)	<0.01	0.5 (0.5–0.6)	0.6 (0.6–0.7)
Positive	2,214 (40.8)	1,735 (55.9)	479 (20.6)	<0.01	0.2 (0.2–0.2)	0.2 (0.2–0.3)

**Abbreviations:** CI = confidence interval; NA = not adjusted; NS = not significant; OR = odds ratio.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

† Decedent had been identified as having a current diagnosis of mental health condition in coroner/medical examiner or law enforcement reports.

§ OR reflects the risk among those without known mental health condition relative to those with known mental health condition.

¶ Logistic regression was used to estimate adjusted OR with 95% CIs after controlling for age, sex, race, and ethnicity. Known mental health condition was used as the reference group.

\*\* Decedents were aged ≥10 years, as per standard in the suicide prevention literature.

†† Denominator is decedents aged ≥18 years with reported military service status.

§§ Denominator is decedents who died by poisoning, including overdose.

¶¶ Denominator is decedents with any toxicology testing.

\*\*\* Denominator for each positive group is the number tested for the substance in that group.

15.6%, respectively) and those with mental health conditions (21.4% and 16.8%, respectively). Similarly, among all persons with recent crises, intimate partner problems were the most common types and did not differ by group.

Decedents without known mental health conditions had significantly lower odds of recent release from any institution (aOR = 0.5, 95% CI = 0.4–0.5). Among those recently released, decedents without known mental health conditions were significantly more likely than decedents with mental health problems to have been released from a correctional facility (25.7% versus 8.7%), hospital (43.7% versus 33.0%), or other facility, such as an alcohol/substance use treatment facility (24.2% versus 11.6%). Among decedents with known mental health conditions who were recently released from an institution, 46.7% were released from psychiatric facilities.

Decedents without known mental health conditions were significantly less likely to have a history of suicidal ideation

(23.0%) or prior suicide attempts (10.3%) compared with those with known mental health conditions (40.8% and 29.4%, respectively). Suicide intent was disclosed by 22.4% and 24.5% of persons without and with known mental health conditions, respectively.

## Conclusions and Comments

During 1999–2016, suicide rates increased significantly in 44 states, and 25 states experienced increases >30%. Rates increased significantly among males in 34 states, and females in 43 states. Additional research into the specific causes of these trends is needed. Data from the 27 states participating in NVDRS provide important insight into circumstances surrounding suicide and can help states identify prevention priorities.

Suicidologists regularly state that suicide is not caused by a single factor (5); however, suicide prevention is often



TABLE 2. Circumstances preceding suicide among decedents aged ≥10 years with and without known mental health conditions — National Violent Death Reporting System, 27 states,\* 2015

Characteristic	Total	Known mental health condition <sup>†</sup> no. (%)	No known mental health condition no. (%)	P-value	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>¶</sup> (95% CI)
<b>Suicide with known circumstances</b>	<b>18,764 (91.8)</b>	<b>9,407 (100)</b>	<b>9,357 (84.8)</b>	<b>&lt;0.01</b>	<b>N/A</b>	<b>N/A</b>
<b>Mental health</b>						
Any current diagnosed mental health condition**						
Depression/Dysthymia	—††	7,076 (75.2)	N/A	N/A	N/A	N/A
Anxiety disorder	—††	1,579 (16.8)	N/A	N/A	N/A	N/A
Bipolar disorder	—††	1,431 (15.2)	N/A	N/A	N/A	N/A
Schizophrenia	—††	509 (5.4)	N/A	N/A	N/A	N/A
PTSD	—††	424 (4.5)	N/A	N/A	N/A	N/A
ADD/ADHD	—††	226 (2.4)	N/A	N/A	N/A	N/A
Not specified	—††	760 (8.1)	N/A	N/A	N/A	N/A
Current depressed mood <sup>§§</sup>	7,038 (37.5)	3,962 (42.1)	3,076 (32.9)	<0.01	0.7 (0.6–0.7)	0.7 (0.6–0.7)
<b>Problematic substance use</b>						
Any	5,319 (28.3)	2,976 (31.6)	2,343 (25.0)	<0.01	0.7 (0.7–0.8)	0.7 (0.7–0.8)
Alcohol	3,268 (17.4)	1,862 (19.8)	1,406 (15.0)	<0.01	0.7 (0.7–0.8)	0.7 (0.7–0.8)
Other	3,084 (16.4)	1,768 (18.8)	1,316 (14.1)	<0.01	0.7 (0.7–0.8)	0.7 (0.7–0.8)
<b>Treatment</b>						
Current mental health/substance use treatment	5,141 (27.4)	5,077 (54.0)	64 (0.7)	<0.01	0.01 (0.01–0.01)	0.01 (0.01–0.01)
Ever treated for mental health/substance disorder	6,717 (35.8)	6,323 (67.2)	394 (4.2)	<0.01	0.02 (0.02–0.02)	0.02 (0.02–0.03)
<b>Relationship problems/loss</b>						
Any relationship problem/loss	7,948 (42.4)	3,726 (39.6)	4,222 (45.1)	<0.01	1.3 (1.2–1.3)	1.3 (1.2–1.4)
Intimate partner problem	5,098 (27.2)	2,270 (24.1)	2,828 (30.2)	<0.01	1.4 (1.3–1.5)	1.4 (1.3–1.5)
Perpetrator of interpersonal violence in past month	414 (2.2)	131 (1.4)	283 (3.0)	<0.01	2.2 (1.8–2.7)	2.0 (1.6–2.4)
Victim of interpersonal violence in past month	84 (0.4)	53 (0.6)	31 (0.3)	<0.05	0.6 (0.4–0.9)	0.8 (0.5–1.2)
Family relationship problem	1,671 (8.9)	873 (9.3)	798 (8.5)	NS	0.9 (0.8–1.0)	1.0 (0.9–1.1)
Other relationship problem (nonintimate)	403 (2.1)	202 (2.1)	201 (2.1)	NS	1.0 (0.8–1.2)	1.1 (0.9–1.3)
Argument or conflict (not specified)	2,914 (15.5)	1,278 (13.6)	1,636 (17.5)	<0.01	1.3 (1.2–1.5)	1.4 (1.3–1.5)
Death of a loved one (any)	1,497 (8.0)	826 (8.8)	671 (7.2)	<0.01	0.8 (0.7–0.9)	0.9 (0.8–0.9)
Nonsuicide death	1,181 (6.3)	647 (6.9)	534 (5.7)	<0.01	0.8 (0.7–0.9)	0.9 (0.8–1.0)
Suicide of family or friend	379 (2.0)	217 (2.3)	162 (1.7)	<0.01	0.7 (0.6–0.9)	0.8 (0.7–1.0)
<b>Other life stressors</b>						
Any life stressor	9,171 (48.9)	4,442 (47.2)	4,729 (50.5)	<0.01	1.1 (1.1–1.2)	1.1 (1.0–1.2)
Recent criminal legal problem	1,588 (8.5)	586 (6.2)	1,002 (10.7)	<0.01	1.8 (1.6–2.0)	1.7 (1.5–1.9)
Other legal problem	748 (4.0)	378 (4.0)	370 (4.0)	NS	1.0 (0.8–1.1)	1.0 (0.9–1.2)
Physical health problem	4,179 (22.3)	2,012 (21.4)	2,167 (23.2)	<0.01	1.1 (1.0–1.2)	1.0 (1.0–1.1)
Job/Financial problem <sup>¶¶</sup>	2,941 (16.2)	1,530 (16.8)	1,411 (15.6)	<0.05	0.9 (0.8–1.0)	0.9 (0.8–1.0)
Eviction or loss of home	722 (3.8)	317 (3.4)	405 (4.3)	<0.01	1.3 (1.1–1.5)	1.4 (1.2–1.6)
School problem <sup>***</sup>	162 (19.9)	70 (17.8)	92 (21.9)	NS	1.3 (0.9–1.8)	1.3 (0.9–1.9)
Recent release from an institution <sup>†††</sup>	1,412 (7.6)	941 (10.2)	471 (5.1)	<0.01	0.5 (0.4–0.5)	0.5 (0.4–0.5)
Jail/Prison/Detention facility	203 (14.4)	82 (8.7)	121 (25.7)	<0.01	3.6 (2.7–4.9)	4.5 (3.2–6.4)
Hospital	517 (36.6)	311 (33.0)	206 (43.7)	<0.01	1.6 (1.3–2.0)	1.3 (1.0–1.7)
Psychiatric hospital/institution	469 (33.2)	439 (46.7)	30 (6.4)	<0.01	0.1 (0.1–0.1)	0.1 (0.1–0.1)
Other (includes alcohol/SU treatment facilities)	223 (15.8)	109 (11.6)	114 (24.2)	<0.01	2.4 (1.8–3.3)	2.5 (1.8–3.3)

See table footnotes on next page.

oriented toward mental health conditions alone with regard to downstream identification of suicidal persons, treatment of mental health conditions, and prevention of reattempts. This study found that approximately half of suicide decedents in NVDRS did not have a known mental health condition, indicating that additional focus on nonmental health factors further upstream could provide important information for a public health approach (10). Those without a known mental health condition suffered more from relationship problems and other life stressors such as criminal/legal matters, eviction/loss of home, and recent or impending crises.

Similarly, persons with mental health conditions also often experienced other factors, such as relationship problems and other life stressors such as job/financial or physical health problems that contributed to their suicide. These findings point to the need to both prevent the circumstances associated with the onset of mental health conditions in the first place and support persons with known mental health conditions to decrease their risk for poor outcomes (11). Two thirds of suicide decedents with mental health conditions had a history of treatment for mental health or substance use disorders, with approximately half in treatment when they died. This finding suggests the

---

1	Number: 1	Author: zaf9	Subject: Inserted Text	Date: 5/30/2018 10:49:54 AM
---	-----------	--------------	------------------------	-----------------------------

---

2	Number: 2	Author: zaf9	Subject: Cross-Out	Date: 5/30/2018 10:50:22 AM
---	-----------	--------------	--------------------	-----------------------------

---

3	Number: 3	Author: zaf9	Subject: Cross-Out	Date: 5/30/2018 11:37:15 AM
---	-----------	--------------	--------------------	-----------------------------

---



**TABLE 2. (Continued) Circumstances preceding suicide among decedents aged  $\geq 10$  years with and without known mental health conditions — National Violent Death Reporting System, 27 states,\* 2015**

Characteristic	Total	Known mental health condition <sup>†</sup> no. (%)	No known mental health condition no. (%)	P-value	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>¶</sup> (95% CI)
<b>Crisis within past or upcoming 2 weeks<sup>§§§</sup></b>	<b>5,525 (29.4)</b>	<b>2,444 (26.0)</b>	<b>3,081 (32.9)</b>	<b>&lt;0.01</b>	<b>1.4 (1.3–1.5)</b>	<b>1.4 (1.3–1.5)</b>
Intimate partner problem	1,968 (35.6)	854 (34.9)	1,114 (36.2)	NS	1.1 (0.9–1.2)	1.1 (0.9–1.2)
Physical health problem	739 (13.4)	315 (12.9)	424 (13.8)	NS	1.1 (0.9–1.3)	1.0 (0.8–1.2)
Criminal legal problem	621 (11.2)	203 (8.3)	418 (13.6)	<0.01	1.7 (1.5–2.1)	1.6 (1.3–1.9)
Family relationship problem	430 (7.8)	212 (8.7)	218 (7.1)	<0.05	0.8 (0.7–1.0)	0.9 (0.7–1.1)
Job problem	354 (6.4)	191 (7.8)	163 (5.3)	<0.01	0.7 (0.5–0.8)	0.7 (0.5–0.8)
<b>Suicide event/history</b>						
Left a note	6,468 (34.5)	3,182 (33.8)	3,286 (35.1)	NS	1.1 (1.0–1.1)	1.2 (1.1–1.2)
Disclosed suicide intent	4,405 (23.5)	2,306 (24.5)	2,099 (22.4)	<0.01	0.9 (0.8–1.0)	0.9 (0.8–0.9)
History of ideation	5,990 (31.9)	3,838 (40.8)	2,152 (23.0)	<0.01	0.4 (0.4–0.5)	0.4 (0.4–0.5)
History of attempts	3,732 (19.9)	2,770 (29.4)	962 (10.3)	<0.01	0.3 (0.3–0.3)	0.3 (0.3–0.3)

**Abbreviations:** ADD/ADHD = attention deficit disorder/attention deficit hyperactivity disorder; CI = confidence interval; N/A = not applicable; NS = not significant; OR = odds ratio; PTSD = posttraumatic stress disorder; SU = substance use.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

<sup>†</sup> Decedent had been identified as having a current diagnosis of mental health condition in coroner/medical examiner or law enforcement reports.

<sup>§</sup> OR reflects the risk among those without known mental health condition relative to those with known mental health condition.

<sup>¶</sup> Logistic regression was used to estimate adjusted OR with 95% CIs after controlling for age, sex, race, and ethnicity. Known mental health condition was the reference group.

<sup>\*\*</sup> Includes decedents with one or more diagnosed current mental health conditions, which are not mutually exclusive. Therefore, sums of percentages for the diagnosed conditions exceed 100%. Denominator includes the number of decedents with one or more current diagnosed mental health conditions.

<sup>††</sup> Decedents with no known mental health conditions do not have mental health conditions; therefore total values are equal to the known mental health condition values.

<sup>§§</sup> Not a diagnosis.

<sup>¶¶</sup> Denominator is decedents aged  $\geq 18$  years.

<sup>\*\*\*</sup> Denominator is decedents aged 10–18 years.

<sup>†††</sup> Denominator of institution subgroup is decedents with recent release from an institution. Recent release from an institution is defined as having occurred within the past month.

<sup>§§§</sup> Denominator of crisis subgroup is decedents with any crisis within past or upcoming 2 weeks. Crises depicted here represent the most commonly occurring categories.

need for additional safety supports, including broader implementation of affordable and effective treatment modalities, such as doctor-patient collaborative care models and proven cognitive-behavioral therapies. In addition, increased access to behavioral health providers in underserved areas is needed, as is expansion of health care systems that integrate physical and behavioral health, with a priority on suicide prevention and patient safety, especially through care transitions (12).

Comprehensive statewide suicide prevention activities are needed to address the full range of factors contributing to suicide. Prevention strategies include strengthening economic supports (e.g., housing stabilization policies, household financial support); teaching coping and problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in life; promoting social connectedness to increase a sense of belonging and access to informational, tangible, emotional, and social support; and identifying and better supporting persons at risk (e.g., military veterans, persons with physical/mental health conditions) (12). Other strategies include creating protective environments (e.g., reducing access to lethal means among persons at risk for suicide, creating organizational and workplace policies to promote help-seeking, easing transitions

into and out of work for persons with mental health conditions and other life challenges), strengthening access and delivery of care, supporting family and friends after a suicide, and assuring the media follow safe reporting recommendations (12). Some states, such as Colorado, are planning to implement such a comprehensive approach to suicide prevention (10).

The findings in this report are subject to at least three limitations. First, in the state-level analysis, rankings for four states (Maryland, Massachusetts, Rhode Island, and Utah) might have been affected by large proportions of injury deaths of undetermined intent (potentially biasing reported suicide rates downward) or decreased percentages of such deaths over time (potentially biasing estimated rate trends upward). Second, NVDRS is not yet nationally representative; the 27 states included represent 49.6% of the population (<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml>). Finally, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the extent of informant knowledge can affect data completeness and accuracy. Studies that include more in-depth interviews with next-of-kin often identify greater attributions to mental disorders (13); however, many methodological variations

---

Number: 1 to	Author: zaf9	Subject: Inserted Text	Date: 5/30/2018 11:39:36 AM
-----------------	--------------	------------------------	-----------------------------

---



## References

## Summary

## What is already known about this topic?

In 2016, nearly 45,000 persons died by suicide in the United States. Mental health conditions are one of several contributors to suicide.

## What is added by this report?

During 1999–2016, suicide rates increased in nearly every state, including >30% increases in 25 states. 2015 data from 27 states indicate 54% of suicide decedents were not known to have mental health conditions. <sup>1</sup>Other contributors included <sup>2</sup>relationship, substance use, health, and job or financial problems, <sup>3,4</sup>among others, <sup>5,6</sup>

## What are the implications for public health practice?

A comprehensive approach using proven prevention strategies, such as those in CDC's Technical Package for Suicide Prevention, can help reach the national goal of reducing the annual suicide rate 20% by 2025.

across studies exist (14). It is likely that some persons without known mental health conditions in the current study were experiencing mental health challenges that were unknown, and hence underreported by key informants. Nonetheless, the high prevalence of diverse contributing circumstances among those with and without known mental health conditions suggests the importance of addressing the broad range of factors that contribute to suicide.

Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are available. States and communities can use data from NCHS and resources such as CDC's Preventing Suicide: A Technical Package of Policy, Programs, and Practices (12) to better understand suicide in their populations, prioritize evidence-based comprehensive suicide prevention, and save lives.

## Acknowledgments

Robert Anderson, Holly Hedegaard, Margaret Warner, Division of Vital Statistics, National Center for Health Statistics, CDC.

## Conflict of Interest

No conflicts of interest were reported.

<sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis, Research, and Practice Integration, National Center for Injury Prevention and Control, CDC.

Corresponding author: Deborah M. Stone, dstone3@cdc.gov, 770-488-3942.

1. CDC. Web-based Injury Statistics Query and Reporting System (WISQARS). Atlanta, GA: National Center for Injury Prevention and Control; 2018. <https://www.cdc.gov/injury/wisqars/index.html>
2. Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide trends among and within urbanization levels by sex, race/ethnicity, age group, and mechanism of death—United States, 2001–2015. *MMWR Surveill Summ* 2017;66(No. SS-18). <https://doi.org/10.15585/mmwr.ss6618a1>
3. Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999–2014. NCHS data brief no 241. Hyattsville, MD: US Department of Health and Human Services, CDC, National Center for Health Statistics; 2016. <https://www.cdc.gov/nchs/data/databriefs/db241.pdf>
4. Kochanek K, Murphy S, Xu J, Arias E. Mortality in the United States, 2016. NCHS data brief no 293. Hyattsville, MD: US Department of Health and Human Services, CDC, National Center for Health Statistics; 2017. <https://www.cdc.gov/nchs/data/databriefs/db293.pdf>
5. Office of the Surgeon General; National Action Alliance for Suicide Prevention. 2012 National strategy for suicide prevention: goals and objectives for action. Washington, DC: US Department of Health and Human Services, Office of the Surgeon General; 2012. <https://www.surgeongeneral.gov/library/reports/national-strategy-suicide-prevention/full-report.pdf>
6. Zalsman G, Hawton K, Wasserman D, et al. Suicide prevention strategies revisited: 10-year systematic review. *Lancet Psychiatry* 2016;3:646–59. [https://doi.org/10.1016/S2215-0366\(16\)30030-X](https://doi.org/10.1016/S2215-0366(16)30030-X)
7. Torguson K, O'Brien A. Leading suicide prevention efforts unite to address rising national suicide rate. Washington, DC: American Foundation for Suicide Prevention; 2017. <https://afsp.org/leading-suicide-prevention-efforts-unite-address-rising-national-suicide-rate/>
8. Crepeau-Hobson F. The psychological autopsy and determination of child suicides: a survey of medical examiners. *Arch Suicide Res* 2010;14:24–34. <https://doi.org/10.1080/13811110903479011>
9. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5). Washington, DC: American Psychiatric Association; 2013.
10. Caine ED, Reed J, Hindman J, Quinlan K. Comprehensive, integrated approaches to suicide prevention: practical guidance. *Inj Prev* 2017. Epub December 20, 2017. <https://doi.org/10.1136/injuryprev-2017-042366>
11. World Health Organization. Risks to mental health: an overview of vulnerabilities and risk factors. Geneva, Switzerland: World Health Organization; 2012.
12. Stone DM, Holland KM, Bowles BN, Crosby AE, Davis SP, Wilkins N. Preventing suicide: a technical package of policy, programs, and practice. Atlanta, GA: US Department of Health and Human Services, CDC; 2017. <https://www.cdc.gov/violenceprevention/pdf/suicidetechnicalpackage.pdf>
13. Milner A, Svetlicic J, De Leo D. Suicide in the absence of mental disorder? A review of psychological autopsy studies across countries. *Int J Soc Psychiatry* 2013;59:545–54. <https://doi.org/10.1177/0020764012444259>
14. Pouliot L, De Leo D. Critical issues in psychological autopsy studies. *Suicide Life Threat Behav* 2006;36:491–510. <https://doi.org/10.1521/suli.2006.36.5.491>

	Number: 1	Author: zaf9	Subject: Cross-Out	Date: 5/30/2018 11:41:07 AM
	Number: 2 R	Author: zaf9	Subject: Inserted Text	Date: 5/30/2018 11:41:14 AM
	Number: 3	Author: zaf9	Subject: Cross-Out	Date: 5/30/2018 11:41:26 AM
	Number: 4 are	Author: zaf9	Subject: Inserted Text	Date: 5/30/2018 11:41:40 AM
	Number: 5	Author: zaf9	Subject: Inserted Text	Date: 5/30/2018 11:42:48 AM
	Number: 6 the other contributing factors.	Author: zaf9	Subject: Inserted Text	Date: 5/30/2018 11:42:34 AM
	Number: 7 Should this title be italicized?	Author: zaf9	Subject: Sticky Note	Date: 5/30/2018 10:52:37 AM
	Number: 8 I think this should be capital 'a', no? This title comes up at least twice in the document so want to make sure it's written correctly. Lower case 'a' looks odd to me but i'm not sure of the technical way to write this.	Author: zaf9	Subject: Sticky Note	Date: 5/30/2018 10:53:44 AM
	Number: 9	Author: zaf9	Subject: Cross-Out	Date: 5/30/2018 11:05:27 AM
	Number: 10 Link still isn't working but i think it's just broken. Here's another link but not sure it conforms to the style-- <a href="https://onlinelibrary.wiley.com/doi/full/10.1521/suli.2006.36.5.491">https://onlinelibrary.wiley.com/doi/full/10.1521/suli.2006.36.5.491</a> If not, just leave it out. Thanks!	Author: zaf9	Subject: Sticky Note	Date: 5/30/2018 11:06:30 AM
	Number: 11	Author: zaf9	Subject: Cross-Out	Date: 5/30/2018 11:05:15 AM



**Short Title:** Vital Signs: Contributing Circumstances to Suicide and Increasing Trends in State Suicide Rates

Deborah M. Stone, ScD;<sup>1</sup> Thomas R. Simon PhD;<sup>1</sup> Katherine A. Fowler, PhD;<sup>1</sup> Scott R. Kegler, PhD;<sup>2</sup> Keming Yuan, MS;<sup>1</sup> Kristin M. Holland, PhD;<sup>1</sup> Asha Z. Ivey-Stephenson, PhD;<sup>1</sup> Alex E. Crosby, MD<sup>1</sup>

**Background:** Suicide rates in the United States have risen nearly 30% since 1999. Mental health problems (MHP) are just one factor contributing to suicide. Examining state-level trends in, and the multiple contributing circumstances to, suicide can inform comprehensive state suicide prevention planning.

**Methods:** Trends in age-adjusted suicide rates among people aged ≥10 years, by state and sex, across six consecutive three-year periods (1999-2016), were assessed using data from the National Vital Statistics System for 50 states and Washington, D.C. Data from the National Violent Death Reporting System, covering 27 states in 2015, were used to examine contributing circumstances among decedents with and without known mental health problems (MHP).

**Results:** From 1999-2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases of more than 30%. Rates increased significantly among males and females in 34 and 43 states, respectively. In 2015, more than half (54%) of decedents in 27 states did not have a known MHP. Among people with circumstance information, several circumstances, including relationship problems/loss (45.1% vs 39.6%), life stressors (54.2% vs 49.7%), and recent/impending crises (32.9% vs 26.0%) were significantly more likely among those without a known MHP than decedents with MHP, but were common across groups.

**Conclusions:** Suicide rates increased significantly across most states from 1999-2016. Various circumstances contributed to suicides among people with and without known MHP.

**Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach to prevent suicide risk before it occurs, identify and support people at risk, prevent reattempts, and help friends/family after a suicide occurs.

## INTRODUCTION

### BACKGROUND AND PURPOSE

In 2016, nearly 45,000 suicides (15.6/100,000 [age-adjusted]) occurred in the United States (U.S.), among people ≥10 years old (1). Between 1999 and 2015, suicide rates increased across sexes, racial/ethnic groups, and urbanization levels (2, 3). Suicide is the 10<sup>th</sup> leading cause of death and is one of just three leading causes that are *increasing* (1, 4). Additionally, rates of emergency department visits for nonfatal self-harm, a key risk factor for suicide, increased nearly 45% between 2001 and 2015 (1). Together, suicides and self-harm injuries cost the nation more than \$69 billion in direct medical and work loss costs (1).

The *National Strategy for Suicide Prevention (NSSP)* (5) calls for a public health approach to suicide prevention with efforts spanning across multiple levels (i.e., individual, family/relationship, community, and societal). Such a comprehensive approach underscores that suicide is rarely caused by any single factor, but rather, is multi-determined. Despite the NSSP guidance, suicide prevention largely focuses on identifying suicidal people, providing treatment for mental health problems (MHP) and preventing re-attempts (6). In addition to MHP and prior attempts, other contributing circumstances to suicide include social and economic problems, access to lethal means (e.g., substances, firearms) among people at risk, and poor coping and problem-solving skills (5). Expanded awareness of these additional circumstances contributing to suicide risk and action to address them, can help reach the nation's goal of reducing suicide rates 20% by 2025 (7). To assist states in achieving this goal,

this study analyzes state-specific trends in suicide rates, assesses the multiple contributing factors to suicide, and provides options for multi-level comprehensive suicide prevention based on the best available evidence.

## METHODS

Suicide rates were analyzed for people aged  $\geq 10$  years only, as determining suicidal intent in younger children can be difficult (8). Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases 10<sup>th</sup> Revision*, underlying-cause-of death codes X60-X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods spanning 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Characteristics and circumstances of suicide decedents  $\geq 10$  years old, with and without known MHP, were compared in the 27 states with complete data participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines MHP as disorders and syndromes listed in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (9), with the exception of alcohol and other substance dependence, which are captured separately in NVDRS. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known MHP were compared using Chi-square tests. Logistic regression analyses estimated adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and race/ethnicity.

## RESULTS

The most recent overall suicide rates (representing 2014-2016) varied four-fold, from 6.9 (D.C.) to 29.2 (Montana) per 100,000 persons per year (Table 1). Across the study period, rates increased in all states, except Nevada (which had a consistently high rate throughout), with absolute increases ranging from +0.8 (Delaware) to +8.1 (Wyoming) per 100,000. Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with increases of more than 30% observed in 25 states (Table 1, Figure 1).

Modeled suicide rate trends indicated significant increases for 44 states, for males (34 states) and females (43 states), as well as for the U.S. overall (Table 1). Nationally, the model-estimated AAPC for the overall suicide rate was +1.5%. By sex, estimated national rate trends further indicated significant increases for males (AAPC +1.1%) and females (AAPC +2.6%).

Suicide decedents without known MHP (N=11,039) were compared to those with MHP (N=9,407) in 27 states. While all decedents were predominately male (Table 2; 76.8%) and non-Hispanic white (83.6%), those without known MHP, relative to those with MHP, were more likely male (83.6% vs. 68.8%; odds ratio (OR)=2.3, 95% CI = 2.2-2.5) and racial/ethnic minorities (OR range: 1.2-2.0). Suicide decedents without known MHP also had significantly greater odds of perpetrating homicide-suicide (adjusted odds ratio aOR = 2.9, 95% CI = 2.2-3.8). Among adult decedents, 20.1% of those without known MHP and 15.3% of those with MPH ever served, or were currently serving, in the U.S. military.

While firearms were the most common method of suicide used overall (48.5%) and for both groups, decedents without known MHP were more likely to die by firearm (55.3% vs. 40.6%) and less likely to die by



84 hanging/strangulation/suffocation (26.9% vs 31.3%) or poisoning (10.4% vs 19.8%) than those with known MHP.  
85 These differences remained significant in the adjusted models.

86 Decedents without known MHP were less likely to receive toxicology testing. Among those with toxicology  
87 results, decedents without known MHP were less likely to test positive for any substance overall (aOR=0.8, 95%  
88 CI=0.7-0.8), such as opioids (aOR=.90 95% CI=0.81-.99) but more likely to test positive for alcohol (aOR=1.2, 95%  
89 CI=1.1-1.3).

90 All suicide decedents with MHP (N=9,407) and approximately 85% without known MHP (N=9,357) had available  
91 circumstances information (Table 3). People without known MHP were less likely to have any substance abuse  
92 problems (aOR=0.7, 95% CI=0.7-0.8). While two-thirds of those with known MHP had a history of mental health  
93 or substance abuse treatment (67.2%), just over half (54.0%) were in current treatment.

94 Decedents without, versus those with, known MHP, had significantly greater likelihood of any relationship  
95 problem/loss (45.1% vs. 39.6%), specifically intimate partner problems (30.2% vs. 24.1%), arguments/conflicts  
96 (17.5% vs. 13.6%), and recently perpetrating interpersonal violence (3.0% vs. 1.4%). They also were more likely  
97 to have experienced any life stressors (54.2% vs 49.7%), such as criminal-legal problems (10.7% vs. 6.2%), or  
98 eviction/loss of home (4.3% vs. 3.4%) and were more likely to have had a crisis within the preceding or  
99 upcoming two weeks (32.9% vs. 26.0%). All of these differences remained significant in the adjusted models.  
100 Among all people with crises, intimate partner problems were the most common types and did not differ by  
101 group. Similarly, among people without versus with MHP, physical health problems (23.2% and 21.4%) and  
102 job/financial problems (15.6% and 16.8%) were commonly experienced by both groups.

103 Decedents without known MHP had significantly lower odds of recent release from any institution (aOR=0.5,  
104 95% CI=0.4-0.5), but among those who were recently released (5.1%), they were significantly more likely to be  
105 released from a correctional facility (25.7% vs. 8.7%), hospital (43.7% vs. 33.0%), or other facility (e.g.,  
106 alcohol/substance treatment) (aOR=2.5 95% CI=1.8-3.3), than those with a known MHP. Among decedents with  
107 known MHP who were recently released from an institution (10.2%), 46.7% of this group were released from  
108 psychiatric facilities.

109 Decedents without known MHP, compared to those with MHP, were significantly less likely to have a history of  
110 suicidal ideation (23.0% vs. 40.8%) and prior suicide attempts (10.3% vs. 29.4%). More than one in five people in  
111 both groups disclosed suicide intent (22.4% vs. 24.5%).

## 112 **Conclusions and Comments**

113 From 1999-2016, 44 states saw significant increases in suicide rates and 25 states experienced substantial  
114 increases in suicide rates of more than 30%. Rates increased significantly among males, in 34 states, and  
115 females, in 43 states. This finding is consistent with prior research showing a decreasing gender gap in male-  
116 female suicide rates between 1999-2014 (3). Additional research into the specific causes of these trends is  
117 necessary. Fortunately, data from the 27 states participating in NVDRS provides important insight into suicide  
118 circumstances and can help states identify prevention priorities.

119 Suicidologists regularly state that suicide is not caused by a single factor; (5) however, suicide prevention is often  
120 oriented towards downstream identification of suicidal people, treatment of MHP and prevention of reattempts.  
121 Additional focus on non-mental health factors, further upstream, is essential to a public health approach (10), as  
122 the current study found that more than half of suicide decedents in NVDRS did *not* have a known MHP. This  
123 group suffered more from relationship problems and other life stressors such as criminal-legal matters,  
124 eviction/loss of home, and recent or impending crises.

Similarly, people with MHP often experienced relationship problems and other life stressors such as job/financial and/or physical health problems. These findings point to the need to both help people manage the conditions associated with mental health problems in the first place, and to support people with known MHP to decrease their risk of poor outcomes (11). Two-thirds of this group had a history of any mental health and/or substance abuse treatment, with over half in treatment when they died. This suggests the need for additional safety supports, including broader implementation of affordable and effective treatment modalities such as doctor-patient collaborative care models and proven cognitive-behavioral therapies. Additionally, greater access to behavioral health providers in underserved areas is needed, as is expansion of healthcare systems needed that integrates physical and behavioral health with a priority on suicide prevention and patient safety, especially through care transitions (12).

Comprehensive statewide suicide prevention activities are needed to address the full range of factors contributing to suicide. Prevention strategies include: strengthening economic supports (e.g., housing stabilization policies, household financial support); teaching coping and problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in life; promoting social connectedness to increase a sense of belongingness and access to informational, tangible, emotional, and social support; and identifying and better supporting people at risk (e.g., Veterans, people with physical/mental health problems) (12). Other strategies include creating protective environments (e.g., reducing access to lethal means among people at risk, creating organizational and workplace policies to promote help-seeking, easing transitions into and out of work for people with MHP and other life challenges), supporting family and friends after a suicide, and assuring safe reporting by the media in order to prevent suicide contagion (12). Some states, such as Colorado, are planning to implement such a comprehensive approach to suicide prevention (10).

These findings have at least three limitations. In the state-level analysis, rankings for four states (MD, MA, RI, UT) might have been impacted by large proportions of injury deaths of undetermined intent (potentially biasing reported suicide rates downward), or decreased percentages of such deaths over time (potentially biasing estimated rate trends upward). Second, NVDRS is not yet nationally representative; the 27 states included represent 49.6% of the population

(<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml>).

Third, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the extent of informant knowledge can impact data completeness and accuracy. Studies including more in-depth interviews with next-of-kin often see greater attributions to mental disorders (13), however many methodological variations across studies exist (14). It is likely that some people without known MHP in the current study were experiencing mental health challenges that were unknown, and hence underreported by key informants. Nonetheless, the high prevalence of diverse contributing circumstances among those with and without known MHP suggests the importance of addressing the broad range of factors that contribute to suicide.

Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are available. States and communities can use data from NVDRS and resources such as CDC's *Preventing Suicide: a Technical Package of Policies, Programs, and Practices* (12) to better understand their suicide problem, prioritize evidence-based comprehensive suicide prevention, and save lives.

## Acknowledgments



166 The authors acknowledge Robert Anderson, Holly Hedegaard, and Margaret Warner from the Division of Vital  
167 Statistics, National Center for Health Statistics, CDC, for their statistical consultation.

168  
169 **Conflict of Interest** No conflicts of interest were reported.

170  
171 **Corresponding author:** Deborah M. Stone, [dstone3@cdc.gov](mailto:dstone3@cdc.gov), 770-488-3942

172 **Author Affiliations:**

173 <sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis,  
174 Research, and Practice Integration, National Center for Injury Prevention and Control, CDC

175 **References:**

- 176 1. Centers for Disease Control and Prevention. Web-based Injury Statistics Query and Reporting System  
177 (WISQARS). Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018. In.
- 178 2. Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide Trends Among and  
179 Within Urbanization Levels by Sex, Race/Ethnicity, Age Group, and Mechanism of Death - United States,  
180 2001-2015. *MMWR Surveill Summ* 2017;66(18):1-16.
- 181 3. Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999-2014. In: US Department  
182 of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health  
183 Statistics Hyattsville, MD; 2016.
- 184 4. Kochanek K, Murphy S, Xu J, Arias E. Mortality in the United States, 2016. *NCHS Data Brief*, no 293.  
185 National Center for Health Statistics 2017.
- 186 5. Office of the Surgeon General, National Action Alliance for Suicide Prevention. 2012 National strategy for  
187 suicide prevention: Goals and objectives for action: a report of the US Surgeon General and of the National  
188 Action Alliance for Suicide Prevention. 2012.
- 189 6. Zalsman G, Hawton K, Wasserman D, van Heeringen K, Arensman E, Sarchiapone M, et al. Suicide  
190 prevention strategies revisited: 10-year systematic review. *The Lancet Psychiatry* 2016;3(7):646-659.
- 191 7. Torguson K, O'Brien A. Leading Suicide Prevention Efforts Unite to Address Rising National Suicide Rate. In.  
192 Washington, D.C.; 2017.
- 193 8. Crepeau-Hobson F. The Psychological Autopsy and Determination of Child Suicides: A Survey of Medical  
194 Examiners. *Archives of Suicide Research* 2010;14(1):24-34.
- 195 9. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5®):  
196 American Psychiatric Pub; 2013.
- 197 10. Caine ED, Reed J, Hindman J, Quinlan K. Comprehensive, integrated approaches to suicide prevention:  
198 practical guidance. *Injury prevention* 2017;injuryprev-2017-042366.
- 199 11. World Health Organization. Risks to mental health: An overview of vulnerabilities and risk factors. Geneva:  
200 WHO 2012.
- 201 12. Stone DM, Holland KM, Bartholow BN, Crosby AE, Davis SP, Wilkins N. Preventing suicide: A technical  
202 package of policies, programs, and practice. 2017.
- 203 13. Milner A, Svetcic J, De Leo D. Suicide in the absence of mental disorder? A review of psychological autopsy  
204 studies across countries. *Int J Soc Psychiatry* 2013;59(6):545-54.
- 205 14. Pouliot L, De Leo D. Critical issues in psychological autopsy studies. *Suicide Life Threat Behav*  
206 2006;36(5):491-510.

207 **Attachments:**

208 *MMWR Tables\_V1\_4.10.18\_4.30pm\_DS*

209 **Word Count:** 1903/1800

# **Title:** Vital Signs: Contributing Circumstances to Suicide and Increasing Trends in State Suicide Rates

Deborah M. Stone, ScD;<sup>1</sup> Thomas R. Simon PhD;<sup>1</sup> Katherine A. Fowler, PhD;<sup>1</sup> Scott R. Kegler, PhD;<sup>2</sup> Keming Yuan, MS;<sup>1</sup> Kristin M. Holland, PhD;<sup>1</sup> Asha Z. Ivey-Stephenson, PhD;<sup>1</sup> Alex E. Crosby, MD<sup>1</sup>

**Background:** Suicide rates in the United States have risen nearly 30% since 1999. Mental health problems (MHP) are just one factor contributing to suicide. Examining state-level trends in, and the multiple contributing circumstances to, suicide can inform comprehensive state suicide prevention planning.

**Methods:** Trends in age-adjusted suicide rates among people aged ≥10 years, by state and sex, across six consecutive three-year periods (1999-2016), were assessed using data from the National Vital Statistics System for 50 states and Washington, D.C. Data from the National Violent Death Reporting System, covering 27 states in 2015, were used to examine contributing circumstances among decedents with and without known mental health problems (MHP).

**Results:** From 1999-2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases of more than 30%. Rates increased significantly among males and females in 34 and 43 states, respectively. In 2015, more than half (54%) of decedents in 27 states did not have a known MHP. Among people with circumstance information, several circumstances, including relationship problems/loss (45.1% vs 39.6%), life stressors (54.2% vs 49.7%), and recent/impending crises (32.9% vs 26.0%) were significantly more likely among those without a known MHP than decedents with MHP, but were common across groups.

**Conclusions:** Suicide rates increased significantly across most states from 1999-2016. Various circumstances contributed to suicides among people with and without known MHP.

**Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach to prevent suicide risk before it occurs, identify and support people at risk, prevent reattempts, and help friends/family after a suicide occurs.

## **INTRODUCTION**

### **BACKGROUND AND PURPOSE**

In 2016, nearly 45,000 suicides (15.6/100,000 [age-adjusted]) occurred in the United States (U.S.), among people ≥10 years old (1). Between 1999 and 2015, suicide rates increased across sexes, racial/ethnic groups, and urbanization levels (2, 3). Suicide is the 10<sup>th</sup> leading cause of death and is one of just three leading causes that are *increasing* (1, 4). Additionally, rates of emergency department visits for nonfatal self-harm, a key risk factor for suicide, increased nearly 45% between 2001 and 2015 (1). Together, suicides and self-harm injuries cost the nation more than \$69 billion in direct medical and work loss costs (1).

The *National Strategy for Suicide Prevention (NSSP)* (5) calls for a public health approach to suicide prevention with efforts spanning across multiple levels (i.e., individual, family/relationship, community, and societal). Such a comprehensive approach underscores that suicide is rarely caused by any single factor, but rather, is multi-determined. Despite the NSSP guidance, suicide prevention largely focuses on identifying suicidal people, providing treatment for mental health problems (MHP) and preventing re-attempts (6). In addition to MHP and prior attempts, other contributing circumstances to suicide include social and economic problems, access to lethal means (e.g., substances, firearms) among people at risk, and poor coping and problem-solving skills (5). Expanded awareness of these additional circumstances contributing to suicide risk and action to address them,



can help reach the nation's goal of reducing suicide rates 20% by 2025 (7). To assist states in achieving this goal, this study analyzes state-specific trends in suicide rates, assesses the multiple contributing factors to suicide, and provides options for multi-level comprehensive suicide prevention based on the best available evidence.

## METHODS

Suicide rates were analyzed for people aged  $\geq 10$  years only, as determining suicidal intent in younger children can be difficult (8). Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases 10<sup>th</sup> Revision*, underlying-cause-of death codes X60-X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods spanning 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Characteristics and circumstances of suicide decedents  $\geq 10$  years old, with and without known MHP, were compared in the 27 states with complete data participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines MHP as disorders and syndromes listed in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (9), with the exception of alcohol and other substance dependence, which are captured separately in NVDRS. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known MHP were compared using Chi-square tests. Logistic regression analyses estimated adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and race/ethnicity.

## RESULTS

The most recent overall suicide rates (representing 2014-2016) varied four-fold, from 6.9 (D.C.) to 29.2 (Montana) per 100,000 persons per year (Table 1). Across the study period, rates increased in all states, except Nevada (which had a consistently high rate throughout), with absolute increases ranging from +0.8 (Delaware) to +8.1 (Wyoming) per 100,000. Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with increases of more than 30% observed in 25 states (Table 1, Figure 1).

Modeled suicide rate trends indicated significant increases for 44 states, for males (34 states) and females (43 states), as well as for the U.S. overall (Table 1). Nationally, the model-estimated AAPC for the overall suicide rate was +1.5%. By sex, estimated national rate trends further indicated significant increases for males (AAPC +1.1%) and females (AAPC +2.6%).

Suicide decedents without known MHP (N=11,039) were compared to those with MHP (N=9,407) in 27 states. While all decedents were predominately male (Table 2; 76.8%) and non-Hispanic white (83.6%), those without known MHP, relative to those with MHP, were more likely male (83.6% vs. 68.8%; odds ratio (OR)=2.3, 95% CI = 2.2-2.5) and racial/ethnic minorities (OR range: 1.2-2.0). Suicide decedents without known MHP also had significantly greater odds of perpetrating homicide-suicide (adjusted odds ratio aOR = 2.9, 95% CI = 2.2-3.8).

Among adult decedents, 20.1% of those without known MHP and 15.3% of those with MPH ever served, or were currently serving, in the U.S. military.

While firearms were the most common method of suicide used overall (48.5%) and for both groups, decedents without known MHP were more likely to die by firearm (55.3% vs. 40.6%) and less likely to die by hanging/strangulation/suffocation (26.9% vs 31.3%) or poisoning (10.4% vs 19.8%) than those with known MHP. These differences remained significant in the adjusted models.

Decedents without known MHP were less likely to receive toxicology testing. Among those with toxicology results, decedents without known MHP were less likely to test positive for any substance overall (aOR=0.8, 95% CI=0.7-0.8), such as opioids (aOR=.90 95% CI=0.81-.99) but more likely to test positive for alcohol (aOR=1.2, 95% CI=1.1-1.3).

All suicide decedents with MHP (N=9,407) and approximately 85% without known MHP (N=9,357) had available circumstances information (Table 3). People without known MHP were less likely to have any substance abuse problems (aOR=0.7, 95% CI=0.7-0.8). While two-thirds of those with known MHP had a history of mental health or substance abuse treatment (67.2%), just over half (54.0%) were in current treatment.

Decedents without, versus those with, known MHP, had significantly greater likelihood of any relationship problem/loss (45.1% vs. 39.6%), specifically intimate partner problems (30.2% vs. 24.1%), arguments/conflicts (17.5% vs. 13.6%), and recently perpetrating interpersonal violence (3.0% vs. 1.4%). They also were more likely to have experienced any life stressors (54.2% vs 49.7%), such as criminal-legal problems (10.7% vs. 6.2%), or eviction/loss of home (4.3% vs. 3.4%) and were more likely to have had a crisis within the preceding or upcoming two weeks (32.9% vs. 26.0%). All of these differences remained significant in the adjusted models. Among all people with crises, intimate partner problems were the most common types and did not differ by group. Similarly, among people without versus with MHP, physical health problems (23.2% and 21.4%) and job/financial problems (15.6% and 16.8%) were commonly experienced by both groups.

Decedents without known MHP had significantly lower odds of recent release from any institution (aOR=0.5, 95% CI=0.4-0.5), but among those who were recently released (5.1%), they were significantly more likely to be released from a correctional facility (25.7% vs. 8.7%), hospital (43.7% vs. 33.0%), or other facility (e.g., alcohol/substance treatment) (aOR=2.5 95% CI=1.8-3.3), than those with a known MHP. Among decedents with known MHP who were recently released from an institution (10.2%), 46.7% of this group were released from psychiatric facilities.

Decedents without known MHP, compared to those with MHP, were significantly less likely to have a history of suicidal ideation (23.0% vs. 40.8%) and prior suicide attempts (10.3% vs. 29.4%). More than one in five people in both groups disclosed suicide intent (22.4% vs. 24.5%).

### **Conclusions and Comments**

From 1999-2016, 44 states saw significant increases in suicide rates and 25 states experienced substantial increases in suicide rates of more than 30%. Rates increased significantly among males, in 34 states, and females, in 43 states. This finding is consistent with prior research showing a decreasing gender gap in male-female suicide rates between 1999-2014 (3). Additional research into the specific causes of these trends is necessary. Fortunately, data from the 27 states participating in NVDRS provides important insight into suicide circumstances and can help states identify prevention priorities.



Suicidologists regularly state that suicide is not caused by a single factor; (5) however, suicide prevention is often oriented towards downstream identification of suicidal people, treatment of MHP and prevention of reattempts. Additional focus on non-mental health factors, further upstream, is essential to a public health approach (10), as the current study found that more than half of suicide decedents in NVDRS did *not* have a known MHP. This group suffered more from relationship problems and other life stressors such as criminal-legal matters, eviction/loss of home, and recent or impending crises.

Similarly, people with MHP often experienced relationship problems and other life stressors such as job/financial and/or physical health problems. These findings point to the need to both help people manage the conditions associated with mental health problems in the first place, and to support people with known MHP to decrease their risk of poor outcomes (11). Two-thirds of this group had a history of any mental health and/or substance abuse treatment, with over half in treatment when they died. This suggests the need for additional safety supports, including broader implementation of affordable and effective treatment modalities such as doctor-patient collaborative care models and proven cognitive-behavioral therapies. Additionally, greater access to behavioral health providers in underserved areas is needed, as is expansion of healthcare systems needed that integrates physical and behavioral health with a priority on suicide prevention and patient safety, especially through care transitions (12).

Comprehensive statewide suicide prevention activities are needed to address the full range of factors contributing to suicide. Prevention strategies include: strengthening economic supports (e.g., housing stabilization policies, household financial support); teaching coping and problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in life; promoting social connectedness to increase a sense of belongingness and access to informational, tangible, emotional, and social support; and identifying and better supporting people at risk (e.g., Veterans, people with physical/mental health problems) (12). Other strategies include creating protective environments (e.g., reducing access to lethal means among people at risk, creating organizational and workplace policies to promote help-seeking, easing transitions into and out of work for people with MHP and other life challenges), supporting family and friends after a suicide, and assuring safe reporting by the media in order to prevent suicide contagion (12). Some states, such as Colorado, are planning to implement such a comprehensive approach to suicide prevention (10).

These findings have at least three limitations. In the state-level analysis, rankings for four states (MD, MA, RI, UT) might have been impacted by large proportions of injury deaths of undetermined intent (potentially biasing reported suicide rates downward), or decreased percentages of such deaths over time (potentially biasing estimated rate trends upward). Second, NVDRS is not yet nationally representative; the 27 states included represent 49.6% of the population

(<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml>).

Third, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the extent of informant knowledge can impact data completeness and accuracy. Studies including more in-depth interviews with next-of-kin often see greater attributions to mental disorders (13), however many methodological variations across studies exist (14). It is likely that some people without known MHP in the current study were experiencing mental health challenges that were unknown, and hence underreported by key informants. Nonetheless, the high prevalence of diverse contributing circumstances among those with and without known MHP suggests the importance of addressing the broad range of factors that contribute to suicide.



Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are available. States and communities can use data from NVDRS and resources such as CDC's *Preventing Suicide: a Technical Package of Policies, Programs, and Practices* (12) to better understand their suicide problem, prioritize evidence-based comprehensive suicide prevention, and save lives.

### Acknowledgments

The authors acknowledge Robert Anderson, Holly Hedegaard, and Margaret Warner from the Division of Vital Statistics, National Center for Health Statistics, CDC, for their statistical consultation.

**Conflict of Interest** No conflicts of interest were reported.

**Corresponding author:** Deborah M. Stone, [dstone3@cdc.gov](mailto:dstone3@cdc.gov), 770-488-3942

### Author Affiliations:

<sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis, Research, and Practice Integration, National Center for Injury Prevention and Control, CDC

### References:

- Centers for Disease Control and Prevention. Web-based Injury Statistics Query and Reporting System (WISQARS). Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018. In.
- Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide Trends Among and Within Urbanization Levels by Sex, Race/Ethnicity, Age Group, and Mechanism of Death - United States, 2001-2015. *MMWR Surveill Summ* 2017;66(18):1-16.
- Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999-2014. In: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics Hyattsville, MD; 2016.
- Kochanek K, Murphy S, Xu J, Arias E. Mortality in the United States, 2016. NCHS Data Brief, no 293. National Center for Health Statistics 2017.
- Office of the Surgeon General, National Action Alliance for Suicide Prevention. 2012 National strategy for suicide prevention: Goals and objectives for action: a report of the US Surgeon General and of the National Action Alliance for Suicide Prevention. 2012.
- Zalsman G, Hawton K, Wasserman D, van Heeringen K, Arensman E, Sarchiapone M, et al. Suicide prevention strategies revisited: 10-year systematic review. *The Lancet Psychiatry* 2016;3(7):646-659.
- Torguson K, O'Brien A. Leading Suicide Prevention Efforts Unite to Address Rising National Suicide Rate. In. Washington, D.C.; 2017.
- Crepeau-Hobson F. The Psychological Autopsy and Determination of Child Suicides: A Survey of Medical Examiners. *Archives of Suicide Research* 2010;14(1):24-34.
- American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5®): American Psychiatric Pub; 2013.
- Caine ED, Reed J, Hindman J, Quinlan K. Comprehensive, integrated approaches to suicide prevention: practical guidance. *Injury prevention* 2017;injuryprev-2017-042366.
- World Health Organization. Risks to mental health: An overview of vulnerabilities and risk factors. Geneva: WHO 2012.
- Stone DM, Holland KM, Bartholow BN, Crosby AE, Davis SP, Wilkins N. Preventing suicide: A technical package of policies, programs, and practice. 2017.
- Milner A, Svetcic J, De Leo D. Suicide in the absence of mental disorder? A review of psychological autopsy studies across countries. *Int J Soc Psychiatry* 2013;59(6):545-54.
- Pouliot L, De Leo D. Critical issues in psychological autopsy studies. *Suicide Life Threat Behav* 2006;36(5):491-510.



4.25.18

**Word Count:** 1904/1800

## **Vital Signs: Trends in State Suicide Rates — United States, 1999–2016 and Circumstances Contributing to Suicide — 27 States, 2015**

Deborah M. Stone, ScD<sup>1</sup>; Thomas R. Simon PhD<sup>1</sup>; Katherine A. Fowler, PhD<sup>1</sup>; Scott R. Kegler, PhD<sup>2</sup>; Keming Yuan, MS<sup>1</sup>; Kristin M. Holland, PhD<sup>1</sup>; Asha Z. Ivey-Stephenson, PhD<sup>1</sup>; Alex E. Crosby, MD<sup>1</sup>

### **Abstract**

**Introduction:** Suicide rates in the United States have risen nearly 30% since 1999, and mental health conditions are one of several factors contributing to suicide. Examining state-level trends in suicide and the multiple circumstances contributing to it can inform comprehensive state suicide prevention planning.

**Methods:** Trends in age-adjusted suicide rates among persons aged  $\geq 10$  years, by state and sex, across six consecutive 3-year periods (1999–2016), were assessed using data from the National Vital Statistics System for 50 states and the District of Columbia. Data from the National Violent Death Reporting System, covering 27 states in 2015, were used to examine contributing circumstances among decedents with and without known mental health conditions.

**Results:** During 1999–2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases  $>30\%$ . Rates increased significantly among males and females in 34 and 43 states, respectively. Fifty-four percent of decedents in 27 states in 2015 did not have a known mental health condition.

Among decedents with available information, several circumstances were significantly more likely among those without known mental health conditions than among those with mental health conditions, including relationship problems/loss (45.1% versus 39.6%), life stressors (50.5% versus 47.2%), and recent/impending crises (32.9% versus 26.0%), but these circumstances were common across groups.

**Conclusions:** Suicide rates increased significantly across most states during 1999–2016. Various circumstances contributed to suicides among persons with and without known mental health conditions.

**Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach to prevent suicide risk before it occurs, identify and support persons at risk, prevent reattempts, and help friends and family members in the aftermath of a suicide.

### **INSIDE**

- 625 Invasive Methicillin-Resistant *Staphylococcus aureus* Infections Among Persons Who Inject Drugs — Six Sites, 2005–2016
- 629 Tobacco Product Use Among Middle and High School Students — United States, 2011–2017
- 634 Update: Influenza Activity in the United States During the 2017–18 Season and Composition of the 2018–19 Influenza Vaccine
- 643 Update: ACIP Recommendations for the Use of Quadrivalent Live Attenuated Influenza Vaccine (LAIV4) — United States, 2018–19 Influenza Season
- 646 Notes from the Field: Crimean-Congo Hemorrhagic Fever Outbreak — Central Uganda, August–September 2017
- 648 QuickStats

**Continuing Education** examination available at  
[https://www.cdc.gov/mmwr/cme/conted\\_info.html#weekly](https://www.cdc.gov/mmwr/cme/conted_info.html#weekly).



**U.S. Department of Health and Human Services**  
Centers for Disease Control and Prevention



## Introduction

In 2016, nearly 45,000 suicides (15.6/100,000 population [age-adjusted]) occurred in the United States among persons aged  $\geq 10$  years (1). From 1999 to 2015, suicide rates increased among both sexes, all racial/ethnic groups, and all urbanization levels (2,3). Suicide rates have also increased among persons in all age groups  $< 75$  years, with adults aged 45–64 having the largest absolute rate increase (from 13.2 per 100,000 persons [1999] to 19.2 per 100,000 [2016]) and the greatest number of suicides (232,108) during the same period (1,3). Suicide is the tenth leading cause of death and is one of just three leading causes that are increasing (1,4). In addition, rates of emergency department visits for nonfatal self-harm, a main risk factor for suicide, increased 42% from 2001 to 2016 (1). Together, suicides and self-harm injuries cost the nation approximately \$70 billion per year in direct medical and work loss costs (1).

The National Strategy for Suicide Prevention (5) calls for a public health approach to suicide prevention with efforts spanning multiple levels (individual, family/relationship, community, and societal). Such a comprehensive approach underscores that suicide is rarely caused by any single factor, but rather, is determined by multiple factors. Despite this call to action, suicide prevention largely focuses on identifying and referring suicidal persons to mental health treatment and preventing reattempts (6). In addition to mental health conditions and prior suicide attempts, other contributing circumstances include social and economic problems, access to lethal means (e.g., substances,

firearms) among persons at risk, and poor coping and problem-solving skills (5). Expanded awareness of these additional circumstances contributing to suicide risk and action to address them can help reach the national goal, established by the National Action Alliance of Suicide Prevention and the American Foundation for Suicide Prevention, of reducing the annual suicide rate 20% by 2025 (7). To assist states in achieving this goal, CDC analyzed state-specific trends in suicide rates and assessed the multiple contributing factors to suicide; this report presents options for strategies to include in comprehensive suicide prevention efforts that are based on the best available evidence.

## Methods

Suicide rates were analyzed for persons aged  $\geq 10$  years because determining suicidal intent in younger children can be difficult (8). Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases, Tenth Revision*, underlying-cause-of-death codes X60–X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive 3-year aggregate periods spanning 1999–2016 (1999–2001; 2002–2004; 2005–2007; 2008–2010; 2011–2013; and 2014–2016). Rate estimates were age-adjusted to the U.S. 2000 standard population and expressed

The *MMWR* series of publications is published by the Center for Surveillance, Epidemiology, and Laboratory Services, Centers for Disease Control and Prevention (CDC), U.S. Department of Health and Human Services, Atlanta, GA 30329-4027.

**Suggested citation:** [Author names; first three, then et al., if more than six.] [Report title]. *MMWR Morb Mortal Wkly Rep* 2018;67:[inclusive page numbers].

### Centers for Disease Control and Prevention

Robert R. Redfield, MD, *Director*  
 Anne Schuchat, MD, *Principal Deputy Director*  
 Leslie Dauphin, PhD, *Acting Associate Director for Science*  
 Joanne Cono, MD, ScM, *Director, Office of Science Quality*  
 Chesley L. Richards, MD, MPH, *Deputy Director for Public Health Scientific Services*  
 Michael F. Iademarco, MD, MPH, *Director, Center for Surveillance, Epidemiology, and Laboratory Services*

### MMWR Editorial and Production Staff (Weekly)

Charlotte K. Kent, PhD, MPH, *Acting Editor in Chief, Executive Editor*  
 Jacqueline Gindler, MD, *Editor*  
 Mary Dott, MD, MPH, *Online Editor*  
 Teresa F. Rutledge, *Managing Editor*  
 Douglas W. Weatherwax, *Lead Technical Writer-Editor*  
 Glenn Damon, Soumya Dunworth, PhD, Teresa M. Hood, MS,  
*Technical Writer-Editors*

Martha F. Boyd, *Lead Visual Information Specialist*  
 Maureen A. Leahy, Julia C. Martinroe,  
 Stephen R. Spriggs, Tong Yang,  
*Visual Information Specialists*  
 Quang M. Doan, MBA, Phyllis H. King,  
 Terraye M. Starr, Moua Yang,  
*Information Technology Specialists*

### MMWR Editorial Board

Timothy F. Jones, MD, *Chairman*  
 Matthew L. Boulton, MD, MPH  
 Virginia A. Caine, MD  
 Katherine Lyon Daniel, PhD  
 Jonathan E. Fielding, MD, MPH, MBA  
 David W. Fleming, MD

William E. Halperin, MD, DrPH, MPH  
 King K. Holmes, MD, PhD  
 Robin Ikeda, MD, MPH  
 Rima F. Khabbaz, MD  
 Phyllis Meadows, PhD, MSN, RN  
 Jewel Mullen, MD, MPH, MPA

Jeff Niederdeppe, PhD  
 Patricia Quinlisk, MD, MPH  
 Patrick L. Remington, MD, MPH  
 Carlos Roig, MS, MA  
 William L. Roper, MD, MPH  
 William Schaffner, MD



per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same 3-year data aggregates, employing weighted least-squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes.

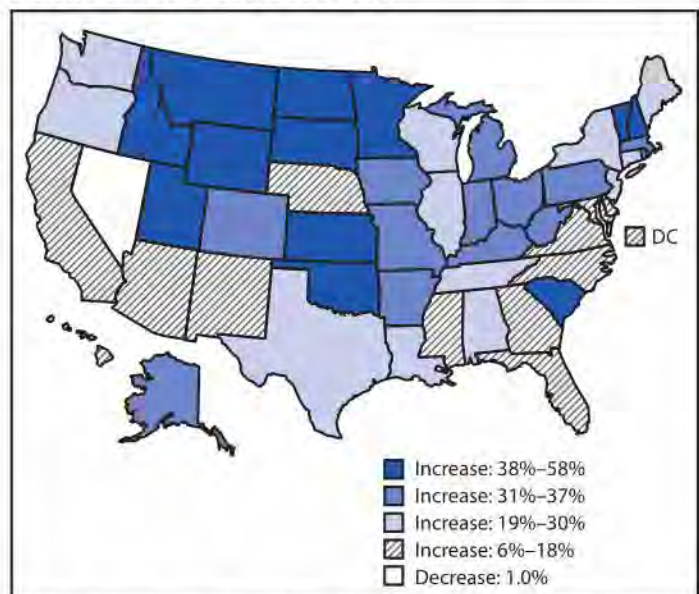
Characteristics of persons aged  $\geq 10$  years who died by suicide, with and without known mental health conditions, and the circumstances surrounding the suicides were compared in the 27 states\* with complete data participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines mental health conditions as disorders and syndromes listed in the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (9), with the exception of problematic alcohol use and other substance use that are captured separately in NVDRS. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. A range of circumstances (relationship problems, life stressors, and recent or impending crises) have been identified as potential risk factors for suicide in NVDRS. Circumstances captured are those identified as contributing to suicide in coroner/medical examiner or law enforcement reports, which reflect information provided by family and friends at the time of death. Decedents could have experienced multiple circumstances. Decedents with and without known mental health conditions were compared using chi-square tests. Logistic regression analyses were used to estimate adjusted odds ratios (aORs) with 95% confidence intervals (CIs), controlling for sex, age group, and race/ethnicity.

## Results

The most recent overall suicide rates (representing 2014–2016) varied fourfold, from 6.9 (District of Columbia) to 29.2 (Montana) per 100,000 persons per year (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>). Across the study period, rates increased in all states except Nevada (where the rate was consistently high throughout the study period), with absolute increases ranging from 0.8 per 100,000 (Delaware) to 8.1 (Wyoming). Percentage increases in rates ranged from 5.9% (Delaware) to 57.6% (North Dakota), with increases  $>30\%$  observed in 25 states (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>) (Figure).

Modeled suicide rate trends indicated significant increases in 44 states, among males (34 states) and females (43 states), as well as for the United States overall (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>). Nationally, the model-estimated average annual percentage change for the overall

FIGURE. Percent change in annual suicide rate,\* by state — United States, from 1999–2001 to 2014–2016



\* Per 100,000 population, age-adjusted to the 2000 U.S. standard population.

suicide rate was an increase of 1.5%. By sex, estimated national rate trends further indicated significant average annual percentage change increases for males (1.1%) and females (2.6%) (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>).

Suicide decedents without known mental health conditions (11,039; 54.0%) were compared with those with known mental health conditions (9,407; 46.0%) for 27 states. Whereas decedents were predominantly male (76.8%) (Table 1) and non-Hispanic white (83.6%), those without known mental health conditions, relative to those with mental health conditions, were more likely to be male (83.6% versus 68.8%; odds ratio [OR] = 2.3, 95% CI = 2.2–2.5) and belong to a racial/ethnic minority (OR range = 1.2–2.0). Suicide decedents without known mental health conditions also had significantly higher odds of perpetrating homicide followed by suicide (aOR = 2.9, 95% CI = 2.2–3.8). Among decedents aged  $\geq 18$  years, 20.1% of those without known mental health conditions and 15.3% of those with mental health conditions had previously served in the U.S. military or were serving at the time of death.

Whereas firearms were the most common method of suicide overall (48.5%), decedents without known mental health conditions were more likely to die by firearm (55.3%) and less likely to die by hanging/strangulation/suffocation (26.9%) or poisoning (10.4%) than were those with known mental health conditions (40.6%, 31.3%, and 19.8%, respectively). These differences remained significant in the adjusted models.

Toxicology testing was less likely to be performed for decedents without known mental health conditions. Among those with toxicology results, decedents without known mental health

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.



**TABLE 1. Selected demographic and descriptive characteristics of suicides among persons aged ≥10 years with and without known mental health conditions — National Violent Death Reporting System, 27 states,\* 2015**

Characteristic	Total (N = 20,446) No. (%)	Known mental health condition <sup>†</sup> (n = 9,407) No. (%)	No known mental health condition (n = 11,039) No. (%)	Chi-square p-value	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>¶</sup> (95% CI)
<b>Sex</b>						
Male	15,702 (76.8)	6,469 (68.8)	9,233 (83.6)	<0.01	2.3 (2.2–2.5)	NA
Female	4,744 (23.2)	2,938 (31.2)	1,806 (16.4)	<0.01	0.4 (0.4–0.5)	NA
<b>Age group (yrs)**</b>						
10–24	2,804 (13.7)	1,211 (12.9)	1,593 (14.4)	<0.01	1.1 (1.1–1.2)	NA
25–44	6,456 (31.6)	3,036 (32.3)	3,420 (31.0)	<0.05	0.9 (0.9–1.0)	NA
45–64	7,718 (37.7)	3,820 (40.6)	3,898 (35.3)	<0.01	0.8 (0.8–0.8)	NA
≥65	3,468 (17.0)	1,340 (14.2)	2,128 (19.3)	<0.01	1.4 (1.3–1.5)	NA
<b>Race/Ethnicity</b>						
White, non-Hispanic	17,102 (83.6)	8,165 (86.8)	8,937 (81.0)	<0.01	0.6 (0.6–0.7)	NA
Black, non-Hispanic	1,228 (6.0)	411 (4.4)	817 (7.4)	<0.01	1.7 (1.5–2.0)	NA
American Indian/Alaska Native, non-Hispanic	378 (1.8)	112 (1.2)	266 (2.4)	<0.01	2.0 (1.6–2.6)	NA
Asian, non-Hispanic	576 (2.8)	235 (2.5)	341 (3.1)	<0.05	1.2 (1.1–1.5)	NA
Hispanic	1,096 (5.4)	463 (4.9)	633 (5.7)	<0.05	1.2 (1.0–1.3)	NA
Other	66 (0.3)	21 (0.2)	45 (0.4)	<0.05	1.8 (1.1–3.1)	NA
<b>Extended demographics</b>						
Ever served in military <sup>††</sup>	3,429 (17.8)	1,354 (15.3)	2,075 (20.1)	<0.01	1.4 (1.3–1.5)	1.1 (1.0–1.1)
Homeless	240 (1.2)	104 (1.1)	136 (1.3)	NS	1.1 (0.9–1.5)	1.2 (0.9–1.5)
<b>Incident type</b>						
Single suicide	20,063 (98.2)	9,318 (99.1)	10,745 (97.4)	<0.01	0.3 (0.3–0.4)	0.4 (0.3–0.5)
Homicide followed by suicide	319 (1.6)	64 (0.7)	255 (2.3)	<0.01	3.5 (2.6–4.5)	2.9 (2.2–3.8)
Multiple suicides	64 (0.3)	25 (0.3)	39 (0.4)	NS	1.3 (0.8–2.2)	1.6 (0.9–2.6)
<b>Method</b>						
Firearm	9,909 (48.5)	3,821 (40.6)	6,088 (55.3)	<0.01	1.8 (1.7–1.9)	1.6 (1.5–1.7)
Hanging/Strangulation/Suffocation	5,907 (28.9)	2,940 (31.3)	2,967 (26.9)	<0.01	0.8 (0.8–0.9)	0.8 (0.7–0.8)
Poisoning	3,003 (14.7)	1,861 (19.8)	1,142 (10.4)	<0.01	0.5 (0.4–0.5)	0.6 (0.6–0.7)
Substance class causing death <sup>§§</sup>						
Other (e.g., over-the-counter)	1,021 (34.0)	666 (35.8)	355 (31.1)	<0.01	0.8 (0.7–0.9)	0.9 (0.7–1.0)
Opioids	944 (31.4)	608 (32.7)	336 (29.4)	NS	0.9 (0.7–1.0)	0.9 (0.8–1.1)
Antidepressants	800 (26.6)	644 (34.6)	156 (13.7)	<0.01	0.3 (0.2–0.4)	0.3 (0.3–0.4)
Benzodiazepines	624 (20.8)	468 (25.1)	156 (13.7)	<0.01	0.5 (0.4–0.6)	0.5 (0.4–0.6)
Antipsychotics	219 (7.3)	195 (10.5)	24 (2.1)	<0.01	0.2 (0.1–0.3)	0.2 (0.1–0.3)
Other	1,595 (7.8)	780 (8.3)	815 (7.4)	<0.05	0.9 (0.8–1.0)	0.9 (0.8–1.0)

See table footnotes on next page.

conditions were less likely to test positive for any substance overall (aOR = 0.8, 95% CI = 0.7–0.8), including opioids (aOR = 0.90, 95% CI = 0.81–0.99), but were more likely to test positive for alcohol (aOR = 1.2, 95% CI = 1.1–1.3).

Information on circumstances surrounding suicide were available for all decedents with mental health conditions (9,407) and approximately 85% of those without known mental health conditions (9,357) in 27 states (Table 2). Persons without known mental health conditions were less likely to have any problematic substance use (aOR = 0.7, 95% CI = 0.7–0.8) than were persons with known mental health conditions. Whereas two thirds of decedents with known mental health conditions had a history of mental health or substance use treatment (67.2%), just over half (54.0%) were in treatment at the time of death.

Decedents without known mental health conditions had a significantly higher likelihood of any relationship problem/loss

(45.1%) than did those with known mental health conditions (39.6%), specifically intimate partner problems (30.2% versus 24.1%), arguments/conflicts (17.5% versus 13.6%), and perpetrating interpersonal violence in the past month (3.0% versus 1.4%). Decedents without known mental health conditions were also more likely than were those with known mental health conditions to have experienced any life stressors (50.5% versus 47.2%) such as recent criminal legal problems (10.7% versus 6.2%) or eviction/loss of home (4.3% versus 3.4%) and were more likely to have had a recent or impending (within the preceding or upcoming 2 weeks, respectively) crisis (a current or acute event thought to contribute to the suicide) (32.9% versus 26.0%). All of these differences remained significant in the adjusted models. Physical health problems and job/financial problems were commonly contributing stressors among both persons without mental health conditions (23.2% and 15.6%, respectively) and those with mental health conditions (21.4%



**TABLE 1. (Continued) Selected demographic and descriptive characteristics of suicides among persons aged ≥10 years with and without known mental health conditions — National Violent Death Reporting System, 27 states,\* 2015**

Characteristic	Total (N = 20,446) No. (%)	Known mental health condition <sup>†</sup> (n = 9,407) No. (%)	No known mental health condition (n = 11,039) No. (%)	Chi-square p-value	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>¶</sup> (95% CI)
<b>Toxicology results</b>						
Any toxicology testing	13,317 (65.1)	6,658 (70.8)	6,659 (60.3)	<0.01	0.6 (0.6–0.7)	0.7 (0.6–0.7)
Positive for ≥1 substance <sup>¶¶</sup>	9,913 (74.4)	5,192 (78.0)	4,721 (70.9)	<0.01	0.7 (0.6–0.7)	0.8 (0.7–0.8)
<b>Substance detected***</b>						
Alcohol						
Tested	10,950 (53.6)	5,409 (57.5)	5,541 (50.2)	<0.01	0.7 (0.7–0.8)	0.8 (0.7–0.8)
Positive	4,442 (40.6)	2,115 (39.1)	2,327 (42.0)	<0.01	1.1 (1.0–1.2)	1.2 (1.1–1.3)
Opioids						
Tested	8,554 (41.8)	4,258 (45.3)	4,296 (38.9)	<0.01	0.8 (0.7–0.8)	0.8 (0.8–0.9)
Positive	2,279 (26.6)	1,238 (29.1)	1,041 (24.2)	<0.01	0.8 (0.7–0.9)	0.9 (0.8–1.0)
Benzodiazepines						
Tested	8,124 (39.7)	4,226 (44.9)	3,898 (35.3)	<0.01	0.7 (0.6–0.7)	0.7 (0.7–0.8)
Positive	2,464 (30.3)	1,639 (38.8)	825 (21.2)	<0.01	0.4 (0.4–0.5)	0.5 (0.5–0.6)
Cocaine						
Tested	7,978 (39.0)	3,866 (41.1)	4,112 (37.2)	<0.01	0.9 (0.8–0.9)	0.9 (0.9–1.0)
Positive	499 (6.3)	216 (5.6)	283 (6.9)	<0.05	1.2 (1.0–1.5)	1.2 (1.0–1.5)
Amphetamines						
Tested	7,615 (37.2)	3,696 (39.3)	3,919 (35.5)	<0.01	0.9 (0.8–0.9)	0.9 (0.8–0.9)
Positive	736 (9.7)	376 (10.2)	360 (9.2)	NS	0.9 (0.8–1.0)	1.0 (0.8–1.1)
Marijuana						
Tested	6,569 (32.1)	3,127 (33.2)	3,442 (31.2)	<0.01	0.9 (0.9–1.0)	0.9 (0.9–1.0)
Positive	1,471 (22.4)	710 (22.7)	761 (22.1)	NS	1.0 (0.9–1.1)	0.9 (0.8–1.0)
Antidepressants						
Tested	5,425 (26.5)	3,103 (33.0)	2,322 (21.0)	<0.01	0.5 (0.5–0.6)	0.6 (0.6–0.7)
Positive	2,214 (40.8)	1,735 (55.9)	479 (20.6)	<0.01	0.2 (0.2–0.2)	0.2 (0.2–0.3)

Abbreviations: CI = confidence interval; NA = not adjusted; NS = not significant; OR = odds ratio.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

<sup>†</sup> Decedent had been identified as having a current diagnosis of mental health condition in coroner/medical examiner or law enforcement reports.

<sup>§</sup> OR reflects the risk among those without known mental health condition relative to those with known mental health condition.

<sup>¶</sup> Logistic regression was used to estimate adjusted OR with 95% CIs after controlling for sex, age group, and race/ethnicity. Known mental health condition was used as the reference group.

\*\* Decedents were aged ≥10 years, as per standard in the suicide prevention literature.

†† Denominator is decedents aged ≥18 years with reported military service status.

§§ Denominator is decedents who died by poisoning, including overdose.

¶¶ Denominator is decedents with any toxicology testing.

\*\*\* Denominator for each positive group is the number tested for the substance in that group.

and 16.8%, respectively). Similarly, among all persons with recent crises, intimate partner problems were the most common types and did not differ by group.

Decedents without known mental health conditions had significantly lower odds of recent release from any institution (aOR = 0.5, 95% CI = 0.4–0.5). Among those recently released, decedents without known mental health conditions were significantly more likely than decedents with mental health conditions to have been released from a correctional facility (25.7% versus 8.7%), hospital (43.7% versus 33.0%), or other facility, such as an alcohol/substance use treatment facility (24.2% versus 11.6%). Among decedents with known mental health conditions who were recently released from an institution, 46.7% were released from psychiatric facilities.

Decedents without known mental health conditions were significantly less likely to have a history of suicidal ideation

(23.0%) or prior suicide attempts (10.3%) compared with those with known mental health conditions (40.8% and 29.4%, respectively). Suicide intent was disclosed by 22.4% and 24.5% of persons without and with known mental health conditions, respectively.

## Conclusions and Comments

During 1999–2016, suicide rates increased significantly in 44 states, and 25 states experienced increases >30%. Rates increased significantly among males in 34 states, and females in 43 states. Additional research into the specific causes of these trends is needed. Data from the 27 states participating in NVDRS provide important insight into circumstances surrounding suicide and can help states identify prevention priorities.



**TABLE 2. Circumstances preceding suicide among decedents aged  $\geq 10$  years with and without known mental health conditions — National Violent Death Reporting System, 27 states,\* 2015**

Characteristic	Total No. (%)	Known mental health condition <sup>†</sup> No. (%)	No known mental health condition No. (%)	Chi- square p-value	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>¶</sup> (95% CI)
<b>Suicide with known circumstances</b>	<b>18,764 (91.8)</b>	<b>9,407 (100)</b>	<b>9,357 (84.8)</b>	<b>&lt;0.01</b>	<b>N/A</b>	<b>N/A</b>
<b>Mental health</b>						
Any current diagnosed mental health condition**						
Depression/Dysthymia	—††	7,076 (75.2)	N/A	N/A	N/A	N/A
Anxiety disorder	—††	1,579 (16.8)	N/A	N/A	N/A	N/A
Bipolar disorder	—††	1,431 (15.2)	N/A	N/A	N/A	N/A
Schizophrenia	—††	509 (5.4)	N/A	N/A	N/A	N/A
PTSD	—††	424 (4.5)	N/A	N/A	N/A	N/A
ADD/ADHD	—††	226 (2.4)	N/A	N/A	N/A	N/A
Not specified	—††	760 (8.1)	N/A	N/A	N/A	N/A
Current depressed mood <sup>§§</sup>	7,038 (37.5)	3,962 (42.1)	3,076 (32.9)	<0.01	0.7 (0.6–0.7)	0.7 (0.6–0.7)
<b>Problematic substance use</b>						
Any	5,319 (28.3)	2,976 (31.6)	2,343 (25.0)	<0.01	0.7 (0.7–0.8)	0.7 (0.7–0.8)
Alcohol	3,268 (17.4)	1,862 (19.8)	1,406 (15.0)	<0.01	0.7 (0.7–0.8)	0.7 (0.7–0.8)
Other	3,084 (16.4)	1,768 (18.8)	1,316 (14.1)	<0.01	0.7 (0.7–0.8)	0.7 (0.7–0.8)
<b>Treatment</b>						
Current mental health/substance use treatment	5,141 (27.4)	5,077 (54.0)	64 (0.7)	<0.01	0.01 (0.01–0.01)	0.01 (0.01–0.01)
Ever treated for mental health/substance disorder	6,717 (35.8)	6,323 (67.2)	394 (4.2)	<0.01	0.02 (0.02–0.02)	0.02 (0.02–0.03)
<b>Relationship problems/loss</b>						
Any relationship problem/loss	7,948 (42.4)	3,726 (39.6)	4,222 (45.1)	<0.01	1.3 (1.2–1.3)	1.3 (1.2–1.4)
Intimate partner problem	5,098 (27.2)	2,270 (24.1)	2,828 (30.2)	<0.01	1.4 (1.3–1.5)	1.4 (1.3–1.5)
Perpetrator of interpersonal violence in past month	414 (2.2)	131 (1.4)	283 (3.0)	<0.01	2.2 (1.8–2.7)	2.0 (1.6–2.4)
Victim of interpersonal violence in past month	84 (0.4)	53 (0.6)	31 (0.3)	<0.05	0.6 (0.4–0.9)	0.8 (0.5–1.2)
Family relationship problem	1,671 (8.9)	873 (9.3)	798 (8.5)	NS	0.9 (0.8–1.0)	1.0 (0.9–1.1)
Other relationship problem (nonintimate)	403 (2.1)	202 (2.1)	201 (2.1)	NS	1.0 (0.8–1.2)	1.1 (0.9–1.3)
Argument or conflict (not specified)	2,914 (15.5)	1,278 (13.6)	1,636 (17.5)	<0.01	1.3 (1.2–1.5)	1.4 (1.3–1.5)
Death of a loved one (any)	1,497 (8.0)	826 (8.8)	671 (7.2)	<0.01	0.8 (0.7–0.9)	0.9 (0.8–0.9)
Nonsuicide death	1,181 (6.3)	647 (6.9)	534 (5.7)	<0.01	0.8 (0.7–0.9)	0.9 (0.8–1.0)
Suicide of family or friend	379 (2.0)	217 (2.3)	162 (1.7)	<0.01	0.7 (0.6–0.9)	0.8 (0.7–1.0)
<b>Other life stressors</b>						
Any life stressor	9,171 (48.9)	4,442 (47.2)	4,729 (50.5)	<0.01	1.1 (1.1–1.2)	1.1 (1.0–1.2)
Recent criminal legal problem	1,588 (8.5)	586 (6.2)	1,002 (10.7)	<0.01	1.8 (1.6–2.0)	1.7 (1.5–1.9)
Other legal problem	748 (4.0)	378 (4.0)	370 (4.0)	NS	1.0 (0.8–1.1)	1.0 (0.9–1.2)
Physical health problem	4,179 (22.3)	2,012 (21.4)	2,167 (23.2)	<0.01	1.1 (1.0–1.2)	1.0 (1.0–1.1)
Job/Financial problem <sup>¶¶</sup>	2,941 (16.2)	1,530 (16.8)	1,411 (15.6)	<0.05	0.9 (0.8–1.0)	0.9 (0.8–1.0)
Eviction or loss of home	722 (3.8)	317 (3.4)	405 (4.3)	<0.01	1.3 (1.1–1.5)	1.4 (1.2–1.6)
School problem <sup>***</sup>	162 (0.9)	70 (0.7)	92 (1.0)	NS	1.3 (0.9–1.8)	1.3 (0.9–1.9)
Recent release from an institution <sup>†††</sup>	1,412 (7.6)	941 (10.2)	471 (5.1)	<0.01	0.5 (0.4–0.5)	0.5 (0.4–0.5)
Jail/Prison/Detention facility	203 (1.4)	82 (0.8)	121 (1.3)	<0.01	3.6 (2.7–4.9)	4.5 (3.2–6.4)
Hospital	517 (36.6)	311 (33.0)	206 (43.7)	<0.01	1.6 (1.3–2.0)	1.3 (1.0–1.7)
Psychiatric hospital/institution	469 (33.2)	439 (46.7)	30 (6.4)	<0.01	0.1 (0.1–0.1)	0.1 (0.1–0.1)
Other (includes alcohol/SU treatment facilities)	223 (15.8)	109 (11.6)	114 (24.2)	<0.01	2.4 (1.8–3.3)	2.5 (1.8–3.3)

See table footnotes on next page.

Suicidologists regularly state that suicide is not caused by a single factor (5); however, suicide prevention is often oriented toward mental health conditions alone with regard to downstream identification of suicidal persons, treatment of mental health conditions, and prevention of reattempts. This study found that approximately half of suicide decedents in NVDRS did not have a known mental health condition, indicating that additional focus on nonmental health factors further upstream could provide important information for a public health approach (10). Those without a known mental health condition suffered more from relationship problems and

other life stressors such as criminal/legal matters, eviction/loss of home, and recent or impending crises.

Similarly, persons with mental health conditions also often experienced other circumstances such as relationship problems and job/financial or physical health problems that contributed to their suicide. These findings point to the need to both prevent the circumstances associated with the onset of mental health conditions and support persons with known mental health conditions to decrease their risk for poor outcomes (11). Two thirds of suicide decedents with mental health conditions had a history of treatment for mental health or substance use disorders,



**TABLE 2. (Continued) Circumstances preceding suicide among decedents aged  $\geq 10$  years with and without known mental health conditions — National Violent Death Reporting System, 27 states,\* 2015**

Characteristic	Total No. (%)	Known mental health condition <sup>†</sup> No. (%)	No known mental health condition No. (%)	Chi- square p-value	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>¶</sup> (95% CI)
<b>Crisis within past or upcoming 2 weeks<sup>§§§</sup></b>	<b>5,525 (29.4)</b>	<b>2,444 (26.0)</b>	<b>3,081 (32.9)</b>	<b>&lt;0.01</b>	<b>1.4 (1.3–1.5)</b>	<b>1.4 (1.3–1.5)</b>
Intimate partner problem	1,968 (35.6)	854 (34.9)	1,114 (36.2)	NS	1.1 (0.9–1.2)	1.1 (0.9–1.2)
Physical health problem	739 (13.4)	315 (12.9)	424 (13.8)	NS	1.1 (0.9–1.3)	1.0 (0.8–1.2)
Criminal legal problem	621 (11.2)	203 (8.3)	418 (13.6)	<0.01	1.7 (1.5–2.1)	1.6 (1.3–1.9)
Family relationship problem	430 (7.8)	212 (8.7)	218 (7.1)	<0.05	0.8 (0.7–1.0)	0.9 (0.7–1.1)
Job problem	354 (6.4)	191 (7.8)	163 (5.3)	<0.01	0.7 (0.5–0.8)	0.7 (0.5–0.8)
<b>Suicide event/history</b>						
Left a note	6,468 (34.5)	3,182 (33.8)	3,286 (35.1)	NS	1.1 (1.0–1.1)	1.2 (1.1–1.2)
Disclosed suicide intent	4,405 (23.5)	2,306 (24.5)	2,099 (22.4)	<0.01	0.9 (0.8–1.0)	0.9 (0.8–0.9)
History of ideation	5,990 (31.9)	3,838 (40.8)	2,152 (23.0)	<0.01	0.4 (0.4–0.5)	0.4 (0.4–0.5)
History of attempts	3,732 (19.9)	2,770 (29.4)	962 (10.3)	<0.01	0.3 (0.3–0.3)	0.3 (0.3–0.3)

**Abbreviations:** ADD/ADHD = attention deficit disorder/attention deficit hyperactivity disorder; CI = confidence interval; N/A = not applicable; NS = not significant; OR = odds ratio; PTSD = posttraumatic stress disorder; SU = substance use.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

<sup>†</sup> Decedent had been identified as having a current diagnosis of mental health condition in coroner/medical examiner or law enforcement reports.

<sup>§</sup> OR reflects the risk among those without known mental health condition relative to those with known mental health condition.

<sup>¶</sup> Logistic regression was used to estimate adjusted OR with 95% CIs after controlling for sex, age group, and race/ethnicity. Known mental health condition was the reference group.

<sup>\*\*</sup> Includes decedents with one or more diagnosed current mental health conditions, which are not mutually exclusive. Therefore, sums of percentages for the diagnosed conditions exceed 100%. Denominator includes the number of decedents with one or more current diagnosed mental health conditions.

<sup>††</sup> The specific type of mental health condition was calculated only among those with one or more known diagnosed mental health conditions.

<sup>§§</sup> Not a diagnosis.

<sup>¶¶</sup> Denominator is decedents aged  $\geq 18$  years.

<sup>\*\*\*</sup> Denominator is decedents aged 10–18 years.

<sup>†††</sup> Denominator of institution subgroup is decedents with recent release from an institution. Recent release from an institution is defined as having occurred within the past month.

<sup>§§§</sup> Denominator of crisis subgroup is decedents with any crisis within past or upcoming 2 weeks. Crises depicted here represent the most commonly occurring categories.

with approximately half in treatment when they died. This finding suggests the need for additional safety supports, including broader implementation of affordable and effective treatment modalities, such as doctor-patient collaborative care models and proven cognitive-behavioral therapies. In addition, increased access to behavioral health providers in underserved areas is needed, as is expansion of health care systems that integrate physical and behavioral health, with a priority on suicide prevention and patient safety, especially through care transitions (12).

Comprehensive statewide suicide prevention activities are needed to address the full range of factors contributing to suicide. Prevention strategies include strengthening economic supports (e.g., housing stabilization policies, household financial support); teaching coping and problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in life; promoting social connectedness to increase a sense of belonging and access to informational, tangible, emotional, and social support; and identifying and better supporting persons at risk (e.g., military veterans, persons with physical/mental health conditions) (12). Other strategies include creating protective environments (e.g., reducing access to lethal means among persons at risk for suicide, creating organizational and

workplace policies to promote help-seeking, easing transitions into and out of work for persons with mental health conditions and other life challenges), strengthening access to and delivery of care, supporting family and friends after a suicide, and encouraging the media to follow safe reporting recommendations (12). Some states, such as Colorado, are planning to implement such a comprehensive approach to suicide prevention (10).

The findings in this report are subject to at least three limitations. First, in the state-level analysis, rankings for four states (Maryland, Massachusetts, Rhode Island, and Utah) might have been affected by large proportions of injury deaths of undetermined intent (potentially biasing reported suicide rates downward) or decreased percentages of such deaths over time (potentially biasing estimated rate trends upward). Second, NVDRS is not yet nationally representative; the 27 states included represent 49.6% of the population (<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml>). Finally, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the extent of informant knowledge can affect data completeness and accuracy. Studies that include more in-depth interviews with next-of-kin often identify greater attributions to mental health disorders



## References

## Summary

## What is already known about this topic?

In 2016, nearly 45,000 persons died by suicide in the United States. Mental health conditions are one of several contributors to suicide.

## What is added by this report?

During 1999–2016, suicide rates increased in nearly every state, including >30% increases in 25 states. 2015 data from 27 states indicate 54% of suicide decedents were not known to have mental health conditions. Relationship, substance use, health, and job or financial problems are among the other circumstances contributing to suicide.

## What are the implications for public health practice?

A comprehensive approach using proven prevention strategies, such as those in CDC's *Preventing Suicide: A Technical Package of Policy, Programs, and Practices*, can help reach the national goal of reducing the annual suicide rate 20% by 2025.

(13); however, many methodological variations across studies exist (14). It is likely that some persons without known mental health conditions in the current study were experiencing mental health challenges that were unknown, undiagnosed, or not reported by key informants. Nonetheless, the high prevalence of diverse contributing circumstances among those with and without known mental health conditions suggests the importance of addressing the broad range of factors that contribute to suicide.

Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are available. States and communities can use data from NVDRS and resources such as CDC's *Preventing Suicide: A Technical Package of Policy, Programs, and Practices* (12) to better understand suicide in their populations, prioritize evidence-based comprehensive suicide prevention, and save lives.

## Acknowledgments

Robert Anderson, Holly Hedegaard, Margaret Warner, Division of Vital Statistics, National Center for Health Statistics, CDC.

## Conflict of Interest

No conflicts of interest were reported.

<sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis, Research, and Practice Integration, National Center for Injury Prevention and Control, CDC.

Corresponding author: Deborah M. Stone, dstone3@cdc.gov, 770-488-3942.

1. CDC. Web-based Injury Statistics Query and Reporting System (WISQARS). Atlanta, GA: US Department of Health and Human Services, CDC, National Center for Injury Prevention and Control; 2018. <https://www.cdc.gov/injury/wisqars/index.html>
2. Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide trends among and within urbanization levels by sex, race/ethnicity, age group, and mechanism of death—United States, 2001–2015. *MMWR Surveill Summ* 2017;66(No. SS-18). <https://doi.org/10.15585/mmwr.ss6618a1>
3. Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999–2014. NCHS data brief no. 241. Hyattsville, MD: US Department of Health and Human Services, CDC, National Center for Health Statistics; 2016. <https://www.cdc.gov/nchs/data/databriefs/db241.pdf>
4. Kochanek K, Murphy S, Xu J, Arias E. Mortality in the United States, 2016. NCHS data brief no. 293. Hyattsville, MD: US Department of Health and Human Services, CDC, National Center for Health Statistics; 2017. <https://www.cdc.gov/nchs/data/databriefs/db293.pdf>
5. Office of the Surgeon General; National Action Alliance for Suicide Prevention. 2012 National strategy for suicide prevention: goals and objectives for action. Washington, DC: US Department of Health and Human Services, Office of the Surgeon General; 2012. <https://www.surgeongeneral.gov/library/reports/national-strategy-suicide-prevention/full-report.pdf>
6. Zalsman G, Hawton K, Wasserman D, et al. Suicide prevention strategies revisited: 10-year systematic review. *Lancet Psychiatry* 2016;3:646–59. [https://doi.org/10.1016/S2215-0366\(16\)30030-X](https://doi.org/10.1016/S2215-0366(16)30030-X)
7. Torguson K, O'Brien A. Leading suicide prevention efforts unite to address rising national suicide rate. Washington, DC: American Foundation for Suicide Prevention; 2017. <https://afsp.org/leading-suicide-prevention-efforts-unite-address-rising-national-suicide-rate/>
8. Crepeau-Hobson F. The psychological autopsy and determination of child suicides: a survey of medical examiners. *Arch Suicide Res* 2010;14:24–34. <https://doi.org/10.1080/1381110903479011>
9. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5). Washington, DC: American Psychiatric Association; 2013.
10. Caine ED, Reed J, Hindman J, Quinlan K. Comprehensive, integrated approaches to suicide prevention: practical guidance. *Inj Prev* 2017. Epub December 20, 2017. <https://doi.org/10.1136/injuryprev-2017-042366>
11. World Health Organization. Risks to mental health: an overview of vulnerabilities and risk factors. Geneva, Switzerland: World Health Organization; 2012. [http://www.who.int/mental\\_health/mhgap/risks\\_to\\_mental\\_health\\_EN\\_27\\_08\\_12.pdf](http://www.who.int/mental_health/mhgap/risks_to_mental_health_EN_27_08_12.pdf)
12. Stone DM, Holland KM, Bartholow BN, Crosby AE, Davis SP, Wilkins N. Preventing suicide: a technical package of policy, programs, and practice. Atlanta, GA: US Department of Health and Human Services, CDC; 2017. <https://www.cdc.gov/violenceprevention/pdf/suicidetechnicalpackage.pdf>
13. Milner A, Svetlic J, De Leo D. Suicide in the absence of mental disorder? A review of psychological autopsy studies across countries. *Int J Soc Psychiatry* 2013;59:545–54. <https://doi.org/10.1177/0020764012444259>
14. Pouliot L, De Leo D. Critical issues in psychological autopsy studies. *Suicide Life Threat Behav* 2006;36:491–510.



## Vital Signs: Trends in State Suicide Rates — United States, 1999–2016 and Circumstances Contributing to Suicide — 27 States, 2015

Deborah M. Stone, ScD<sup>1</sup>; Thomas R. Simon PhD<sup>1</sup>; Katherine A. Fowler, PhD<sup>1</sup>; Scott R. Kegler, PhD<sup>2</sup>; Keming Yuan, MS<sup>1</sup>; Kristin M. Holland, PhD<sup>1</sup>; Asha Z. Ivey-Stephenson, PhD<sup>1</sup>; Alex E. Crosby, MD<sup>1</sup>

### Abstract

**Introduction:** Suicide rates in the United States have risen nearly 30% since 1999, and mental health conditions are one of several factors contributing to suicide. Examining state-level trends in suicide and the multiple circumstances contributing to it can inform comprehensive state suicide prevention planning.

**Methods:** Trends in age-adjusted suicide rates among persons aged  $\geq 10$  years, by state and sex, across six consecutive 3-year periods (1999–2016), were assessed using data from the National Vital Statistics System for 50 states and the District of Columbia. Data from the National Violent Death Reporting System, covering 27 states in 2015, were used to examine contributing circumstances among decedents with and without known mental health conditions.

**Results:** During 1999–2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases  $>30\%$ . Rates increased significantly among males and females in 34 and 43 states, respectively. Fifty-four percent of decedents in 27 states in 2015 did not have a known mental health condition.

Among decedents with available information, several circumstances were significantly more likely among those without known mental health conditions than among those with mental health conditions, including relationship problems/loss (45.1% versus 39.6%), life stressors (50.5% versus 47.2%), and recent/impending crises (32.9% versus 26.0%), but these circumstances were common across groups.

**Conclusions:** Suicide rates increased significantly across most states during 1999–2016. Various circumstances contributed to suicides among persons with and without known mental health conditions.

**Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach to prevent suicide risk before it occurs, identify and support persons at risk, prevent reattempts, and help friends and family members in the aftermath of a suicide.

### INSIDE

7 QuickStats

Continuing Education examination available at  
[https://www.cdc.gov/mmwr/cme/conted\\_info.html#weekly](https://www.cdc.gov/mmwr/cme/conted_info.html#weekly).



U.S. Department of Health and Human Services  
Centers for Disease Control and Prevention



## Introduction

In 2016, nearly 45,000 suicides (15.6/100,000 population [age-adjusted]) occurred in the United States among persons aged  $\geq 10$  years (1). From 1999 to 2015, suicide rates increased among both sexes, all racial/ethnic groups, and all urbanization levels (2,3). Suicide rates have also increased among persons in all age groups  $< 75$  years, with adults aged 45–64 having the largest percent increase (45% from 10.2 per 100,000 persons [1999] to 19.2 per 100,000 [2016]) and the greatest number of suicides (232,108) during the same period (1,3). Suicide is the 10th leading cause of death and is one of just three leading causes that are increasing (1,4). In addition, rates of emergency department visits for nonfatal self-harm, a main risk factor for suicide, increased 42% from 2001 to 2016 (1). Together, suicides and self-harm injuries cost the nation approximately \$70 billion per year in direct medical and work loss costs (1).

The National Strategy for Suicide Prevention (NSSP) (5) calls for a public health approach to suicide prevention with efforts spanning multiple levels (individual, family/relationship, community, and societal). Such a comprehensive approach underscores that suicide is rarely caused by any single factor, but rather, is determined by multiple factors. Despite this call to action, suicide prevention largely focuses on identifying and referring suicidal persons to mental health treatment and preventing reattempts (6). In addition to mental health conditions and prior suicide attempts, other contributing circumstances include social and economic problems, access to lethal means

(e.g., substances, firearms) among persons at risk, and poor coping and problem-solving skills (5). Expanded awareness of these additional circumstances contributing to suicide risk and action to address them can help reach the national goal, established by the National Action Alliance of Suicide Prevention and the American Foundation for Suicide Prevention, of reducing the annual suicide rate 20% by 2025 (7). To assist states in achieving this goal, CDC analyzed state-specific trends in suicide rates and assessed the multiple contributing factors to suicide; this report presents options for strategies to include in comprehensive suicide prevention efforts that are based on the best available evidence.

## Methods

Suicide rates were analyzed for persons aged  $\geq 10$  years because determining suicidal intent in younger children can be difficult (8). Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases, Tenth Revision*, underlying-cause-of-death codes X60–X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive 3-year aggregate periods spanning 1999–2016 (1999–2001; 2002–2004; 2005–2007; 2008–2010; 2011–2013; and 2014–2016). Rate estimates

The *MMWR* series of publications is published by the Center for Surveillance, Epidemiology, and Laboratory Services, Centers for Disease Control and Prevention (CDC), U.S. Department of Health and Human Services, Atlanta, GA 30329-4027.

**Suggested citation:** [Author names; first three, then et al., if more than six.] [Report title]. *MMWR Morb Mortal Wkly Rep* 2018;67:[inclusive page numbers].

### Centers for Disease Control and Prevention

Robert R. Redfield, MD, *Director*  
 Anne Schuchat, MD, *Principal Deputy Director*  
 Leslie Dauphin, PhD, *Acting Associate Director for Science*  
 Joanne Cono, MD, ScM, *Director, Office of Science Quality*  
 Chesley L. Richards, MD, MPH, *Deputy Director for Public Health Scientific Services*  
 Michael F. Iademarco, MD, MPH, *Director, Center for Surveillance, Epidemiology, and Laboratory Services*

### MMWR Editorial and Production Staff (Weekly)

Charlotte K. Kent, PhD, MPH, *Acting Editor in Chief, Executive Editor*  
 Jacqueline Gindler, MD, *Editor*  
 Mary Dott, MD, MPH, *Online Editor*  
 Teresa F. Rutledge, *Managing Editor*  
 Douglas W. Weatherwax, *Lead Technical Writer-Editor*  
 Glenn Damon, Soumya Dunworth, PhD, Teresa M. Hood, MS,  
*Technical Writer-Editors*

Martha F. Boyd, *Lead Visual Information Specialist*  
 Maureen A. Leahy, Julia C. Martinroe,  
 Stephen R. Spriggs, Tong Yang,  
*Visual Information Specialists*  
 Quang M. Doan, MBA, Phyllis H. King,  
 Terraye M. Starr, Moua Yang,  
*Information Technology Specialists*

### MMWR Editorial Board

Timothy F. Jones, MD, *Chairman*  
 Matthew L. Boulton, MD, MPH  
 Virginia A. Caine, MD  
 Katherine Lyon Daniel, PhD  
 Jonathan E. Fielding, MD, MPH, MBA  
 David W. Fleming, MD

William E. Halperin, MD, DrPH, MPH  
 King K. Holmes, MD, PhD  
 Robin Ikeda, MD, MPH  
 Rima F. Khabbaz, MD  
 Phyllis Meadows, PhD, MSN, RN  
 Jewel Mullen, MD, MPH, MPA

Jeff Niederdeppe, PhD  
 Patricia Quinlisk, MD, MPH  
 Patrick L. Remington, MD, MPH  
 Carlos Roig, MS, MA  
 William L. Roper, MD, MPH  
 William Schaffner, MD



were age-adjusted to the U.S. 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same 3-year data aggregates, employing weighted least-squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes.

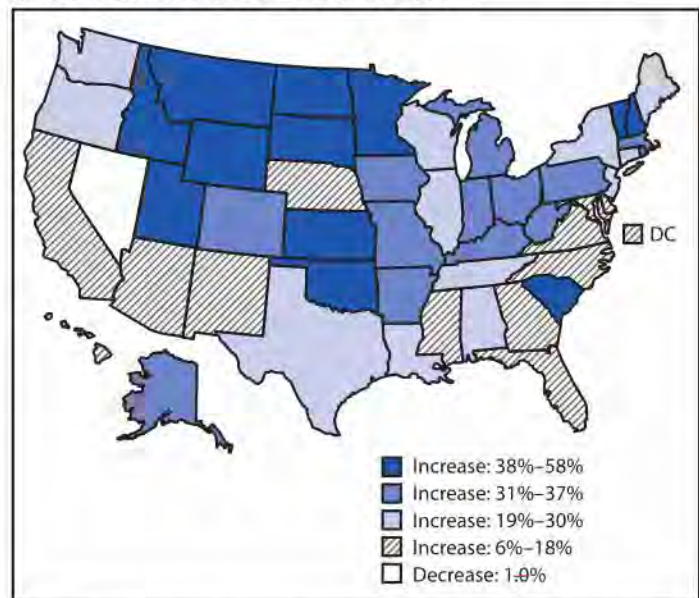
Characteristics of persons aged  $\geq 10$  years who died by suicide, with and without known mental health conditions, and the circumstances surrounding the suicides were compared in the 27 states\* with complete data participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines mental health conditions as disorders and syndromes listed in the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (9), with the exception of problematic alcohol use and other substance use that are captured separately in NVDRS. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. A range of circumstances (relationship problems, life stressors, and recent or impending crises) have been identified as potential risk factors for suicide in NVDRS. Circumstances captured are those identified as contributing to suicide in coroner/medical examiner or law enforcement reports, which reflect information provided by family and friends at the time of death. Decedents could have experienced multiple circumstances. Decedents with and without known mental health conditions were compared using chi-square tests. Logistic regression analyses were used to estimate adjusted odds ratios (aORs) with 95% confidence intervals (CIs), controlling for sex, age group, and race/ethnicity.

## Results

The most recent overall suicide rates (representing 2014–2016) varied fourfold, from 6.9 (District of Columbia) to 29.2 (Montana) per 100,000 persons per year (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>). Across the study period, rates increased in all states except Nevada (where the rate was consistently high throughout the study period), with absolute increases ranging from 0.8 per 100,000 (Delaware) to 8.1 (Wyoming). Percentage increases in rates ranged from 5.9% (Delaware) to 57.6% (North Dakota), with increases  $>30\%$  observed in 25 states (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>) (Figure).

Modeled suicide rate trends indicated significant increases in 44 states, among males (34 states) and females (43 states), as well as for the United States overall (Supplementary Table;

**FIGURE. Percent change in annual suicide rate,\* by state — United States, from 1999–2001 to 2014–2016**



\* Per 100,000 population, age-adjusted to the 2000 U.S. standard population.

<https://stacks.cdc.gov/view/cdc/53785>). Nationally, the model-estimated average annual percentage change for the overall suicide rate was an increase of 1.5%. By sex, estimated national rate trends further indicated significant average annual percentage change increases for males (1.1%) and females (2.6%) (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>).

Suicide decedents without known mental health conditions (11,039; 54.0%) were compared with those with known mental health conditions (9,407; 46.0%) for 27 states. Whereas decedents were predominantly male (76.8%) (Table 1) and non-Hispanic white (83.6%), those without known mental health conditions, relative to those with mental health conditions, were more likely to be male (83.6% versus 68.8%; odds ratio [OR] = 2.3, 95% CI = 2.2–2.5) and belong to a racial/ethnic minority (OR range = 1.2–2.0). Suicide decedents without known mental health conditions also had significantly higher odds of perpetrating homicide followed by suicide (aOR = 2.9, 95% CI = 2.2–3.8). Among decedents aged  $\geq 18$  years, 20.1% of those without known mental health conditions and 15.3% of those with mental health conditions had previously served in the U.S. military or were serving at the time of death.

Whereas firearms were the most common method of suicide overall (48.5%), decedents without known mental health conditions were more likely to die by firearm (55.3%) and less likely to die by hanging/strangulation/suffocation (26.9%) or poisoning (10.4%) than were those with known mental health

\*Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.



**TABLE 1. Selected demographic and descriptive characteristics of suicides among persons aged ≥10 years with and without known mental health conditions — National Violent Death Reporting System, 27 states,\* 2015**

Characteristic	Total (N = 20,446) <sup>‡</sup>	Known mental health condition <sup>†</sup> (n = 9,407) <sup>‡</sup>	No known mental health condition (n = 11,039) <sup>‡</sup>	Chi-square p-value	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>¶</sup> (95% CI)
<b>Sex</b>						
Male	15,702 (76.8)	6,469 (68.8)	9,233 (83.6)	<0.01	2.3 (2.2–2.5)	NA
Female	4,744 (23.2)	2,938 (31.2)	1,806 (16.4)	<0.01	0.4 (0.4–0.5)	NA
<b>Age (yrs)**</b>						
10–24	2,804 (13.7)	1,211 (12.9)	1,593 (14.4)	<0.01	1.1 (1.1–1.2)	NA
25–44	6,456 (31.6)	3,036 (32.3)	3,420 (31.0)	<0.05	0.9 (0.9–1.0)	NA
45–64	7,718 (37.7)	3,820 (40.6)	3,898 (35.3)	<0.01	0.8 (0.8–0.8)	NA
≥65	3,468 (17.0)	1,340 (14.2)	2,128 (19.3)	<0.01	1.4 (1.3–1.5)	NA
<b>Race/Ethnicity</b>						
White, non-Hispanic	17,102 (83.6)	8,165 (86.8)	8,937 (81.0)	<0.01	0.6 (0.6–0.7)	NA
Black, non-Hispanic	1,228 (6.0)	411 (4.4)	817 (7.4)	<0.01	1.7 (1.5–2.0)	NA
American Indian/Alaska Native, non-Hispanic	378 (1.8)	112 (1.2)	266 (2.4)	<0.01	2.0 (1.6–2.6)	NA
Asian, non-Hispanic	576 (2.8)	235 (2.5)	341 (3.1)	<0.05	1.2 (1.1–1.5)	NA
Hispanic	1,096 (5.4)	463 (4.9)	633 (5.7)	<0.05	1.2 (1.0–1.3)	NA
Other	66 (0.3)	21 (0.2)	45 (0.4)	<0.05	1.8 (1.1–3.1)	NA
<b>Extended demographics</b>						
Ever served in military <sup>††</sup>	3,429 (17.8)	1,354 (15.3)	2,075 (20.1)	<0.01	1.4 (1.3–1.5)	1.1 (1.0–1.1)
Homeless	240 (1.2)	104 (1.1)	136 (1.3)	NS	1.1 (0.9–1.5)	1.2 (0.9–1.5)
<b>Incident type</b>						
Single suicide	20,063 (98.2)	9,318 (99.1)	10,745 (97.4)	<0.01	0.3 (0.3–0.4)	0.4 (0.3–0.5)
Homicide followed by suicide	319 (1.6)	64 (0.7)	255 (2.3)	<0.01	3.5 (2.6–4.5)	2.9 (2.2–3.8)
Multiple suicides	64 (0.3)	25 (0.3)	39 (0.4)	NS	1.3 (0.8–2.2)	1.6 (0.9–2.6)
<b>Method</b>						
Firearm	9,909 (48.5)	3,821 (40.6)	6,088 (55.3)	<0.01	1.8 (1.7–1.9)	1.6 (1.5–1.7)
Hanging/Strangulation/Suffocation	5,907 (28.9)	2,940 (31.3)	2,967 (26.9)	<0.01	0.8 (0.8–0.9)	0.8 (0.7–0.8)
Poisoning	3,003 (14.7)	1,861 (19.8)	1,142 (10.4)	<0.01	0.5 (0.4–0.5)	0.6 (0.6–0.7)
<b>Substance class causing death<sup>§§</sup></b>						
Other (e.g., over-the-counter)	1,021 (34.0)	666 (35.8)	355 (31.1)	<0.01	0.8 (0.7–0.9)	0.9 (0.7–1.0)
Opioids	944 (31.4)	608 (32.7)	336 (29.4)	NS	0.9 (0.7–1.0)	0.9 (0.8–1.1)
Antidepressants	800 (26.6)	644 (34.6)	156 (13.7)	<0.01	0.3 (0.2–0.4)	0.3 (0.3–0.4)
Benzodiazepines	624 (20.8)	468 (25.1)	156 (13.7)	<0.01	0.5 (0.4–0.6)	0.5 (0.4–0.6)
Antipsychotics	219 (7.3)	195 (10.5)	24 (2.1)	<0.01	0.2 (0.1–0.3)	0.2 (0.1–0.3)
Other	1,595 (7.8)	780 (8.3)	815 (7.4)	<0.05	0.9 (0.8–1.0)	0.9 (0.8–1.0)

See table footnotes on next page.

conditions (40.6%, 31.3%, and 19.8%, respectively). These differences remained significant in the adjusted models.

Toxicology testing was less likely to be performed for decedents without known mental health conditions. Among those with toxicology results, decedents without known mental health conditions were less likely to test positive for any substance overall (aOR = 0.8, 95% CI = 0.7–0.8), including opioids (aOR = 0.90, 95% CI = 0.81–0.99), but were more likely to test positive for alcohol (aOR = 1.2, 95% CI = 1.1–1.3).

Information on circumstances surrounding suicide were available for all decedents with mental health conditions (9,407) and approximately 85% of those without known mental health conditions (9,357) in 27 states (Table 2). Persons without known mental health conditions were less likely to have any problematic substance use (aOR = 0.7, 95% CI = 0.7–0.8) than were persons with known mental health conditions. Whereas two thirds of decedents with known mental health conditions had a history of mental health

or substance use treatment (67.2%), just over half (54.0%) were in treatment at the time of death.

Decedents without known mental health conditions had a significantly higher likelihood of any relationship problem/loss (45.1%) than did those with known mental health conditions (39.6%), specifically intimate partner problems (30.2% versus 24.1%), arguments/conflicts (17.5% versus 13.6%), and perpetrating interpersonal violence in the past month (3.0% versus 1.4%). Decedents without known mental health conditions were also more likely than were those with known mental health conditions to have experienced any life stressors (50.5% versus 47.2%) such as criminal legal problems (10.7% versus 6.2%) or eviction/loss of home (4.3% versus 3.4%) and were more likely to have had a recent or impending (within the preceding or upcoming 2 weeks, respectively) crisis (a current or acute event thought to contribute to the suicide) (32.9% versus 26.0%). All of these differences remained significant in the adjusted models. Physical health problems and



**TABLE 1. (Continued) Selected demographic and descriptive characteristics of suicides among persons aged ≥10 years with and without known mental health conditions — National Violent Death Reporting System, 27 states,\* 2015**

Characteristic	Total (N = 20,446) <sup>‡</sup>	Known mental health condition <sup>†</sup> (n = 9,407) <sup>‡</sup>	No known mental health condition (n = 11,039) <sup>‡</sup>	Chi-square p-value	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>¶</sup> (95% CI)
<b>Toxicology results</b>						
Any toxicology testing	13,317 (65.1)	6,658 (70.8)	6,659 (60.3)	<0.01	0.6 (0.6–0.7)	0.7 (0.6–0.7)
Positive for ≥1 substance <sup>¶¶</sup>	9,913 (74.4)	5,192 (78.0)	4,721 (70.9)	<0.01	0.7 (0.6–0.7)	0.8 (0.7–0.8)
<b>Substance detected***</b>						
Alcohol						
Tested	10,950 (53.6)	5,409 (57.5)	5,541 (50.2)	<0.01	0.7 (0.7–0.8)	0.8 (0.7–0.8)
Positive	4,442 (40.6)	2,115 (39.1)	2,327 (42.0)	<0.01	1.1 (1.0–1.2)	1.2 (1.1–1.3)
Opioids						
Tested	8,554 (41.8)	4,258 (45.3)	4,296 (38.9)	<0.01	0.8 (0.7–0.8)	0.8 (0.8–0.9)
Positive	2,279 (26.6)	1,238 (29.1)	1,041 (24.2)	<0.01	0.8 (0.7–0.9)	0.9 (0.8–1.0)
Benzodiazepines						
Tested	8,124 (39.7)	4,226 (44.9)	3,898 (35.3)	<0.01	0.7 (0.6–0.7)	0.7 (0.7–0.8)
Positive	2,464 (30.3)	1,639 (38.8)	825 (21.2)	<0.01	0.4 (0.4–0.5)	0.5 (0.5–0.6)
Cocaine						
Tested	7,978 (39.0)	3,866 (41.1)	4,112 (37.2)	<0.01	0.9 (0.8–0.9)	0.9 (0.9–1.0)
Positive	499 (6.3)	216 (5.6)	283 (6.9)	<0.05	1.2 (1.0–1.5)	1.2 (1.0–1.5)
Amphetamines						
Tested	7,615 (37.2)	3,696 (39.3)	3,919 (35.5)	<0.01	0.9 (0.8–0.9)	0.9 (0.8–0.9)
Positive	736 (9.7)	376 (10.2)	360 (9.2)	NS	0.9 (0.8–1.0)	1.0 (0.8–1.1)
Marijuana						
Tested	6,569 (32.1)	3,127 (33.2)	3,442 (31.2)	<0.01	0.9 (0.9–1.0)	0.9 (0.9–1.0)
Positive	1,471 (22.4)	710 (22.7)	761 (22.1)	NS	1.0 (0.9–1.1)	0.9 (0.8–1.0)
Antidepressants						
Tested	5,425 (26.5)	3,103 (33.0)	2,322 (21.0)	<0.01	0.5 (0.5–0.6)	0.6 (0.6–0.7)
Positive	2,214 (40.8)	1,735 (55.9)	479 (20.6)	<0.01	0.2 (0.2–0.2)	0.2 (0.2–0.3)

**Abbreviations:** CI = confidence interval; NA = not adjusted; NS = not significant; OR = odds ratio.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

† Decedent had been identified as having a current diagnosis of mental health condition in coroner/medical examiner or law enforcement reports.

§ OR reflects the risk among those without known mental health condition relative to those with known mental health condition.

¶ Logistic regression was used to estimate adjusted OR with 95% CIs after controlling for sex, age group, and race/ethnicity. Known mental health condition was used as the reference group.

\*\* Decedents were aged ≥10 years, as per standard in the suicide prevention literature.

†† Denominator is decedents aged ≥18 years with reported military service status.

§§ Denominator is decedents who died by poisoning, including overdose.

¶¶ Denominator is decedents with any toxicology testing.

\*\*\* Denominator for each positive group is the number tested for the substance in that group.

job/financial problems were commonly contributing stressors among both persons without mental health conditions (23.2% and 15.6%, respectively) and those with mental health conditions (21.4% and 16.8%, respectively). Similarly, among all persons with recent crises, intimate partner problems were the most common types and did not differ by group.

Decedents without known mental health conditions had significantly lower odds of recent release from any institution (aOR = 0.5, 95% CI = 0.4–0.5). Among those recently released, decedents without known mental health conditions were significantly more likely than decedents with mental health conditions to have been released from a correctional facility (25.7% versus 8.7%), hospital (43.7% versus 33.0%), or other facility, such as an alcohol/substance use treatment facility (24.2% versus 11.6%). Among decedents with known mental health conditions who were recently released from an institution, 46.7% were released from psychiatric facilities.

Decedents without known mental health conditions were significantly less likely to have a history of suicidal ideation (23.0%) or prior suicide attempts (10.3%) compared with those with known mental health conditions (40.8% and 29.4%, respectively). Suicide intent was disclosed by 22.4% and 24.5% of persons without and with known mental health conditions, respectively.

## Conclusions and Comments

During 1999–2016, suicide rates increased significantly in 44 states, and 25 states experienced increases >30%. Rates increased significantly among males in 34 states, and females in 43 states. Additional research into the specific causes of these trends is needed. Data from the 27 states participating in NVDRS provide important insight into circumstances surrounding suicide and can help states identify prevention priorities.



**TABLE 2. Circumstances preceding suicide among decedents aged ≥10 years with and without known mental health conditions — National Violent Death Reporting System, 27 states,\* 2015**

Characteristic	Total	Known mental health condition <sup>†</sup> no. (%)	No known mental health condition no. (%)	Chi-square p-value	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>¶</sup> (95% CI)
<b>Suicide with known circumstances</b>	<b>18,764 (91.8)</b>	<b>9,407 (100)</b>	<b>9,357 (84.8)</b>	<b>&lt;0.01</b>	<b>N/A</b>	<b>N/A</b>
<b>Mental health</b>						
Any current diagnosed mental health condition**						
Depression/Dysthymia	—††	7,076 (75.2)	N/A	N/A	N/A	N/A
Anxiety disorder	—††	1,579 (16.8)	N/A	N/A	N/A	N/A
Bipolar disorder	—††	1,431 (15.2)	N/A	N/A	N/A	N/A
Schizophrenia	—††	509 (5.4)	N/A	N/A	N/A	N/A
PTSD	—††	424 (4.5)	N/A	N/A	N/A	N/A
ADD/ADHD	—††	226 (2.4)	N/A	N/A	N/A	N/A
Not specified	—††	760 (8.1)	N/A	N/A	N/A	N/A
Current depressed mood <sup>§§</sup>	<b>7,038 (37.5)</b>	<b>3,962 (42.1)</b>	<b>3,076 (32.9)</b>	<b>&lt;0.01</b>	<b>0.7 (0.6–0.7)</b>	<b>0.7 (0.6–0.7)</b>
<b>Problematic substance use</b>						
Any	<b>5,319 (28.3)</b>	<b>2,976 (31.6)</b>	<b>2,343 (25.0)</b>	<b>&lt;0.01</b>	<b>0.7 (0.7–0.8)</b>	<b>0.7 (0.7–0.8)</b>
Alcohol	<b>3,268 (17.4)</b>	<b>1,862 (19.8)</b>	<b>1,406 (15.0)</b>	<b>&lt;0.01</b>	<b>0.7 (0.7–0.8)</b>	<b>0.7 (0.7–0.8)</b>
Other	<b>3,084 (16.4)</b>	<b>1,768 (18.8)</b>	<b>1,316 (14.1)</b>	<b>&lt;0.01</b>	<b>0.7 (0.7–0.8)</b>	<b>0.7 (0.7–0.8)</b>
<b>Treatment</b>						
Current mental health/substance use treatment	<b>5,141 (27.4)</b>	<b>5,077 (54.0)</b>	<b>64 (0.7)</b>	<b>&lt;0.01</b>	<b>0.01 (0.01–0.01)</b>	<b>0.01 (0.01–0.01)</b>
Ever treated for mental health/substance disorder	<b>6,717 (35.8)</b>	<b>6,323 (67.2)</b>	<b>394 (4.2)</b>	<b>&lt;0.01</b>	<b>0.02 (0.02–0.02)</b>	<b>0.02 (0.02–0.03)</b>
<b>Relationship problems/loss</b>						
Any relationship problem/loss	<b>7,948 (42.4)</b>	<b>3,726 (39.6)</b>	<b>4,222 (45.1)</b>	<b>&lt;0.01</b>	<b>1.3 (1.2–1.3)</b>	<b>1.3 (1.2–1.4)</b>
Intimate partner problem	<b>5,098 (27.2)</b>	<b>2,270 (24.1)</b>	<b>2,828 (30.2)</b>	<b>&lt;0.01</b>	<b>1.4 (1.3–1.5)</b>	<b>1.4 (1.3–1.5)</b>
Perpetrator of interpersonal violence in past month	<b>414 (2.2)</b>	<b>131 (1.4)</b>	<b>283 (3.0)</b>	<b>&lt;0.01</b>	<b>2.2 (1.8–2.7)</b>	<b>2.0 (1.6–2.4)</b>
Victim of interpersonal violence in past month	<b>84 (0.4)</b>	<b>53 (0.6)</b>	<b>31 (0.3)</b>	<b>&lt;0.05</b>	<b>0.6 (0.4–0.9)</b>	<b>0.8 (0.5–1.2)</b>
Family relationship problem	<b>1,671 (8.9)</b>	<b>873 (9.3)</b>	<b>798 (8.5)</b>	<b>NS</b>	<b>0.9 (0.8–1.0)</b>	<b>1.0 (0.9–1.1)</b>
Other relationship problem (nonintimate)	<b>403 (2.1)</b>	<b>202 (2.1)</b>	<b>201 (2.1)</b>	<b>NS</b>	<b>1.0 (0.8–1.2)</b>	<b>1.1 (0.9–1.3)</b>
Argument or conflict (not specified)	<b>2,914 (15.5)</b>	<b>1,278 (13.6)</b>	<b>1,636 (17.5)</b>	<b>&lt;0.01</b>	<b>1.3 (1.2–1.5)</b>	<b>1.4 (1.3–1.5)</b>
Death of a loved one (any)	<b>1,497 (8.0)</b>	<b>826 (8.8)</b>	<b>671 (7.2)</b>	<b>&lt;0.01</b>	<b>0.8 (0.7–0.9)</b>	<b>0.9 (0.8–0.9)</b>
Nonsuicide death	<b>1,181 (6.3)</b>	<b>647 (6.9)</b>	<b>534 (5.7)</b>	<b>&lt;0.01</b>	<b>0.8 (0.7–0.9)</b>	<b>0.9 (0.8–1.0)</b>
Suicide of family or friend	<b>379 (2.0)</b>	<b>217 (2.3)</b>	<b>162 (1.7)</b>	<b>&lt;0.01</b>	<b>0.7 (0.6–0.9)</b>	<b>0.8 (0.7–1.0)</b>
<b>Other life stressors</b>						
Any life stressor	<b>9,171 (48.9)</b>	<b>4,442 (47.2)</b>	<b>4,729 (50.5)</b>	<b>&lt;0.01</b>	<b>1.1 (1.1–1.2)</b>	<b>1.1 (1.0–1.2)</b>
Recent criminal legal problem	<b>1,588 (8.5)</b>	<b>586 (6.2)</b>	<b>1,002 (10.7)</b>	<b>&lt;0.01</b>	<b>1.8 (1.6–2.0)</b>	<b>1.7 (1.5–1.9)</b>
Other legal problem	<b>748 (4.0)</b>	<b>378 (4.0)</b>	<b>370 (4.0)</b>	<b>NS</b>	<b>1.0 (0.8–1.1)</b>	<b>1.0 (0.9–1.2)</b>
Physical health problem	<b>4,179 (22.3)</b>	<b>2,012 (21.4)</b>	<b>2,167 (23.2)</b>	<b>&lt;0.01</b>	<b>1.1 (1.0–1.2)</b>	<b>1.0 (1.0–1.1)</b>
Job/Financial problem <sup>¶¶</sup>	<b>2,941 (16.2)</b>	<b>1,530 (16.8)</b>	<b>1,411 (15.6)</b>	<b>&lt;0.05</b>	<b>0.9 (0.8–1.0)</b>	<b>0.9 (0.8–1.0)</b>
Eviction or loss of home	<b>722 (3.8)</b>	<b>317 (3.4)</b>	<b>405 (4.3)</b>	<b>&lt;0.01</b>	<b>1.3 (1.1–1.5)</b>	<b>1.4 (1.2–1.6)</b>
School problem <sup>***</sup>	<b>162 (19.9)</b>	<b>70 (17.8)</b>	<b>92 (21.9)</b>	<b>NS</b>	<b>1.3 (0.9–1.8)</b>	<b>1.3 (0.9–1.9)</b>
Recent release from an institution <sup>†††</sup>	<b>1,412 (7.6)</b>	<b>941 (10.2)</b>	<b>471 (5.1)</b>	<b>&lt;0.01</b>	<b>0.5 (0.4–0.5)</b>	<b>0.5 (0.4–0.5)</b>
Jail/Prison/Detention facility	<b>203 (14.4)</b>	<b>82 (8.7)</b>	<b>121 (25.7)</b>	<b>&lt;0.01</b>	<b>3.6 (2.7–4.9)</b>	<b>4.5 (3.2–6.4)</b>
Hospital	<b>517 (36.6)</b>	<b>311 (33.0)</b>	<b>206 (43.7)</b>	<b>&lt;0.01</b>	<b>1.6 (1.3–2.0)</b>	<b>1.3 (1.0–1.7)</b>
Psychiatric hospital/institution	<b>469 (33.2)</b>	<b>439 (46.7)</b>	<b>30 (6.4)</b>	<b>&lt;0.01</b>	<b>0.1 (0.1–0.1)</b>	<b>0.1 (0.1–0.1)</b>
Other (includes alcohol/SU treatment facilities)	<b>223 (15.8)</b>	<b>109 (11.6)</b>	<b>114 (24.2)</b>	<b>&lt;0.01</b>	<b>2.4 (1.8–3.3)</b>	<b>2.5 (1.8–3.3)</b>

See table footnotes on next page.

Suicidologists regularly state that suicide is not caused by a single factor (5); however, suicide prevention is often oriented toward mental health conditions alone with regard to downstream identification of suicidal persons, treatment of mental health conditions, and prevention of reattempts. This study found that approximately half of suicide decedents in NVDRS did not have a known mental health condition, indicating that additional focus on nonmental health factors further upstream could provide important information for a public health approach (10). Those without a known mental health condition suffered more from relationship problems and

other life stressors such as criminal/legal matters, eviction/loss of home, and recent or impending crises.

Similarly, persons with mental health conditions also often experienced other circumstances such as relationship problems and job/financial or physical health problems that contributed to their suicide. These findings point to the need to both prevent the circumstances associated with the onset of mental health conditions and support persons with known mental health conditions to decrease their risk for poor outcomes (11). Two thirds of suicide decedents with mental health conditions had a history of treatment for mental health or substance use



**TABLE 2. (Continued) Circumstances preceding suicide among decedents aged  $\geq 10$  years with and without known mental health conditions — National Violent Death Reporting System, 27 states,\* 2015**

Characteristic	Total	Known mental health condition <sup>†</sup> no. (%)	No known mental health condition no. (%)	Chi-square p-value	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>¶</sup> (95% CI)
<b>Crisis within past or upcoming 2 weeks<sup>§§</sup></b>	<b>5,525 (29.4)</b>	<b>2,444 (26.0)</b>	<b>3,081 (32.9)</b>	<b>&lt;0.01</b>	<b>1.4 (1.3–1.5)</b>	<b>1.4 (1.3–1.5)</b>
Intimate partner problem	1,968 (35.6)	854 (34.9)	1,114 (36.2)	NS	1.1 (0.9–1.2)	1.1 (0.9–1.2)
Physical health problem	739 (13.4)	315 (12.9)	424 (13.8)	NS	1.1 (0.9–1.3)	1.0 (0.8–1.2)
Criminal legal problem	621 (11.2)	203 (8.3)	418 (13.6)	<0.01	1.7 (1.5–2.1)	1.6 (1.3–1.9)
Family relationship problem	430 (7.8)	212 (8.7)	218 (7.1)	<0.05	0.8 (0.7–1.0)	0.9 (0.7–1.1)
Job problem	354 (6.4)	191 (7.8)	163 (5.3)	<0.01	0.7 (0.5–0.8)	0.7 (0.5–0.8)
<b>Suicide event/history</b>						
Left a note	6,468 (34.5)	3,182 (33.8)	3,286 (35.1)	NS	1.1 (1.0–1.1)	1.2 (1.1–1.2)
Disclosed suicide intent	4,405 (23.5)	2,306 (24.5)	2,099 (22.4)	<0.01	0.9 (0.8–1.0)	0.9 (0.8–0.9)
History of ideation	5,990 (31.9)	3,838 (40.8)	2,152 (23.0)	<0.01	0.4 (0.4–0.5)	0.4 (0.4–0.5)
History of attempts	3,732 (19.9)	2,770 (29.4)	962 (10.3)	<0.01	0.3 (0.3–0.3)	0.3 (0.3–0.3)

**Abbreviations:** ADD/ADHD = attention deficit disorder/attention deficit hyperactivity disorder; CI = confidence interval; N/A = not applicable; NS = not significant; OR = odds ratio; PTSD = posttraumatic stress disorder; SU = substance use.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

<sup>†</sup> Decedent had been identified as having a current diagnosis of mental health condition in coroner/medical examiner or law enforcement reports.

<sup>§</sup> OR reflects the risk among those without known mental health condition relative to those with known mental health condition.

<sup>¶</sup> Logistic regression was used to estimate adjusted OR with 95% CIs after controlling for sex, age group, and race/ethnicity. Known mental health condition was the reference group.

<sup>\*\*</sup> Includes decedents with one or more diagnosed current mental health conditions, which are not mutually exclusive. Therefore, sums of percentages for the diagnosed conditions exceed 100%. Denominator includes the number of decedents with one or more current diagnosed mental health conditions.

<sup>††</sup> The specific type of mental health condition was calculated only among those with one or more known diagnosed mental health conditions.

<sup>§§</sup> Not a diagnosis.

<sup>¶¶</sup> Denominator is decedents aged  $\geq 18$  years.

<sup>\*\*\*</sup> Denominator is decedents aged 10–18 years.

<sup>†††</sup> Denominator of institution subgroup is decedents with recent release from an institution. Recent release from an institution is defined as having occurred within the past month.

<sup>§§§</sup> Denominator of crisis subgroup is decedents with any crisis within past or upcoming 2 weeks. Crises depicted here represent the most commonly occurring categories.

disorders, with approximately half in treatment when they died. This finding suggests the need for additional safety supports, including broader implementation of affordable and effective treatment modalities, such as doctor-patient collaborative care models and proven cognitive-behavioral therapies. In addition, increased access to behavioral health providers in underserved areas is needed, as is expansion of health care systems that integrate physical and behavioral health, with a priority on suicide prevention and patient safety, especially through care transitions (12).

Comprehensive statewide suicide prevention activities are needed to address the full range of factors contributing to suicide. Prevention strategies include strengthening economic supports (e.g., housing stabilization policies, household financial support); teaching coping and problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in life; promoting social connectedness to increase a sense of belonging and access to informational, tangible, emotional, and social support; and identifying and better supporting persons at risk (e.g., military veterans, persons with physical/mental health conditions) (12). Other strategies include creating protective environments (e.g., reducing access to lethal means

among persons at risk for suicide, creating organizational and workplace policies to promote help-seeking, easing transitions into and out of work for persons with mental health conditions and other life challenges), strengthening access to and delivery of care, supporting family and friends after a suicide, and assuring the media for safe reporting recommendations (12). Some states, such as Colorado, are planning to implement such a comprehensive approach to suicide prevention (10).

The findings in this report are subject to at least three limitations. First, in the state-level analysis, rankings for four states (Maryland, Massachusetts, Rhode Island, and Utah) might have been affected by large proportions of injury deaths of undetermined intent (potentially biasing reported suicide rates downward) or decreased percentages of such deaths over time (potentially biasing estimated rate trends upward). Second, NVDRS is not yet nationally representative; the 27 states included represent 49.6% of the population (<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml>). Finally, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the extent of informant knowledge can affect data completeness and accuracy. Studies that include more in-depth interviews



## References

## Summary

## What is already known about this topic?

In 2016, nearly 45,000 persons died by suicide in the United States. Mental health conditions are one of several contributors to suicide.

## What is added by this report?

During 1999–2016, suicide rates increased in nearly every state, including >30% increases in 25 states. 2015 data from 27 states indicate 54% of suicide decedents were not known to have mental health conditions. Relationship, substance use, health, and job or financial problems are among the other circumstances contributing to suicide.

## What are the implications for public health practice?

A comprehensive approach using proven prevention strategies, such as those in CDC's Technical Package for Suicide Prevention, can help reach the national goal of reducing the annual suicide rate 20% by 2025.

with next-of-kin often identify greater attributions to mental disorders (13); however, many methodological variations across studies exist (14). It is likely that some persons without known mental health conditions in the current study were experiencing mental health challenges that were unknown, and hence underreported by key informants. Nonetheless, the high prevalence of diverse contributing circumstances among those with and without known mental health conditions suggests the importance of addressing the broad range of factors that contribute to suicide.

Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are available. States and communities can use data from NVDRS and resources such as CDC's *Preventing Suicide: A Technical Package of Policy, Programs, and Practices* (12) to better understand suicide in their populations, prioritize evidence-based comprehensive suicide prevention, and save lives.

## Acknowledgments

Robert Anderson, Holly Hedegaard, Margaret Warner, Division of Vital Statistics, National Center for Health Statistics, CDC.

## Conflict of Interest

No conflicts of interest were reported.

<sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis, Research, and Practice Integration, National Center for Injury Prevention and Control, CDC.

Corresponding author: Deborah M. Stone, dstone3@cdc.gov, 770-488-3942.

1. CDC. Web-based Injury Statistics Query and Reporting System (WISQARS). Atlanta, GA: National Center for Injury Prevention and Control; 2018. <https://www.cdc.gov/injury/wisqars/index.html>
2. Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide trends among and within urbanization levels by sex, race/ethnicity, age group, and mechanism of death—United States, 2001–2015. *MMWR Surveill Summ* 2017;66(No. SS-18). <https://doi.org/10.15585/mmwr.ss6618a1>
3. Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999–2014. NCHS data brief no 241. Hyattsville, MD: US Department of Health and Human Services, CDC, National Center for Health Statistics; 2016. <https://www.cdc.gov/nchs/data/databriefs/db241.pdf>
4. Kochanek K, Murphy S, Xu J, Arias E. Mortality in the United States, 2016. NCHS data brief no 293. Hyattsville, MD: US Department of Health and Human Services, CDC, National Center for Health Statistics; 2017. <https://www.cdc.gov/nchs/data/databriefs/db293.pdf>
5. Office of the Surgeon General; National Action Alliance for Suicide Prevention. 2012 National strategy for suicide prevention: goals and objectives for action. Washington, DC: US Department of Health and Human Services, Office of the Surgeon General; 2012. <https://www.surgeongeneral.gov/library/reports/national-strategy-suicide-prevention/full-report.pdf>
6. Zalsman G, Hawton K, Wasserman D, et al. Suicide prevention strategies revisited: 10-year systematic review. *Lancet Psychiatry* 2016;3:646–59. [https://doi.org/10.1016/S2215-0366\(16\)30030-X](https://doi.org/10.1016/S2215-0366(16)30030-X)
7. Torguson K, O'Brien A. Leading suicide prevention efforts unite to address rising national suicide rate. Washington, DC: American Foundation for Suicide Prevention; 2017. <https://afsp.org/leading-suicide-prevention-efforts-unite-address-rising-national-suicide-rate/>
8. Crepeau-Hobson F. The psychological autopsy and determination of child suicides: a survey of medical examiners. *Arch Suicide Res* 2010;14:24–34. <https://doi.org/10.1080/13811110903479011>
9. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5). Washington, DC: American Psychiatric Association; 2013.
10. Caine ED, Reed J, Hindman J, Quinlan K. Comprehensive, integrated approaches to suicide prevention: practical guidance. *Inj Prev* 2017. Epub December 20, 2017. <https://doi.org/10.1136/injuryprev-2017-042366>
11. World Health Organization. Risks to mental health: an overview of vulnerabilities and risk factors. Geneva, Switzerland: World Health Organization; 2012.
12. Stone DM, Holland KM, Bartholow BN, Crosby AE, Davis SP, Wilkins N. Preventing suicide: a technical package of policy, programs, and practice. Atlanta, GA: US Department of Health and Human Services, CDC; 2017. <https://www.cdc.gov/violenceprevention/pdf/suicidetechnicalpackage.pdf>
13. Milner A, Svetcic J, De Leo D. Suicide in the absence of mental disorder? A review of psychological autopsy studies across countries. *Int J Soc Psychiatry* 2013;59:545–54. <https://doi.org/10.1177/0020764012444259>
14. Pouliot L, De Leo D. Critical issues in psychological autopsy studies. *Suicide Life Threat Behav* 2006;36:491–510.



## Vital Signs: Trends in State Suicide Rates — United States, 1999–2016 and Circumstances Contributing to Suicide — 27 States, 2015

Deborah M. Stone, ScD<sup>1</sup>; Thomas R. Simon PhD<sup>1</sup>; Katherine A. Fowler, PhD<sup>1</sup>; Scott R. Kegler, PhD<sup>2</sup>; Keming Yuan, MS<sup>1</sup>; Kristin M. Holland, PhD<sup>1</sup>; Asha Z. Ivey-Stephenson, PhD<sup>1</sup>; Alex E. Crosby, MD<sup>1</sup>

### Abstract

**Introduction:** Suicide rates in the United States have risen nearly 30% since 1999, and mental health conditions are one of several factors contributing to suicide. Examining state-level trends in suicide and the multiple circumstances contributing to it can inform comprehensive state suicide prevention planning.

**Methods:** Trends in age-adjusted suicide rates among persons aged  $\geq 10$  years, by state and sex, across six consecutive 3-year periods (1999–2016), were assessed using data from the National Vital Statistics System for 50 states and the District of Columbia. Data from the National Violent Death Reporting System, covering 27 states in 2015, were used to examine contributing circumstances among decedents with and without known mental health conditions.

**Results:** During 1999–2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases  $>30\%$ . Rates increased significantly among males and females in 34 and 43 states, respectively. Fifty-four percent of decedents in 27 states in 2015 did not have a known mental health condition.

Among decedents with available information, several circumstances were significantly more likely among those without known mental health conditions than among those with mental health conditions, including relationship problems/loss (45.1% versus 39.6%), life stressors (50.5% versus 47.2%), and recent/impending crises (32.9% versus 26.0%), but these circumstances were common across groups.

**Conclusions:** Suicide rates increased significantly across most states during 1999–2016. Various circumstances contributed to suicides among persons with and without known mental health conditions.

**Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach to prevent suicide risk before it occurs, identify and support persons at risk, prevent reattempts, and help friends and family members in the aftermath of a suicide.

### INSIDE

7 QuickStats

Continuing Education examination available at  
[https://www.cdc.gov/mmwr/cme/conted\\_info.html#weekly](https://www.cdc.gov/mmwr/cme/conted_info.html#weekly).



U.S. Department of Health and Human Services  
Centers for Disease Control and Prevention



## Introduction

In 2016, nearly 45,000 suicides (15.6/100,000 population [age-adjusted]) occurred in the United States among persons aged  $\geq 10$  years (1). From 1999 to 2015, suicide rates increased among both sexes, all racial/ethnic groups, and all urbanization levels (2,3). Suicide rates have also increased among persons in all age groups  $< 75$  years, with adults aged 45–64 having the largest percent increase (45%; from 13.2 per 100,000 persons [1999] to 19.2 per 100,000 [2016]) and the greatest number of suicides (232,108) during the same period (1,3). Suicide is the 10th leading cause of death and is one of just three leading causes that are increasing (1,4). In addition, rates of emergency department visits for nonfatal self-harm, a main risk factor for suicide, increased 42% from 2001 to 2016 (1). Together, suicides and self-harm injuries cost the nation approximately \$70 billion per year in direct medical and work loss costs (1).

The National Strategy for Suicide Prevention (NSSP) (5) calls for a public health approach to suicide prevention with efforts spanning multiple levels (individual, family/relationship, community, and societal). Such a comprehensive approach underscores that suicide is rarely caused by any single factor, but rather, is determined by multiple factors. Despite this call to action, suicide prevention largely focuses on identifying and referring suicidal persons to mental health treatment and preventing reattempts (6). In addition to mental health conditions and prior suicide attempts, other contributing circumstances include social and economic problems, access to lethal means

(e.g., substances, firearms) among persons at risk, and poor coping and problem-solving skills (5). Expanded awareness of these additional circumstances contributing to suicide risk and action to address them can help reach the national goal, established by the National Action Alliance of Suicide Prevention and the American Foundation for Suicide Prevention, of reducing the annual suicide rate 20% by 2025 (7). To assist states in achieving this goal, CDC analyzed state-specific trends in suicide rates and assessed the multiple contributing factors to suicide; this report presents options for strategies to include in comprehensive suicide prevention efforts that are based on the best available evidence.

## Methods

Suicide rates were analyzed for persons aged  $\geq 10$  years because determining suicidal intent in younger children can be difficult (8). Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases, Tenth Revision*, underlying-cause-of-death codes X60–X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive 3-year aggregate periods spanning 1999–2016 (1999–2001; 2002–2004; 2005–2007; 2008–2010; 2011–2013; and 2014–2016). Rate estimates

The *MMWR* series of publications is published by the Center for Surveillance, Epidemiology, and Laboratory Services, Centers for Disease Control and Prevention (CDC), U.S. Department of Health and Human Services, Atlanta, GA 30329-4027.

**Suggested citation:** [Author names; first three, then et al., if more than six.] [Report title]. *MMWR Morb Mortal Wkly Rep* 2018;67:[inclusive page numbers].

### Centers for Disease Control and Prevention

Robert R. Redfield, MD, *Director*  
 Anne Schuchat, MD, *Principal Deputy Director*  
 Leslie Dauphin, PhD, *Acting Associate Director for Science*  
 Joanne Cono, MD, ScM, *Director, Office of Science Quality*  
 Chesley L. Richards, MD, MPH, *Deputy Director for Public Health Scientific Services*  
 Michael F. Iademarco, MD, MPH, *Director, Center for Surveillance, Epidemiology, and Laboratory Services*

### MMWR Editorial and Production Staff (Weekly)

Charlotte K. Kent, PhD, MPH, *Acting Editor in Chief, Executive Editor*  
 Jacqueline Gindler, MD, *Editor*  
 Mary Dott, MD, MPH, *Online Editor*  
 Teresa F. Rutledge, *Managing Editor*  
 Douglas W. Weatherwax, *Lead Technical Writer-Editor*  
 Glenn Damon, Soumya Dunworth, PhD, Teresa M. Hood, MS,  
*Technical Writer-Editors*

Martha F. Boyd, *Lead Visual Information Specialist*  
 Maureen A. Leahy, Julia C. Martinroe,  
 Stephen R. Spriggs, Tong Yang,  
*Visual Information Specialists*  
 Quang M. Doan, MBA, Phyllis H. King,  
 Terraye M. Starr, Moua Yang,  
*Information Technology Specialists*

### MMWR Editorial Board

Timothy F. Jones, MD, *Chairman*  
 Matthew L. Boulton, MD, MPH  
 Virginia A. Caine, MD  
 Katherine Lyon Daniel, PhD  
 Jonathan E. Fielding, MD, MPH, MBA  
 David W. Fleming, MD

William E. Halperin, MD, DrPH, MPH  
 King K. Holmes, MD, PhD  
 Robin Ikeda, MD, MPH  
 Rima F. Khabbaz, MD  
 Phyllis Meadows, PhD, MSN, RN  
 Jewel Mullen, MD, MPH, MPA

Jeff Niederdeppe, PhD  
 Patricia Quinlisk, MD, MPH  
 Patrick L. Remington, MD, MPH  
 Carlos Roig, MS, MA  
 William L. Roper, MD, MPH  
 William Schaffner, MD



were age-adjusted to the U.S. 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same 3-year data aggregates, employing weighted least-squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes.

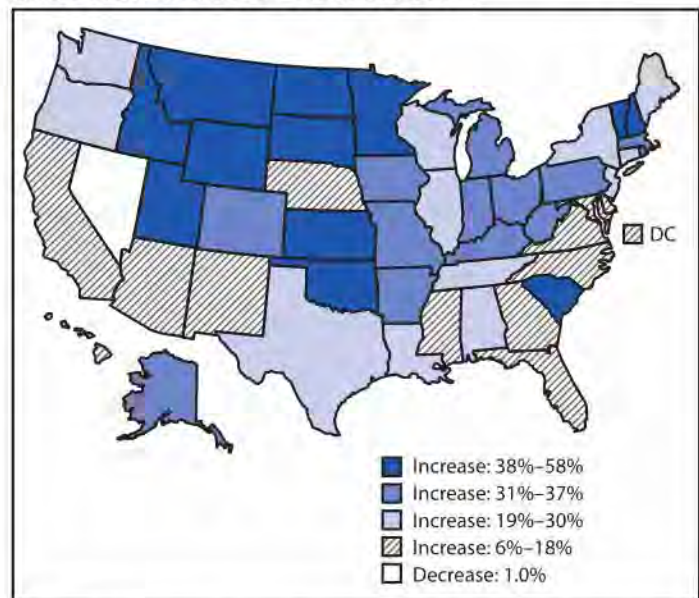
Characteristics of persons aged  $\geq 10$  years who died by suicide, with and without known mental health conditions, and the circumstances surrounding the suicides were compared in the 27 states\* with complete data participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines mental health conditions as disorders and syndromes listed in the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (9), with the exception of problematic alcohol use and other substance use that are captured separately in NVDRS. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. A range of circumstances (relationship problems, life stressors, and recent or impending crises) have been identified as potential risk factors for suicide in NVDRS. Circumstances captured are those identified as contributing to suicide in coroner/medical examiner or law enforcement reports, which reflect information provided by family and friends at the time of death. Decedents could have experienced multiple circumstances. Decedents with and without known mental health conditions were compared using chi-square tests. Logistic regression analyses were used to estimate adjusted odds ratios (aORs) with 95% confidence intervals (CIs), controlling for sex, age group, and race/ethnicity.

## Results

The most recent overall suicide rates (representing 2014–2016) varied fourfold, from 6.9 (District of Columbia) to 29.2 (Montana) per 100,000 persons per year (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>). Across the study period, rates increased in all states except Nevada (where the rate was consistently high throughout the study period), with absolute increases ranging from 0.8 per 100,000 (Delaware) to 8.1 (Wyoming). Percentage increases in rates ranged from 5.9% (Delaware) to 57.6% (North Dakota), with increases  $>30\%$  observed in 25 states (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>) (Figure).

Modeled suicide rate trends indicated significant increases in 44 states, among males (34 states) and females (43 states), as well as for the United States overall (Supplementary Table;

**FIGURE. Percent change in annual suicide rate,\* by state — United States, from 1999–2001 to 2014–2016**



\* Per 100,000 population, age-adjusted to the 2000 U.S. standard population.

<https://stacks.cdc.gov/view/cdc/53785>). Nationally, the model-estimated average annual percentage change for the overall suicide rate was an increase of 1.5%. By sex, estimated national rate trends further indicated significant average annual percentage change increases for males (1.1%) and females (2.6%) (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>).

Suicide decedents without known mental health conditions (11,039; 54.0%) were compared with those with known mental health conditions (9,407; 46.0%) for 27 states. Whereas decedents were predominantly male (76.8%) (Table 1) and non-Hispanic white (83.6%), those without known mental health conditions, relative to those with mental health conditions, were more likely to be male (83.6% versus 68.8%; odds ratio [OR] = 2.3, 95% CI = 2.2–2.5) and belong to a racial/ethnic minority (OR range = 1.2–2.0). Suicide decedents without known mental health conditions also had significantly higher odds of perpetrating homicide followed by suicide (aOR = 2.9, 95% CI = 2.2–3.8). Among decedents aged  $\geq 18$  years, 20.1% of those without known mental health conditions and 15.3% of those with mental health conditions had previously served in the U.S. military or were serving at the time of death.

Whereas firearms were the most common method of suicide overall (48.5%), decedents without known mental health conditions were more likely to die by firearm (55.3%) and less likely to die by hanging/strangulation/suffocation (26.9%) or poisoning (10.4%) than were those with known mental health

\*Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.



**TABLE 1. Selected demographic and descriptive characteristics of suicides among persons aged ≥10 years with and without known mental health conditions — National Violent Death Reporting System, 27 states,\* 2015**

Characteristic	Total (N = 20,446)	Known mental health condition† (n = 9,407)	No known mental health condition (n = 11,039)	Chi-square p-value	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>¶</sup> (95% CI)
<b>Sex</b>						
Male	15,702 (76.8)	6,469 (68.8)	9,233 (83.6)	<0.01	2.3 (2.2–2.5)	NA
Female	4,744 (23.2)	2,938 (31.2)	1,806 (16.4)	<0.01	0.4 (0.4–0.5)	NA
<b>Age (yrs)**</b>						
10–24	2,804 (13.7)	1,211 (12.9)	1,593 (14.4)	<0.01	1.1 (1.1–1.2)	NA
25–44	6,456 (31.6)	3,036 (32.3)	3,420 (31.0)	<0.05	0.9 (0.9–1.0)	NA
45–64	7,718 (37.7)	3,820 (40.6)	3,898 (35.3)	<0.01	0.8 (0.8–0.8)	NA
≥65	3,468 (17.0)	1,340 (14.2)	2,128 (19.3)	<0.01	1.4 (1.3–1.5)	NA
<b>Race/Ethnicity</b>						
White, non-Hispanic	17,102 (83.6)	8,165 (86.8)	8,937 (81.0)	<0.01	0.6 (0.6–0.7)	NA
Black, non-Hispanic	1,228 (6.0)	411 (4.4)	817 (7.4)	<0.01	1.7 (1.5–2.0)	NA
American Indian/Alaska Native, non-Hispanic	378 (1.8)	112 (1.2)	266 (2.4)	<0.01	2.0 (1.6–2.6)	NA
Asian, non-Hispanic	576 (2.8)	235 (2.5)	341 (3.1)	<0.05	1.2 (1.1–1.5)	NA
Hispanic	1,096 (5.4)	463 (4.9)	633 (5.7)	<0.05	1.2 (1.0–1.3)	NA
Other	66 (0.3)	21 (0.2)	45 (0.4)	<0.05	1.8 (1.1–3.1)	NA
<b>Extended demographics</b>						
Ever served in military††	3,429 (17.8)	1,354 (15.3)	2,075 (20.1)	<0.01	1.4 (1.3–1.5)	1.1 (1.0–1.1)
Homeless	240 (1.2)	104 (1.1)	136 (1.3)	NS	1.1 (0.9–1.5)	1.2 (0.9–1.5)
<b>Incident type</b>						
Single suicide	20,063 (98.2)	9,318 (99.1)	10,745 (97.4)	<0.01	0.3 (0.3–0.4)	0.4 (0.3–0.5)
Homicide followed by suicide	319 (1.6)	64 (0.7)	255 (2.3)	<0.01	3.5 (2.6–4.5)	2.9 (2.2–3.8)
Multiple suicides	64 (0.3)	25 (0.3)	39 (0.4)	NS	1.3 (0.8–2.2)	1.6 (0.9–2.6)
<b>Method</b>						
Firearm	9,909 (48.5)	3,821 (40.6)	6,088 (55.3)	<0.01	1.8 (1.7–1.9)	1.6 (1.5–1.7)
Hanging/Strangulation/Suffocation	5,907 (28.9)	2,940 (31.3)	2,967 (26.9)	<0.01	0.8 (0.8–0.9)	0.8 (0.7–0.8)
Poisoning	3,003 (14.7)	1,861 (19.8)	1,142 (10.4)	<0.01	0.5 (0.4–0.5)	0.6 (0.6–0.7)
<b>Substance class causing death<sup>§§</sup></b>						
Other (e.g., over-the-counter)	1,021 (34.0)	666 (35.8)	355 (31.1)	<0.01	0.8 (0.7–0.9)	0.9 (0.7–1.0)
Opioids	944 (31.4)	608 (32.7)	336 (29.4)	NS	0.9 (0.7–1.0)	0.9 (0.8–1.1)
Antidepressants	800 (26.6)	644 (34.6)	156 (13.7)	<0.01	0.3 (0.2–0.4)	0.3 (0.3–0.4)
Benzodiazepines	624 (20.8)	468 (25.1)	156 (13.7)	<0.01	0.5 (0.4–0.6)	0.5 (0.4–0.6)
Antipsychotics	219 (7.3)	195 (10.5)	24 (2.1)	<0.01	0.2 (0.1–0.3)	0.2 (0.1–0.3)
Other	1,595 (7.8)	780 (8.3)	815 (7.4)	<0.05	0.9 (0.8–1.0)	0.9 (0.8–1.0)

See table footnotes on next page.

conditions (40.6%, 31.3%, and 19.8%, respectively). These differences remained significant in the adjusted models.

Toxicology testing was less likely to be performed for decedents without known mental health conditions. Among those with toxicology results, decedents without known mental health conditions were less likely to test positive for any substance overall (aOR = 0.8, 95% CI = 0.7–0.8), including opioids (aOR = 0.90, 95% CI = 0.81–0.99), but were more likely to test positive for alcohol (aOR = 1.2, 95% CI = 1.1–1.3).

Information on circumstances surrounding suicide were available for all decedents with mental health conditions (9,407) and approximately 85% of those without known mental health conditions (9,357) in 27 states (Table 2). Persons without known mental health conditions were less likely to have any problematic substance use (aOR = 0.7, 95% CI = 0.7–0.8) than were persons with known mental health conditions. Whereas two thirds of decedents with known mental health conditions had a history of mental health

or substance use treatment (67.2%), just over half (54.0%) were in treatment at the time of death.

Decedents without known mental health conditions had a significantly higher likelihood of any relationship problem/loss (45.1%) than did those with known mental health conditions (39.6%), specifically intimate partner problems (30.2% versus 24.1%), arguments/conflicts (17.5% versus 13.6%), and perpetrating interpersonal violence in the past month (3.0% versus 1.4%). Decedents without known mental health conditions were also more likely than were those with known mental health conditions to have experienced any life stressors (50.5% versus 47.2%) such as criminal legal problems (10.7% versus 6.2%) or eviction/loss of home (4.3% versus 3.4%) and were more likely to have had a recent or impending (within the preceding or upcoming 2 weeks, respectively) crisis (a current or acute event thought to contribute to the suicide) (32.9% versus 26.0%). All of these differences remained significant in the adjusted models. Physical health problems and



**TABLE 1. (Continued) Selected demographic and descriptive characteristics of suicides among persons aged ≥10 years with and without known mental health conditions — National Violent Death Reporting System, 27 states,\* 2015**

Characteristic	Total (N = 20,446)	Known mental health condition† (n = 9,407)	No known mental health condition (n = 11,039)	Chi-square p-value	OR§ (95% CI)	Adjusted OR¶ (95% CI)
<b>Toxicology results</b>						
Any toxicology testing	13,317 (65.1)	6,658 (70.8)	6,659 (60.3)	<0.01	0.6 (0.6–0.7)	0.7 (0.6–0.7)
Positive for ≥1 substance¶¶	9,913 (74.4)	5,192 (78.0)	4,721 (70.9)	<0.01	0.7 (0.6–0.7)	0.8 (0.7–0.8)
<b>Substance detected***</b>						
Alcohol						
Tested	10,950 (53.6)	5,409 (57.5)	5,541 (50.2)	<0.01	0.7 (0.7–0.8)	0.8 (0.7–0.8)
Positive	4,442 (40.6)	2,115 (39.1)	2,327 (42.0)	<0.01	1.1 (1.0–1.2)	1.2 (1.1–1.3)
Opioids						
Tested	8,554 (41.8)	4,258 (45.3)	4,296 (38.9)	<0.01	0.8 (0.7–0.8)	0.8 (0.8–0.9)
Positive	2,279 (26.6)	1,238 (29.1)	1,041 (24.2)	<0.01	0.8 (0.7–0.9)	0.9 (0.8–1.0)
Benzodiazepines						
Tested	8,124 (39.7)	4,226 (44.9)	3,898 (35.3)	<0.01	0.7 (0.6–0.7)	0.7 (0.7–0.8)
Positive	2,464 (30.3)	1,639 (38.8)	825 (21.2)	<0.01	0.4 (0.4–0.5)	0.5 (0.5–0.6)
Cocaine						
Tested	7,978 (39.0)	3,866 (41.1)	4,112 (37.2)	<0.01	0.9 (0.8–0.9)	0.9 (0.9–1.0)
Positive	499 (6.3)	216 (5.6)	283 (6.9)	<0.05	1.2 (1.0–1.5)	1.2 (1.0–1.5)
Amphetamines						
Tested	7,615 (37.2)	3,696 (39.3)	3,919 (35.5)	<0.01	0.9 (0.8–0.9)	0.9 (0.8–0.9)
Positive	736 (9.7)	376 (10.2)	360 (9.2)	NS	0.9 (0.8–1.0)	1.0 (0.8–1.1)
Marijuana						
Tested	6,569 (32.1)	3,127 (33.2)	3,442 (31.2)	<0.01	0.9 (0.9–1.0)	0.9 (0.9–1.0)
Positive	1,471 (22.4)	710 (22.7)	761 (22.1)	NS	1.0 (0.9–1.1)	0.9 (0.8–1.0)
Antidepressants						
Tested	5,425 (26.5)	3,103 (33.0)	2,322 (21.0)	<0.01	0.5 (0.5–0.6)	0.6 (0.6–0.7)
Positive	2,214 (40.8)	1,735 (55.9)	479 (20.6)	<0.01	0.2 (0.2–0.2)	0.2 (0.2–0.3)

**Abbreviations:** CI = confidence interval; NA = not adjusted; NS = not significant; OR = odds ratio.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

† Decedent had been identified as having a current diagnosis of mental health condition in coroner/medical examiner or law enforcement reports.

§ OR reflects the risk among those without known mental health condition relative to those with known mental health condition.

¶ Logistic regression was used to estimate adjusted OR with 95% CIs after controlling for sex, age group, and race/ethnicity. Known mental health condition was used as the reference group.

\*\* Decedents were aged ≥10 years, as per standard in the suicide prevention literature.

†† Denominator is decedents aged ≥18 years with reported military service status.

§§ Denominator is decedents who died by poisoning, including overdose.

¶¶ Denominator is decedents with any toxicology testing.

\*\*\* Denominator for each positive group is the number tested for the substance in that group.

job/financial problems were commonly contributing stressors among both persons without mental health conditions (23.2% and 15.6%, respectively) and those with mental health conditions (21.4% and 16.8%, respectively). Similarly, among all persons with recent crises, intimate partner problems were the most common types and did not differ by group.

Decedents without known mental health conditions had significantly lower odds of recent release from any institution (aOR = 0.5, 95% CI = 0.4–0.5). Among those recently released, decedents without known mental health conditions were significantly more likely than decedents with mental health conditions to have been released from a correctional facility (25.7% versus 8.7%), hospital (43.7% versus 33.0%), or other facility, such as an alcohol/substance use treatment facility (24.2% versus 11.6%). Among decedents with known mental health conditions who were recently released from an institution, 46.7% were released from psychiatric facilities.

Decedents without known mental health conditions were significantly less likely to have a history of suicidal ideation (23.0%) or prior suicide attempts (10.3%) compared with those with known mental health conditions (40.8% and 29.4%, respectively). Suicide intent was disclosed by 22.4% and 24.5% of persons without and with known mental health conditions, respectively.

## Conclusions and Comments

During 1999–2016, suicide rates increased significantly in 44 states, and 25 states experienced increases >30%. Rates increased significantly among males in 34 states, and females in 43 states. Additional research into the specific causes of these trends is needed. Data from the 27 states participating in NVDRS provide important insight into circumstances surrounding suicide and can help states identify prevention priorities.



**TABLE 2. Circumstances preceding suicide among decedents aged ≥10 years with and without known mental health conditions — National Violent Death Reporting System, 27 states,\* 2015**

Characteristic	Total	Known mental health condition <sup>†</sup> no. (%)	No known mental health condition no. (%)	Chi-square p-value	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>¶</sup> (95% CI)
<b>Suicide with known circumstances</b>	<b>18,764 (91.8)</b>	<b>9,407 (100)</b>	<b>9,357 (84.8)</b>	<b>&lt;0.01</b>	<b>N/A</b>	<b>N/A</b>
<b>Mental health</b>						
Any current diagnosed mental health condition**						
Depression/Dysthymia	—††	7,076 (75.2)	N/A	N/A	N/A	N/A
Anxiety disorder	—††	1,579 (16.8)	N/A	N/A	N/A	N/A
Bipolar disorder	—††	1,431 (15.2)	N/A	N/A	N/A	N/A
Schizophrenia	—††	509 (5.4)	N/A	N/A	N/A	N/A
PTSD	—††	424 (4.5)	N/A	N/A	N/A	N/A
ADD/ADHD	—††	226 (2.4)	N/A	N/A	N/A	N/A
Not specified	—††	760 (8.1)	N/A	N/A	N/A	N/A
Current depressed mood <sup>§§</sup>	<b>7,038 (37.5)</b>	<b>3,962 (42.1)</b>	<b>3,076 (32.9)</b>	<b>&lt;0.01</b>	<b>0.7 (0.6–0.7)</b>	<b>0.7 (0.6–0.7)</b>
<b>Problematic substance use</b>						
Any	<b>5,319 (28.3)</b>	<b>2,976 (31.6)</b>	<b>2,343 (25.0)</b>	<b>&lt;0.01</b>	<b>0.7 (0.7–0.8)</b>	<b>0.7 (0.7–0.8)</b>
Alcohol	<b>3,268 (17.4)</b>	<b>1,862 (19.8)</b>	<b>1,406 (15.0)</b>	<b>&lt;0.01</b>	<b>0.7 (0.7–0.8)</b>	<b>0.7 (0.7–0.8)</b>
Other	<b>3,084 (16.4)</b>	<b>1,768 (18.8)</b>	<b>1,316 (14.1)</b>	<b>&lt;0.01</b>	<b>0.7 (0.7–0.8)</b>	<b>0.7 (0.7–0.8)</b>
<b>Treatment</b>						
Current mental health/substance use treatment	<b>5,141 (27.4)</b>	<b>5,077 (54.0)</b>	<b>64 (0.7)</b>	<b>&lt;0.01</b>	<b>0.01 (0.01–0.01)</b>	<b>0.01 (0.01–0.01)</b>
Ever treated for mental health/substance disorder	<b>6,717 (35.8)</b>	<b>6,323 (67.2)</b>	<b>394 (4.2)</b>	<b>&lt;0.01</b>	<b>0.02 (0.02–0.02)</b>	<b>0.02 (0.02–0.03)</b>
<b>Relationship problems/loss</b>						
Any relationship problem/loss	<b>7,948 (42.4)</b>	<b>3,726 (39.6)</b>	<b>4,222 (45.1)</b>	<b>&lt;0.01</b>	<b>1.3 (1.2–1.3)</b>	<b>1.3 (1.2–1.4)</b>
Intimate partner problem	<b>5,098 (27.2)</b>	<b>2,270 (24.1)</b>	<b>2,828 (30.2)</b>	<b>&lt;0.01</b>	<b>1.4 (1.3–1.5)</b>	<b>1.4 (1.3–1.5)</b>
Perpetrator of interpersonal violence in past month	<b>414 (2.2)</b>	<b>131 (1.4)</b>	<b>283 (3.0)</b>	<b>&lt;0.01</b>	<b>2.2 (1.8–2.7)</b>	<b>2.0 (1.6–2.4)</b>
Victim of interpersonal violence in past month	<b>84 (0.4)</b>	<b>53 (0.6)</b>	<b>31 (0.3)</b>	<b>&lt;0.05</b>	<b>0.6 (0.4–0.9)</b>	<b>0.8 (0.5–1.2)</b>
Family relationship problem	<b>1,671 (8.9)</b>	<b>873 (9.3)</b>	<b>798 (8.5)</b>	<b>NS</b>	<b>0.9 (0.8–1.0)</b>	<b>1.0 (0.9–1.1)</b>
Other relationship problem (nonintimate)	<b>403 (2.1)</b>	<b>202 (2.1)</b>	<b>201 (2.1)</b>	<b>NS</b>	<b>1.0 (0.8–1.2)</b>	<b>1.1 (0.9–1.3)</b>
Argument or conflict (not specified)	<b>2,914 (15.5)</b>	<b>1,278 (13.6)</b>	<b>1,636 (17.5)</b>	<b>&lt;0.01</b>	<b>1.3 (1.2–1.5)</b>	<b>1.4 (1.3–1.5)</b>
Death of a loved one (any)	<b>1,497 (8.0)</b>	<b>826 (8.8)</b>	<b>671 (7.2)</b>	<b>&lt;0.01</b>	<b>0.8 (0.7–0.9)</b>	<b>0.9 (0.8–0.9)</b>
Nonsuicide death	<b>1,181 (6.3)</b>	<b>647 (6.9)</b>	<b>534 (5.7)</b>	<b>&lt;0.01</b>	<b>0.8 (0.7–0.9)</b>	<b>0.9 (0.8–1.0)</b>
Suicide of family or friend	<b>379 (2.0)</b>	<b>217 (2.3)</b>	<b>162 (1.7)</b>	<b>&lt;0.01</b>	<b>0.7 (0.6–0.9)</b>	<b>0.8 (0.7–1.0)</b>
<b>Other life stressors</b>						
Any life stressor	<b>9,171 (48.9)</b>	<b>4,442 (47.2)</b>	<b>4,729 (50.5)</b>	<b>&lt;0.01</b>	<b>1.1 (1.1–1.2)</b>	<b>1.1 (1.0–1.2)</b>
Recent criminal legal problem	<b>1,588 (8.5)</b>	<b>586 (6.2)</b>	<b>1,002 (10.7)</b>	<b>&lt;0.01</b>	<b>1.8 (1.6–2.0)</b>	<b>1.7 (1.5–1.9)</b>
Other legal problem	<b>748 (4.0)</b>	<b>378 (4.0)</b>	<b>370 (4.0)</b>	<b>NS</b>	<b>1.0 (0.8–1.1)</b>	<b>1.0 (0.9–1.2)</b>
Physical health problem	<b>4,179 (22.3)</b>	<b>2,012 (21.4)</b>	<b>2,167 (23.2)</b>	<b>&lt;0.01</b>	<b>1.1 (1.0–1.2)</b>	<b>1.0 (1.0–1.1)</b>
Job/Financial problem <sup>¶¶</sup>	<b>2,941 (16.2)</b>	<b>1,530 (16.8)</b>	<b>1,411 (15.6)</b>	<b>&lt;0.05</b>	<b>0.9 (0.8–1.0)</b>	<b>0.9 (0.8–1.0)</b>
Eviction or loss of home	<b>722 (3.8)</b>	<b>317 (3.4)</b>	<b>405 (4.3)</b>	<b>&lt;0.01</b>	<b>1.3 (1.1–1.5)</b>	<b>1.4 (1.2–1.6)</b>
School problem <sup>***</sup>	<b>162 (19.9)</b>	<b>70 (17.8)</b>	<b>92 (21.9)</b>	<b>NS</b>	<b>1.3 (0.9–1.8)</b>	<b>1.3 (0.9–1.9)</b>
Recent release from an institution <sup>†††</sup>	<b>1,412 (7.6)</b>	<b>941 (10.2)</b>	<b>471 (5.1)</b>	<b>&lt;0.01</b>	<b>0.5 (0.4–0.5)</b>	<b>0.5 (0.4–0.5)</b>
Jail/Prison/Detention facility	<b>203 (14.4)</b>	<b>82 (8.7)</b>	<b>121 (25.7)</b>	<b>&lt;0.01</b>	<b>3.6 (2.7–4.9)</b>	<b>4.5 (3.2–6.4)</b>
Hospital	<b>517 (36.6)</b>	<b>311 (33.0)</b>	<b>206 (43.7)</b>	<b>&lt;0.01</b>	<b>1.6 (1.3–2.0)</b>	<b>1.3 (1.0–1.7)</b>
Psychiatric hospital/institution	<b>469 (33.2)</b>	<b>439 (46.7)</b>	<b>30 (6.4)</b>	<b>&lt;0.01</b>	<b>0.1 (0.1–0.1)</b>	<b>0.1 (0.1–0.1)</b>
Other (includes alcohol/SU treatment facilities)	<b>223 (15.8)</b>	<b>109 (11.6)</b>	<b>114 (24.2)</b>	<b>&lt;0.01</b>	<b>2.4 (1.8–3.3)</b>	<b>2.5 (1.8–3.3)</b>

See table footnotes on next page.

Suicidologists regularly state that suicide is not caused by a single factor (5); however, suicide prevention is often oriented toward mental health conditions alone with regard to downstream identification of suicidal persons, treatment of mental health conditions, and prevention of reattempts. This study found that approximately half of suicide decedents in NVDRS did not have a known mental health condition, indicating that additional focus on nonmental health factors further upstream could provide important information for a public health approach (10). Those without a known mental health condition suffered more from relationship problems and

other life stressors such as criminal/legal matters, eviction/loss of home, and recent or impending crises.

Similarly, persons with mental health conditions also often experienced other circumstances such as relationship problems and job/financial or physical health problems that contributed to their suicide. These findings point to the need to both prevent the circumstances associated with the onset of mental health conditions and support persons with known mental health conditions to decrease their risk for poor outcomes (11). Two thirds of suicide decedents with mental health conditions had a history of treatment for mental health or substance use



**TABLE 2. (Continued) Circumstances preceding suicide among decedents aged  $\geq 10$  years with and without known mental health conditions — National Violent Death Reporting System, 27 states,\* 2015**

Characteristic	Total	Known mental health condition <sup>†</sup> no. (%)	No known mental health condition no. (%)	Chi-square p-value	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>¶</sup> (95% CI)
<b>Crisis within past or upcoming 2 weeks<sup>§§§</sup></b>	<b>5,525 (29.4)</b>	<b>2,444 (26.0)</b>	<b>3,081 (32.9)</b>	<b>&lt;0.01</b>	<b>1.4 (1.3–1.5)</b>	<b>1.4 (1.3–1.5)</b>
Intimate partner problem	1,968 (35.6)	854 (34.9)	1,114 (36.2)	NS	1.1 (0.9–1.2)	1.1 (0.9–1.2)
Physical health problem	739 (13.4)	315 (12.9)	424 (13.8)	NS	1.1 (0.9–1.3)	1.0 (0.8–1.2)
Criminal legal problem	621 (11.2)	203 (8.3)	418 (13.6)	<0.01	1.7 (1.5–2.1)	1.6 (1.3–1.9)
Family relationship problem	430 (7.8)	212 (8.7)	218 (7.1)	<0.05	0.8 (0.7–1.0)	0.9 (0.7–1.1)
Job problem	354 (6.4)	191 (7.8)	163 (5.3)	<0.01	0.7 (0.5–0.8)	0.7 (0.5–0.8)
<b>Suicide event/history</b>						
Left a note	6,468 (34.5)	3,182 (33.8)	3,286 (35.1)	NS	1.1 (1.0–1.1)	1.2 (1.1–1.2)
Disclosed suicide intent	4,405 (23.5)	2,306 (24.5)	2,099 (22.4)	<0.01	0.9 (0.8–1.0)	0.9 (0.8–0.9)
History of ideation	5,990 (31.9)	3,838 (40.8)	2,152 (23.0)	<0.01	0.4 (0.4–0.5)	0.4 (0.4–0.5)
History of attempts	3,732 (19.9)	2,770 (29.4)	962 (10.3)	<0.01	0.3 (0.3–0.3)	0.3 (0.3–0.3)

**Abbreviations:** ADD/ADHD = attention deficit disorder/attention deficit hyperactivity disorder; CI = confidence interval; N/A = not applicable; NS = not significant; OR = odds ratio; PTSD = posttraumatic stress disorder; SU = substance use.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

<sup>†</sup> Decedent had been identified as having a current diagnosis of mental health condition in coroner/medical examiner or law enforcement reports.

<sup>§</sup> OR reflects the risk among those without known mental health condition relative to those with known mental health condition.

<sup>¶</sup> Logistic regression was used to estimate adjusted OR with 95% CIs after controlling for sex, age group, and race/ethnicity. Known mental health condition was the reference group.

<sup>\*\*</sup> Includes decedents with one or more diagnosed current mental health conditions, which are not mutually exclusive. Therefore, sums of percentages for the diagnosed conditions exceed 100%. Denominator includes the number of decedents with one or more current diagnosed mental health conditions.

<sup>††</sup> The specific type of mental health condition was calculated only among those with one or more known diagnosed mental health conditions.

<sup>§§</sup> Not a diagnosis.

<sup>¶¶</sup> Denominator is decedents aged  $\geq 18$  years.

<sup>\*\*\*</sup> Denominator is decedents aged 10–18 years.

<sup>†††</sup> Denominator of institution subgroup is decedents with recent release from an institution. Recent release from an institution is defined as having occurred within the past month.

<sup>§§§</sup> Denominator of crisis subgroup is decedents with any crisis within past or upcoming 2 weeks. Crises depicted here represent the most commonly occurring categories.

disorders, with approximately half in treatment when they died. This finding suggests the need for additional safety supports, including broader implementation of affordable and effective treatment modalities, such as doctor-patient collaborative care models and proven cognitive-behavioral therapies. In addition, increased access to behavioral health providers in underserved areas is needed, as is expansion of health care systems that integrate physical and behavioral health, with a priority on suicide prevention and patient safety, especially through care transitions (12).

Comprehensive statewide suicide prevention activities are needed to address the full range of factors contributing to suicide. Prevention strategies include strengthening economic supports (e.g., housing stabilization policies, household financial support); teaching coping and problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in life; promoting social connectedness to increase a sense of belonging and access to informational, tangible, emotional, and social support; and identifying and better supporting persons at risk (e.g., military veterans, persons with physical/mental health conditions) (12). Other strategies include creating protective environments (e.g., reducing access to lethal means

among persons at risk for suicide, creating organizational and workplace policies to promote help-seeking, easing transitions into and out of work for persons with mental health conditions and other life challenges), strengthening access to and delivery of care, supporting family and friends after a suicide, and assuring the media follow safe reporting recommendations (12). Some states, such as Colorado, are planning to implement such a comprehensive approach to suicide prevention (10).

The findings in this report are subject to at least three limitations. First, in the state-level analysis, rankings for four states (Maryland, Massachusetts, Rhode Island, and Utah) might have been affected by large proportions of injury deaths of undetermined intent (potentially biasing reported suicide rates downward) or decreased percentages of such deaths over time (potentially biasing estimated rate trends upward). Second, NVDRS is not yet nationally representative; the 27 states included represent 49.6% of the population (<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml>). Finally, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the extent of informant knowledge can affect data completeness and accuracy. Studies that include more in-depth interviews



## References

## Summary

## What is already known about this topic?

In 2016, nearly 45,000 persons died by suicide in the United States. Mental health conditions are one of several contributors to suicide.

## What is added by this report?

During 1999–2016, suicide rates increased in nearly every state, including >30% increases in 25 states. 2015 data from 27 states indicate 54% of suicide decedents were not known to have mental health conditions. Relationship, substance use, health, and job or financial problems are among the other circumstances contributing to suicide.

## What are the implications for public health practice?

A comprehensive approach using proven prevention strategies, such as those in CDC's Technical Package for Suicide Prevention, can help reach the national goal of reducing the annual suicide rate 20% by 2025.

with next-of-kin often identify greater attributions to mental disorders (13); however, many methodological variations across studies exist (14). It is likely that some persons without known mental health conditions in the current study were experiencing mental health challenges that were unknown, and hence underreported by key informants. Nonetheless, the high prevalence of diverse contributing circumstances among those with and without known mental health conditions suggests the importance of addressing the broad range of factors that contribute to suicide.

Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are available. States and communities can use data from NVDRS and resources such as CDC's *Preventing Suicide: A Technical Package of Policy, Programs, and Practices* (12) to better understand suicide in their populations, prioritize evidence-based comprehensive suicide prevention, and save lives.

## Acknowledgments

Robert Anderson, Holly Hedegaard, Margaret Warner, Division of Vital Statistics, National Center for Health Statistics, CDC.

## Conflict of Interest

No conflicts of interest were reported.

<sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis, Research, and Practice Integration, National Center for Injury Prevention and Control, CDC.

Corresponding author: Deborah M. Stone, dstone3@cdc.gov, 770-488-3942.

1. CDC. Web-based Injury Statistics Query and Reporting System (WISQARS). Atlanta, GA: National Center for Injury Prevention and Control; 2018. <https://www.cdc.gov/injury/wisqars/index.html>
2. Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide trends among and within urbanization levels by sex, race/ethnicity, age group, and mechanism of death—United States, 2001–2015. *MMWR Surveill Summ* 2017;66(No. SS-18). <https://doi.org/10.15585/mmwr.ss6618a1>
3. Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999–2014. NCHS data brief no 241. Hyattsville, MD: US Department of Health and Human Services, CDC, National Center for Health Statistics; 2016. <https://www.cdc.gov/nchs/data/databriefs/db241.pdf>
4. Kochanek K, Murphy S, Xu J, Arias E. Mortality in the United States, 2016. NCHS data brief no 293. Hyattsville, MD: US Department of Health and Human Services, CDC, National Center for Health Statistics; 2017. <https://www.cdc.gov/nchs/data/databriefs/db293.pdf>
5. Office of the Surgeon General; National Action Alliance for Suicide Prevention. 2012 National strategy for suicide prevention: goals and objectives for action. Washington, DC: US Department of Health and Human Services, Office of the Surgeon General; 2012. <https://www.surgeongeneral.gov/library/reports/national-strategy-suicide-prevention/full-report.pdf>
6. Zalsman G, Hawton K, Wasserman D, et al. Suicide prevention strategies revisited: 10-year systematic review. *Lancet Psychiatry* 2016;3:646–59. [https://doi.org/10.1016/S2215-0366\(16\)30030-X](https://doi.org/10.1016/S2215-0366(16)30030-X)
7. Torguson K, O'Brien A. Leading suicide prevention efforts unite to address rising national suicide rate. Washington, DC: American Foundation for Suicide Prevention; 2017. <https://afsp.org/leading-suicide-prevention-efforts-unite-address-rising-national-suicide-rate/>
8. Crepeau-Hobson F. The psychological autopsy and determination of child suicides: a survey of medical examiners. *Arch Suicide Res* 2010;14:24–34. <https://doi.org/10.1080/13811110903479011>
9. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5). Washington, DC: American Psychiatric Association; 2013.
10. Caine ED, Reed J, Hindman J, Quinlan K. Comprehensive, integrated approaches to suicide prevention: practical guidance. *Inj Prev* 2017. Epub December 20, 2017. <https://doi.org/10.1136/injuryprev-2017-042366>
11. World Health Organization. Risks to mental health: an overview of vulnerabilities and risk factors. Geneva, Switzerland: World Health Organization; 2012.
12. Stone DM, Holland KM, Bartholow BN, Crosby AE, Davis SP, Wilkins N. Preventing suicide: a technical package of policy, programs, and practice. Atlanta, GA: US Department of Health and Human Services, CDC; 2017. <https://www.cdc.gov/violenceprevention/pdf/suicidetechnicalpackage.pdf>
13. Milner A, Svetcic J, De Leo D. Suicide in the absence of mental disorder? A review of psychological autopsy studies across countries. *Int J Soc Psychiatry* 2013;59:545–54. <https://doi.org/10.1177/0020764012444259>
14. Pouliot L, De Leo D. Critical issues in psychological autopsy studies. *Suicide Life Threat Behav* 2006;36:491–510.



## Vital Signs: Trends in State Suicide Rates — United States, 1999–2016 and Circumstances Contributing to Suicide — 27 States, 2015

Deborah M. Stone, ScD<sup>1</sup>; Thomas R. Simon PhD<sup>1</sup>; Katherine A. Fowler, PhD<sup>1</sup>; Scott R. Kegler, PhD<sup>2</sup>; Keming Yuan, MS<sup>1</sup>; Kristin M. Holland, PhD<sup>1</sup>; Asha Z. Ivey-Stephenson, PhD<sup>1</sup>; Alex E. Crosby, MD<sup>1</sup>

### Abstract

**Introduction:** Suicide rates in the United States have risen nearly 30% since 1999, and mental health conditions are one of several factors contributing to suicide. Examining state-level trends in suicide and the multiple circumstances contributing to it can inform comprehensive state suicide prevention planning.

**Methods:** Trends in age-adjusted suicide rates among persons aged  $\geq 10$  years, by state and sex, across six consecutive 3-year periods (1999–2016), were assessed using data from the National Vital Statistics System for 50 states and the District of Columbia. Data from the National Violent Death Reporting System, covering 27 states in 2015, were used to examine contributing circumstances among decedents with and without known mental health conditions.

**Results:** During 1999–2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases  $>30\%$ . Rates increased significantly among males and females in 34 and 43 states, respectively. Fifty-four percent of decedents in 27 states in 2015 did not have a known mental health condition.

Among decedents with available information, several circumstances were significantly more likely among those without known mental health conditions than among those with mental health conditions, including relationship problems/loss (45.1% versus 39.6%), life stressors (50.5% versus 47.2%), and recent/impending crises (32.9% versus 26.0%), but these circumstances were common across groups.

**Conclusions:** Suicide rates increased significantly across most states during 1999–2016. Various circumstances contributed to suicides among persons with and without known mental health conditions.

**Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach to prevent suicide risk before it occurs, identify and support persons at risk, prevent reattempts, and help friends and family members in the aftermath of a suicide.

### INSIDE

7 QuickStats

Continuing Education examination available at  
[https://www.cdc.gov/mmwr/cme/conted\\_info.html#weekly](https://www.cdc.gov/mmwr/cme/conted_info.html#weekly).



U.S. Department of Health and Human Services  
Centers for Disease Control and Prevention



## Introduction

In 2016, nearly 45,000 suicides (15.6/100,000 population [age-adjusted]) occurred in the United States among persons aged  $\geq 10$  years (1). From 1999 to 2015, suicide rates increased among both sexes, all racial/ethnic groups, and all urbanization levels (2,3). Suicide rates have also increased among persons in all age groups  $< 75$  years, with adults aged 45–64 having the largest absolute rate increase (from 13.2 per 100,000 persons [1999] to 19.2 per 100,000 [2016]) and the greatest number of suicides (232,108) during the same period (1,3). Suicide is the 10th leading cause of death and is one of just three leading causes that are increasing (1,4). In addition, rates of emergency department visits for nonfatal self-harm, a main risk factor for suicide, increased 42% from 2001 to 2016 (1). Together, suicides and self-harm injuries cost the nation approximately \$70 billion per year in direct medical and work loss costs (1).

The National Strategy for Suicide Prevention (5) calls for a public health approach to suicide prevention with efforts spanning multiple levels (individual, family/relationship, community, and societal). Such a comprehensive approach underscores that suicide is rarely caused by any single factor, but rather, is determined by multiple factors. Despite this call to action, suicide prevention largely focuses on identifying and referring suicidal persons to mental health treatment and preventing reattempts (6). In addition to mental health conditions and prior suicide attempts, other contributing circumstances include social and economic problems, access to lethal means (e.g., substances,

firearms) among persons at risk, and poor coping and problem-solving skills (5). Expanded awareness of these additional circumstances contributing to suicide risk and action to address them can help reach the national goal, established by the National Action Alliance of Suicide Prevention and the American Foundation for Suicide Prevention, of reducing the annual suicide rate 20% by 2025 (7). To assist states in achieving this goal, CDC analyzed state-specific trends in suicide rates and assessed the multiple contributing factors to suicide; this report presents options for strategies to include in comprehensive suicide prevention efforts that are based on the best available evidence.

## Methods

Suicide rates were analyzed for persons aged  $\geq 10$  years because determining suicidal intent in younger children can be difficult (8). Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases, Tenth Revision*, underlying-cause-of-death codes X60–X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive 3-year aggregate periods spanning 1999–2016 (1999–2001; 2002–2004; 2005–2007; 2008–2010; 2011–2013; and 2014–2016). Rate estimates were age-adjusted to the U.S. 2000 standard population and expressed

The *MMWR* series of publications is published by the Center for Surveillance, Epidemiology, and Laboratory Services, Centers for Disease Control and Prevention (CDC), U.S. Department of Health and Human Services, Atlanta, GA 30329-4027.

**Suggested citation:** [Author names; first three, then et al., if more than six.] [Report title]. *MMWR Morb Mortal Wkly Rep* 2018;67:[inclusive page numbers].

### Centers for Disease Control and Prevention

Robert R. Redfield, MD, *Director*  
Anne Schuchat, MD, *Principal Deputy Director*  
Leslie Dauphin, PhD, *Acting Associate Director for Science*  
Joanne Cono, MD, ScM, *Director, Office of Science Quality*  
Chesley L. Richards, MD, MPH, *Deputy Director for Public Health Scientific Services*  
Michael F. Iademarco, MD, MPH, *Director, Center for Surveillance, Epidemiology, and Laboratory Services*

### MMWR Editorial and Production Staff (Weekly)

Charlotte K. Kent, PhD, MPH, *Acting Editor in Chief, Executive Editor*  
Jacqueline Gindler, MD, *Editor*  
Mary Dott, MD, MPH, *Online Editor*  
Teresa F. Rutledge, *Managing Editor*  
Douglas W. Weatherwax, *Lead Technical Writer-Editor*  
Glenn Damon, Soumya Dunworth, PhD, Teresa M. Hood, MS,  
*Technical Writer-Editors*

Martha F. Boyd, *Lead Visual Information Specialist*  
Maureen A. Leahy, Julia C. Martinroe,  
Stephen R. Spriggs, Tong Yang,  
*Visual Information Specialists*  
Quang M. Doan, MBA, Phyllis H. King,  
Terraye M. Starr, Moua Yang,  
*Information Technology Specialists*

### MMWR Editorial Board

Timothy F. Jones, MD, *Chairman*  
Matthew L. Boulton, MD, MPH  
Virginia A. Caine, MD  
Katherine Lyon Daniel, PhD  
Jonathan E. Fielding, MD, MPH, MBA  
David W. Fleming, MD

William E. Halperin, MD, DrPH, MPH  
King K. Holmes, MD, PhD  
Robin Ikeda, MD, MPH  
Rima F. Khabbaz, MD  
Phyllis Meadows, PhD, MSN, RN  
Jewel Mullen, MD, MPH, MPA

Jeff Niederdeppe, PhD  
Patricia Quinlisk, MD, MPH  
Patrick L. Remington, MD, MPH  
Carlos Roig, MS, MA  
William L. Roper, MD, MPH  
William Schaffner, MD



per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same 3-year data aggregates, employing weighted least-squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes.

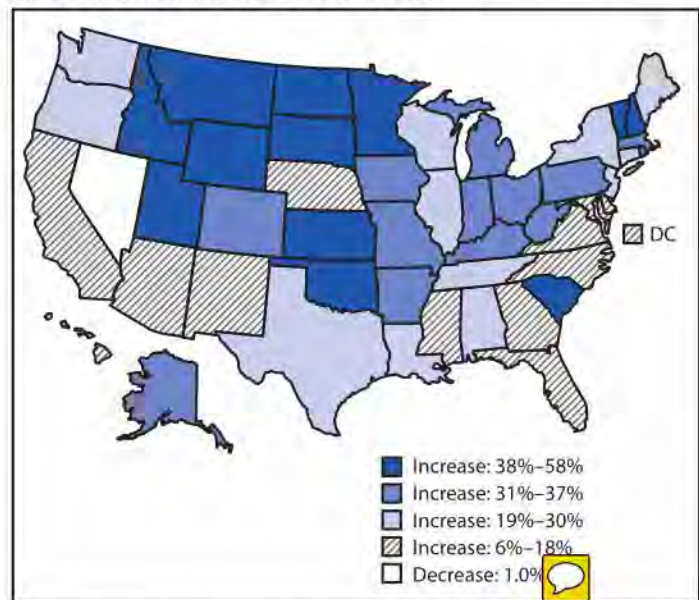
Characteristics of persons aged  $\geq 10$  years who died by suicide, with and without known mental health conditions, and the circumstances surrounding the suicides were compared in the 27 states\* with complete data participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines mental health conditions as disorders and syndromes listed in the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (9), with the exception of problematic alcohol use and other substance use that are captured separately in NVDRS. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. A range of circumstances (relationship problems, life stressors, and recent or impending crises) have been identified as potential risk factors for suicide in NVDRS. Circumstances captured are those identified as contributing to suicide in coroner/medical examiner or law enforcement reports, which reflect information provided by family and friends at the time of death. Decedents could have experienced multiple circumstances. Decedents with and without known mental health conditions were compared using chi-square tests. Logistic regression analyses were used to estimate adjusted odds ratios (aORs) with 95% confidence intervals (CIs), controlling for sex, age group, and race/ethnicity.

## Results

The most recent overall suicide rates (representing 2014–2016) varied fourfold, from 6.9 (District of Columbia) to 29.2 (Montana) per 100,000 persons per year (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>). Across the study period, rates increased in all states except Nevada (where the rate was consistently high throughout the study period), with absolute increases ranging from 0.8 per 100,000 (Delaware) to 8.1 (Wyoming). Percentage increases in rates ranged from 5.9% (Delaware) to 57.6% (North Dakota), with increases  $>30\%$  observed in 25 states (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>) (Figure).

Modeled suicide rate trends indicated significant increases in 44 states, among males (34 states) and females (43 states), as well as for the United States overall (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>). Nationally, the model-estimated average annual percentage change for the overall

**FIGURE. Percent change in annual suicide rate,\* by state — United States, from 1999–2001 to 2014–2016**



\* Per 100,000 population, age-adjusted to the 2000 U.S. standard population.

suicide rate was an increase of 1.5%. By sex, estimated national rate trends further indicated significant average annual percentage change increases for males (1.1%) and females (2.6%) (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>).

Suicide decedents without known mental health conditions (11,039; 54.0%) were compared with those with known mental health conditions (9,407; 46.0%) for 27 states. Whereas decedents were predominantly male (76.8%) (Table 1) and non-Hispanic white (83.6%), those without known mental health conditions, relative to those with mental health conditions, were more likely to be male (83.6% versus 68.8%; odds ratio [OR] = 2.3, 95% CI = 2.2–2.5) and belong to a racial/ethnic minority (OR range = 1.2–2.0). Suicide decedents without known mental health conditions also had significantly higher odds of perpetrating homicide followed by suicide (aOR = 2.9, 95% CI = 2.2–3.8). Among decedents aged  $\geq 18$  years, 20.1% of those without known mental health conditions and 15.3% of those with mental health conditions had previously served in the U.S. military or were serving at the time of death.

Whereas firearms were the most common method of suicide overall (48.5%), decedents without known mental health conditions were more likely to die by firearm (55.3%) and less likely to die by hanging/strangulation/suffocation (26.9%) or poisoning (10.4%) than were those with known mental health conditions (40.6%, 31.3%, and 19.8%, respectively). These differences remained significant in the adjusted models.

Toxicology testing was less likely to be performed for decedents without known mental health conditions. Among those with toxicology results, decedents without known mental health

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.



**TABLE 1. Selected demographic and descriptive characteristics of suicides among persons aged ≥10 years with and without known mental health conditions — National Violent Death Reporting System, 27 states,\* 2015**

Characteristic	Total (N = 20,446) No. (%)	Known mental health condition† (n = 9,407) No. (%)	No known mental health condition (n = 11,039) No. (%)	Chi-square p-value	OR‡ (95% CI)	Adjusted OR¶ (95% CI)
<b>Sex</b>						
Male	15,702 (76.8)	6,469 (68.8)	9,233 (83.6)	<0.01	2.3 (2.2–2.5)	NA
Female	4,744 (23.2)	2,938 (31.2)	1,806 (16.4)	<0.01	0.4 (0.4–0.5)	NA
<b>Age (yrs)**</b>						
10–24	2,804 (13.7)	1,211 (12.9)	1,593 (14.4)	<0.01	1.1 (1.1–1.2)	NA
25–44	6,456 (31.6)	3,036 (32.3)	3,420 (31.0)	<0.05	0.9 (0.9–1.0)	NA
45–64	7,718 (37.7)	3,820 (40.6)	3,898 (35.3)	<0.01	0.8 (0.8–0.8)	NA
≥65	3,468 (17.0)	1,340 (14.2)	2,128 (19.3)	<0.01	1.4 (1.3–1.5)	NA
<b>Race/Ethnicity</b>						
White, non-Hispanic	17,102 (83.6)	8,165 (86.8)	8,937 (81.0)	<0.01	0.6 (0.6–0.7)	NA
Black, non-Hispanic	1,228 (6.0)	411 (4.4)	817 (7.4)	<0.01	1.7 (1.5–2.0)	NA
American Indian/Alaska Native, non-Hispanic	378 (1.8)	112 (1.2)	266 (2.4)	<0.01	2.0 (1.6–2.6)	NA
Asian, non-Hispanic	576 (2.8)	235 (2.5)	341 (3.1)	<0.05	1.2 (1.1–1.5)	NA
Hispanic	1,096 (5.4)	463 (4.9)	633 (5.7)	<0.05	1.2 (1.0–1.3)	NA
Other	66 (0.3)	21 (0.2)	45 (0.4)	<0.05	1.8 (1.1–3.1)	NA
<b>Extended demographics</b>						
Ever served in military††	3,429 (17.8)	1,354 (15.3)	2,075 (20.1)	<0.01	1.4 (1.3–1.5)	1.1 (1.0–1.1)
Homeless	240 (1.2)	104 (1.1)	136 (1.3)	NS	1.1 (0.9–1.5)	1.2 (0.9–1.5)
<b>Incident type</b>						
Single suicide	20,063 (98.2)	9,318 (99.1)	10,745 (97.4)	<0.01	0.3 (0.3–0.4)	0.4 (0.3–0.5)
Homicide followed by suicide	319 (1.6)	64 (0.7)	255 (2.3)	<0.01	3.5 (2.6–4.5)	2.9 (2.2–3.8)
Multiple suicides	64 (0.3)	25 (0.3)	39 (0.4)	NS	1.3 (0.8–2.2)	1.6 (0.9–2.6)
<b>Method</b>						
Firearm	9,909 (48.5)	3,821 (40.6)	6,088 (55.3)	<0.01	1.8 (1.7–1.9)	1.6 (1.5–1.7)
Hanging/Strangulation/Suffocation	5,907 (28.9)	2,940 (31.3)	2,967 (26.9)	<0.01	0.8 (0.8–0.9)	0.8 (0.7–0.8)
Poisoning	3,003 (14.7)	1,861 (19.8)	1,142 (10.4)	<0.01	0.5 (0.4–0.5)	0.6 (0.6–0.7)
Substance class causing death§§						
Other (e.g., over-the-counter)	1,021 (34.0)	666 (35.8)	355 (31.1)	<0.01	0.8 (0.7–0.9)	0.9 (0.7–1.0)
Opioids	944 (31.4)	608 (32.7)	336 (29.4)	NS	0.9 (0.7–1.0)	0.9 (0.8–1.1)
Antidepressants	800 (26.6)	644 (34.6)	156 (13.7)	<0.01	0.3 (0.2–0.4)	0.3 (0.3–0.4)
Benzodiazepines	624 (20.8)	468 (25.1)	156 (13.7)	<0.01	0.5 (0.4–0.6)	0.5 (0.4–0.6)
Antipsychotics	219 (7.3)	195 (10.5)	24 (2.1)	<0.01	0.2 (0.1–0.3)	0.2 (0.1–0.3)
Other	1,595 (7.8)	780 (8.3)	815 (7.4)	<0.05	0.9 (0.8–1.0)	0.9 (0.8–1.0)

See table footnotes on next page.

conditions were less likely to test positive for any substance overall (aOR = 0.8, 95% CI = 0.7–0.8), including opioids (aOR = 0.90, 95% CI = 0.81–0.99), but were more likely to test positive for alcohol (aOR = 1.2, 95%, CI = 1.1–1.3).

Information on circumstances surrounding suicide were available for all decedents with mental health conditions (9,407) and approximately 85% of those without known mental health conditions (9,357) in 27 states (Table 2). Persons without known mental health conditions were less likely to have any problematic substance use (aOR = 0.7, 95% CI = 0.7–0.8) than were persons with known mental health conditions. Whereas two thirds of decedents with known mental health conditions had a history of mental health or substance use treatment (67.2%), just over half (54.0%) were in treatment at the time of death.

Decedents without known mental health conditions had a significantly higher likelihood of any relationship problem/loss

(45.1%) than did those with known mental health conditions (39.6%), specifically intimate partner problems (30.2% versus 24.1%), arguments/conflicts (17.5% versus 13.6%), and perpetrating interpersonal violence in the past month (3.0% versus 1.4%). Decedents without known mental health conditions were also more likely than were those with known mental health conditions to have experienced any life stressors (50.5% versus 47.2%) such as recent criminal legal problems (10.7% versus 6.2%) or eviction/loss of home (4.3% versus 3.4%) and were more likely to have had a recent or impending (within the preceding or upcoming 2 weeks, respectively) crisis (a current or acute event thought to contribute to the suicide) (32.9% versus 26.0%). All of these differences remained significant in the adjusted models. Physical health problems and job/financial problems were commonly contributing stressors among both persons without mental health conditions (23.2% and 15.6%, respectively) and those with mental health conditions (21.4%



**TABLE 1. (Continued) Selected demographic and descriptive characteristics of suicides among persons aged  $\geq 10$  years with and without known mental health conditions — National Violent Death Reporting System, 27 states,\* 2015**

Characteristic	Total (N = 20,446) No. (%)	Known mental health condition† (n = 9,407) No. (%)	No known mental health condition (n = 11,039) No. (%)	Chi-square p-value	OR‡ (95% CI)	Adjusted OR¶ (95% CI)
<b>Toxicology results</b>						
Any toxicology testing	13,317 (65.1)	6,658 (70.8)	6,659 (60.3)	<0.01	0.6 (0.6–0.7)	0.7 (0.6–0.7)
Positive for $\geq 1$ substance**	9,913 (74.4)	5,192 (78.0)	4,721 (70.9)	<0.01	0.7 (0.6–0.7)	0.8 (0.7–0.8)
<b>Substance detected***</b>						
Alcohol						
Tested	10,950 (53.6)	5,409 (57.5)	5,541 (50.2)	<0.01	0.7 (0.7–0.8)	0.8 (0.7–0.8)
Positive	4,442 (40.6)	2,115 (39.1)	2,327 (42.0)	<0.01	1.1 (1.0–1.2)	1.2 (1.1–1.3)
Opioids						
Tested	8,554 (41.8)	4,258 (45.3)	4,296 (38.9)	<0.01	0.8 (0.7–0.8)	0.8 (0.8–0.9)
Positive	2,279 (26.6)	1,238 (29.1)	1,041 (24.2)	<0.01	0.8 (0.7–0.9)	0.9 (0.8–1.0)
Benzodiazepines						
Tested	8,124 (39.7)	4,226 (44.9)	3,898 (35.3)	<0.01	0.7 (0.6–0.7)	0.7 (0.7–0.8)
Positive	2,464 (30.3)	1,639 (38.8)	825 (21.2)	<0.01	0.4 (0.4–0.5)	0.5 (0.5–0.6)
Cocaine						
Tested	7,978 (39.0)	3,866 (41.1)	4,112 (37.2)	<0.01	0.9 (0.8–0.9)	0.9 (0.9–1.0)
Positive	499 (6.3)	216 (5.6)	283 (6.9)	<0.05	1.2 (1.0–1.5)	1.2 (1.0–1.5)
Amphetamines						
Tested	7,615 (37.2)	3,696 (39.3)	3,919 (35.5)	<0.01	0.9 (0.8–0.9)	0.9 (0.8–0.9)
Positive	736 (9.7)	376 (10.2)	360 (9.2)	NS	0.9 (0.8–1.0)	1.0 (0.8–1.1)
Marijuana						
Tested	6,569 (32.1)	3,127 (33.2)	3,442 (31.2)	<0.01	0.9 (0.9–1.0)	0.9 (0.9–1.0)
Positive	1,471 (22.4)	710 (22.7)	761 (22.1)	NS	1.0 (0.9–1.1)	0.9 (0.8–1.0)
Antidepressants						
Tested	5,425 (26.5)	3,103 (33.0)	2,322 (21.0)	<0.01	0.5 (0.5–0.6)	0.6 (0.6–0.7)
Positive	2,214 (40.8)	1,735 (55.9)	479 (20.6)	<0.01	0.2 (0.2–0.2)	0.2 (0.2–0.3)

**Abbreviations:** CI = confidence interval; NA = not adjusted; NS = not significant; OR = odds ratio.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

† Decedent had been identified as having a current diagnosis of mental health condition in coroner/medical examiner or law enforcement reports.

‡ OR reflects the risk among those without known mental health condition relative to those with known mental health condition.

¶ Logistic regression was used to estimate adjusted OR with 95% CIs after controlling for sex, age group, and race/ethnicity. Known mental health condition was used as the reference group.

\*\* Decedents were aged  $\geq 10$  years, as per standard in the suicide prevention literature.

†† Denominator is decedents aged  $\geq 18$  years with reported military service status.

§§ Denominator is decedents who died by poisoning, including overdose.

¶¶ Denominator is decedents with any toxicology testing.

\*\*\* Denominator for each positive group is the number tested for the substance in that group.

and 16.8%, respectively). Similarly, among all persons with recent crises, intimate partner problems were the most common types and did not differ by group.

Decedents without known mental health conditions had significantly lower odds of recent release from any institution (aOR = 0.5, 95% CI = 0.4–0.5). Among those recently released, decedents without known mental health conditions were significantly more likely than decedents with mental health conditions to have been released from a correctional facility (25.7% versus 8.7%), hospital (43.7% versus 33.0%), or other facility, such as an alcohol/substance use treatment facility (24.2% versus 11.6%). Among decedents with known mental health conditions who were recently released from an institution, 46.7% were released from psychiatric facilities.

Decedents without known mental health conditions were significantly less likely to have a history of suicidal ideation (23.0%)

or prior suicide attempts (10.3%) compared with those with known mental health conditions (40.8% and 29.4%, respectively). Suicide intent was disclosed by 22.4% and 24.5% of persons without and with known mental health conditions, respectively.

## Conclusions and Comments

During 1999–2016, suicide rates increased significantly in 44 states, and 25 states experienced increases  $>30\%$ . Rates increased significantly among males in 34 states, and females in 43 states. Additional research into the specific causes of these trends is needed. Data from the 27 states participating in NVDRS provide important insight into circumstances surrounding suicide and can help states identify prevention priorities.

Suicidologists regularly state that suicide is not caused by a single factor (5); however, suicide prevention is often



**TABLE 2. Circumstances preceding suicide among decedents aged ≥10 years with and without known mental health conditions — National Violent Death Reporting System, 27 states,\* 2015**

Characteristic	Total	Known mental health condition <sup>†</sup> No. (%)	No known mental health condition No. (%)	Chi-square p-value	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>¶</sup> (95% CI)
<b>Suicide with known circumstances</b>	<b>18,764 (91.8)</b>	<b>9,407 (100)</b>	<b>9,357 (84.8)</b>	<b>&lt;0.01</b>	<b>N/A</b>	<b>N/A</b>
<b>Mental health</b>						
Any current diagnosed mental health condition**						
Depression/Dysthymia	—††	7,076 (75.2)	N/A	N/A	N/A	N/A
Anxiety disorder	—††	1,579 (16.8)	N/A	N/A	N/A	N/A
Bipolar disorder	—††	1,431 (15.2)	N/A	N/A	N/A	N/A
Schizophrenia	—††	509 (5.4)	N/A	N/A	N/A	N/A
PTSD	—††	424 (4.5)	N/A	N/A	N/A	N/A
ADD/ADHD	—††	226 (2.4)	N/A	N/A	N/A	N/A
Not specified	—††	760 (8.1)	N/A	N/A	N/A	N/A
Current depressed mood <sup>§§</sup>	<b>7,038 (37.5)</b>	<b>3,962 (42.1)</b>	<b>3,076 (32.9)</b>	<b>&lt;0.01</b>	<b>0.7 (0.6–0.7)</b>	<b>0.7 (0.6–0.7)</b>
<b>Problematic substance use</b>						
Any	<b>5,319 (28.3)</b>	<b>2,976 (31.6)</b>	<b>2,343 (25.0)</b>	<b>&lt;0.01</b>	<b>0.7 (0.7–0.8)</b>	<b>0.7 (0.7–0.8)</b>
Alcohol	<b>3,268 (17.4)</b>	<b>1,862 (19.8)</b>	<b>1,406 (15.0)</b>	<b>&lt;0.01</b>	<b>0.7 (0.7–0.8)</b>	<b>0.7 (0.7–0.8)</b>
Other	<b>3,084 (16.4)</b>	<b>1,768 (18.8)</b>	<b>1,316 (14.1)</b>	<b>&lt;0.01</b>	<b>0.7 (0.7–0.8)</b>	<b>0.7 (0.7–0.8)</b>
<b>Treatment</b>						
Current mental health/substance use treatment	<b>5,141 (27.4)</b>	<b>5,077 (54.0)</b>	<b>64 (0.7)</b>	<b>&lt;0.01</b>	<b>0.01 (0.01–0.01)</b>	<b>0.01 (0.01–0.01)</b>
Ever treated for mental health/substance disorder	<b>6,717 (35.8)</b>	<b>6,323 (67.2)</b>	<b>394 (4.2)</b>	<b>&lt;0.01</b>	<b>0.02 (0.02–0.02)</b>	<b>0.02 (0.02–0.03)</b>
<b>Relationship problems/loss</b>						
Any relationship problem/loss	<b>7,948 (42.4)</b>	<b>3,726 (39.6)</b>	<b>4,222 (45.1)</b>	<b>&lt;0.01</b>	<b>1.3 (1.2–1.3)</b>	<b>1.3 (1.2–1.4)</b>
Intimate partner problem	<b>5,098 (27.2)</b>	<b>2,270 (24.1)</b>	<b>2,828 (30.2)</b>	<b>&lt;0.01</b>	<b>1.4 (1.3–1.5)</b>	<b>1.4 (1.3–1.5)</b>
Perpetrator of interpersonal violence in past month	<b>414 (2.2)</b>	<b>131 (1.4)</b>	<b>283 (3.0)</b>	<b>&lt;0.01</b>	<b>2.2 (1.8–2.7)</b>	<b>2.0 (1.6–2.4)</b>
Victim of interpersonal violence in past month	<b>84 (0.4)</b>	<b>53 (0.6)</b>	<b>31 (0.3)</b>	<b>&lt;0.05</b>	<b>0.6 (0.4–0.9)</b>	<b>0.8 (0.5–1.2)</b>
Family relationship problem	<b>1,671 (8.9)</b>	<b>873 (9.3)</b>	<b>798 (8.5)</b>	<b>NS</b>	<b>0.9 (0.8–1.0)</b>	<b>1.0 (0.9–1.1)</b>
Other relationship problem (nonintimate)	<b>403 (2.1)</b>	<b>202 (2.1)</b>	<b>201 (2.1)</b>	<b>NS</b>	<b>1.0 (0.8–1.2)</b>	<b>1.1 (0.9–1.3)</b>
Argument or conflict (not specified)	<b>2,914 (15.5)</b>	<b>1,278 (13.6)</b>	<b>1,636 (17.5)</b>	<b>&lt;0.01</b>	<b>1.3 (1.2–1.5)</b>	<b>1.4 (1.3–1.5)</b>
Death of a loved one (any)	<b>1,497 (8.0)</b>	<b>826 (8.8)</b>	<b>671 (7.2)</b>	<b>&lt;0.01</b>	<b>0.8 (0.7–0.9)</b>	<b>0.9 (0.8–0.9)</b>
Nonsuicide death	<b>1,181 (6.3)</b>	<b>647 (6.9)</b>	<b>534 (5.7)</b>	<b>&lt;0.01</b>	<b>0.8 (0.7–0.9)</b>	<b>0.9 (0.8–1.0)</b>
Suicide of family or friend	<b>379 (2.0)</b>	<b>217 (2.3)</b>	<b>162 (1.7)</b>	<b>&lt;0.01</b>	<b>0.7 (0.6–0.9)</b>	<b>0.8 (0.7–1.0)</b>
<b>Other life stressors</b>						
Any life stressor	<b>9,171 (48.9)</b>	<b>4,442 (47.2)</b>	<b>4,729 (50.5)</b>	<b>&lt;0.01</b>	<b>1.1 (1.1–1.2)</b>	<b>1.1 (1.0–1.2)</b>
Recent criminal legal problem	<b>1,588 (8.5)</b>	<b>586 (6.2)</b>	<b>1,002 (10.7)</b>	<b>&lt;0.01</b>	<b>1.8 (1.6–2.0)</b>	<b>1.7 (1.5–1.9)</b>
Other legal problem	<b>748 (4.0)</b>	<b>378 (4.0)</b>	<b>370 (4.0)</b>	<b>NS</b>	<b>1.0 (0.8–1.1)</b>	<b>1.0 (0.9–1.2)</b>
Physical health problem	<b>4,179 (22.3)</b>	<b>2,012 (21.4)</b>	<b>2,167 (23.2)</b>	<b>&lt;0.01</b>	<b>1.1 (1.0–1.2)</b>	<b>1.0 (1.0–1.1)</b>
Job/Financial problem <sup>¶¶</sup>	<b>2,941 (16.2)</b>	<b>1,530 (16.8)</b>	<b>1,411 (15.6)</b>	<b>&lt;0.05</b>	<b>0.9 (0.8–1.0)</b>	<b>0.9 (0.8–1.0)</b>
Eviction or loss of home	<b>722 (3.8)</b>	<b>317 (3.4)</b>	<b>405 (4.3)</b>	<b>&lt;0.01</b>	<b>1.3 (1.1–1.5)</b>	<b>1.4 (1.2–1.6)</b>
School problem <sup>***</sup>	<b>162 (19.9)</b>	<b>70 (17.8)</b>	<b>92 (21.9)</b>	<b>NS</b>	<b>1.3 (0.9–1.8)</b>	<b>1.3 (0.9–1.9)</b>
Recent release from an institution <sup>†††</sup>	<b>1,412 (7.6)</b>	<b>941 (10.2)</b>	<b>471 (5.1)</b>	<b>&lt;0.01</b>	<b>0.5 (0.4–0.5)</b>	<b>0.5 (0.4–0.5)</b>
Jail/Prison/Detention facility	<b>203 (14.4)</b>	<b>82 (8.7)</b>	<b>121 (25.7)</b>	<b>&lt;0.01</b>	<b>3.6 (2.7–4.9)</b>	<b>4.5 (3.2–6.4)</b>
Hospital	<b>517 (36.6)</b>	<b>311 (33.0)</b>	<b>206 (43.7)</b>	<b>&lt;0.01</b>	<b>1.6 (1.3–2.0)</b>	<b>1.3 (1.0–1.7)</b>
Psychiatric hospital/institution	<b>469 (33.2)</b>	<b>439 (46.7)</b>	<b>30 (6.4)</b>	<b>&lt;0.01</b>	<b>0.1 (0.1–0.1)</b>	<b>0.1 (0.1–0.1)</b>
Other (includes alcohol/SU treatment facilities)	<b>223 (15.8)</b>	<b>109 (11.6)</b>	<b>114 (24.2)</b>	<b>&lt;0.01</b>	<b>2.4 (1.8–3.3)</b>	<b>2.5 (1.8–3.3)</b>

See table footnotes on next page.

oriented toward mental health conditions alone with regard to downstream identification of suicidal persons, treatment of mental health conditions, and prevention of reattempts. This study found that approximately half of suicide decedents in NVDRS did not have a known mental health condition, indicating that additional focus on nonmental health factors further upstream could provide important information for a public health approach (10). Those without a known mental health condition suffered more from relationship problems and other life stressors such as criminal/legal matters, eviction/loss of home, and recent or impending crises.

Similarly, persons with mental health conditions also often experienced other circumstances such as relationship problems and job/financial or physical health problems that contributed to their suicide. These findings point to the need to both prevent the circumstances associated with the onset of mental health conditions and support persons with known mental health conditions to decrease their risk for poor outcomes (11). Two thirds of suicide decedents with mental health conditions had a history of treatment for mental health or substance use disorders, with approximately half in treatment when they died. This finding suggests the need for additional safety supports, including



**TABLE 2. (Continued) Circumstances preceding suicide among decedents aged  $\geq 10$  years with and without known mental health conditions — National Violent Death Reporting System, 27 states,\* 2015**

Characteristic	Total	Known mental health condition <sup>†</sup> No. (%)	No known mental health condition No. (%)	Chi-square p-value	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>¶</sup> (95% CI)
<b>Crisis within past or upcoming 2 weeks<sup>§§§</sup></b>	<b>5,525 (29.4)</b>	<b>2,444 (26.0)</b>	<b>3,081 (32.9)</b>	<b>&lt;0.01</b>	<b>1.4 (1.3–1.5)</b>	<b>1.4 (1.3–1.5)</b>
Intimate partner problem	1,968 (35.6)	854 (34.9)	1,114 (36.2)	NS	1.1 (0.9–1.2)	1.1 (0.9–1.2)
Physical health problem	739 (13.4)	315 (12.9)	424 (13.8)	NS	1.1 (0.9–1.3)	1.0 (0.8–1.2)
Criminal legal problem	621 (11.2)	203 (8.3)	418 (13.6)	<0.01	1.7 (1.5–2.1)	1.6 (1.3–1.9)
Family relationship problem	430 (7.8)	212 (8.7)	218 (7.1)	<0.05	0.8 (0.7–1.0)	0.9 (0.7–1.1)
Job problem	354 (6.4)	191 (7.8)	163 (5.3)	<0.01	0.7 (0.5–0.8)	0.7 (0.5–0.8)
<b>Suicide event/history</b>						
Left a note	6,468 (34.5)	3,182 (33.8)	3,286 (35.1)	NS	1.1 (1.0–1.1)	1.2 (1.1–1.2)
Disclosed suicide intent	4,405 (23.5)	2,306 (24.5)	2,099 (22.4)	<0.01	0.9 (0.8–1.0)	0.9 (0.8–0.9)
History of ideation	5,990 (31.9)	3,838 (40.8)	2,152 (23.0)	<0.01	0.4 (0.4–0.5)	0.4 (0.4–0.5)
History of attempts	3,732 (19.9)	2,770 (29.4)	962 (10.3)	<0.01	0.3 (0.3–0.3)	0.3 (0.3–0.3)

**Abbreviations:** ADD/ADHD = attention deficit disorder/attention deficit hyperactivity disorder; CI = confidence interval; N/A = not applicable; NS = not significant; OR = odds ratio; PTSD = posttraumatic stress disorder; SU = substance use.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

<sup>†</sup> Decedent had been identified as having a current diagnosis of mental health condition in coroner/medical examiner or law enforcement reports.

<sup>§</sup> OR reflects the risk among those without known mental health condition relative to those with known mental health condition.

<sup>¶</sup> Logistic regression was used to estimate adjusted OR with 95% CIs after controlling for sex, age group, and race/ethnicity. Known mental health condition was the reference group.

<sup>\*\*</sup> Includes decedents with one or more diagnosed current mental health conditions, which are not mutually exclusive. Therefore, sums of percentages for the diagnosed conditions exceed 100%. Denominator includes the number of decedents with one or more current diagnosed mental health conditions.

<sup>††</sup> The specific type of mental health condition was calculated only among those with one or more known diagnosed mental health conditions.

<sup>§§</sup> Not a diagnosis.

<sup>¶¶</sup> Denominator is decedents aged  $\geq 18$  years.

<sup>\*\*\*</sup> Denominator is decedents aged 10–18 years.

<sup>†††</sup> Denominator of institution subgroup is decedents with recent release from an institution. Recent release from an institution is defined as having occurred within the past month.

<sup>§§§</sup> Denominator of crisis subgroup is decedents with any crisis within past or upcoming 2 weeks. Crises depicted here represent the most commonly occurring categories.

broader implementation of affordable and effective treatment modalities, such as doctor-patient collaborative care models and proven cognitive-behavioral therapies. In addition, increased access to behavioral health providers in underserved areas is needed, as is expansion of health care systems that integrate physical and behavioral health, with a priority on suicide prevention and patient safety, especially through care transitions (12).

Comprehensive statewide suicide prevention activities are needed to address the full range of factors contributing to suicide. Prevention strategies include strengthening economic supports (e.g., housing stabilization policies, household financial support); teaching coping and problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in life; promoting social connectedness to increase a sense of belonging and access to informational, tangible, emotional, and social support; and identifying and better supporting persons at risk (e.g., military veterans, persons with physical/mental health conditions) (12). Other strategies include creating protective environments (e.g., reducing access to lethal means among persons at risk for suicide, creating organizational and workplace policies to promote help-seeking, easing transitions into and out of work for persons with mental health conditions

and other life challenges), strengthening access to and delivery of care, supporting family and friends after a suicide, and encouraging the media to follow safe reporting recommendations (12). Some states, such as Colorado, are planning to implement such a comprehensive approach to suicide prevention (10).

The findings in this report are subject to at least three limitations. First, in the state-level analysis, rankings for four states (Maryland, Massachusetts, Rhode Island, and Utah) might have been affected by large proportions of injury deaths of undetermined intent (potentially biasing reported suicide rates downward) or decreased percentages of such deaths over time (potentially biasing estimated rate trends upward). Second, NVDRS is not yet nationally representative; the 27 states included represent 49.6% of the population (<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml>). Finally, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the extent of informant knowledge can affect data completeness and accuracy. Studies that include more in-depth interviews with next-of-kin often identify greater attributions to mental health disorders (13); however, many methodological variations across studies exist (14). It is likely that some persons without known mental



## References

## Summary

## What is already known about this topic?

In 2016, nearly 45,000 persons died by suicide in the United States. Mental health conditions are one of several contributors to suicide.

## What is added by this report?

During 1999–2016, suicide rates increased in nearly every state, including >30% increases in 25 states. 2015 data from 27 states indicate 54% of suicide decedents were not known to have mental health conditions. Relationship, substance use, health, and job or financial problems are among the other circumstances contributing to suicide.

## What are the implications for public health practice?

A comprehensive approach using proven prevention strategies, such as those in CDC's Technical Package for Suicide Prevention, can help reach the national goal of reducing the annual suicide rate 20% by 2025.

health conditions in the current study were experiencing mental health challenges that were unknown or not reported by key informants. Nonetheless, the high prevalence of diverse contributing circumstances among those with and without known mental health conditions suggests the importance of addressing the broad range of factors that contribute to suicide.

Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are available. States and communities can use data from NVDRS and resources such as CDC's *Preventing Suicide: A Technical Package of Policy, Programs, and Practices* (12) to better understand suicide in their populations, prioritize evidence-based comprehensive suicide prevention, and save lives.

## Acknowledgments

Robert Anderson, Holly Hedegaard, Margaret Warner, Division of Vital Statistics, National Center for Health Statistics, CDC.

## Conflict of Interest

No conflicts of interest were reported.

<sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis, Research, and Practice Integration, National Center for Injury Prevention and Control, CDC.

Corresponding author: Deborah M. Stone, dstone3@cdc.gov, 770-488-3942.

1. CDC. Web-based Injury Statistics Query and Reporting System (WISQARS). Atlanta, GA: National Center for Injury Prevention and Control; 2018. <https://www.cdc.gov/injury/wisqars/index.html>
2. Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide trends among and within urbanization levels by sex, race/ethnicity, age group, and mechanism of death—United States, 2001–2015. *MMWR Surveill Summ* 2017;66(No. SS-18). <https://doi.org/10.15585/mmwr.ss6618a1>
3. Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999–2014. NCHS data brief no 241. Hyattsville, MD: US Department of Health and Human Services, CDC, National Center for Health Statistics; 2016. <https://www.cdc.gov/nchs/data/databriefs/db241.pdf>
4. Kochanek K, Murphy S, Xu J, Arias E. Mortality in the United States, 2016. NCHS data brief no 293. Hyattsville, MD: US Department of Health and Human Services, CDC, National Center for Health Statistics; 2017. <https://www.cdc.gov/nchs/data/databriefs/db293.pdf>
5. Office of the Surgeon General; National Action Alliance for Suicide Prevention. 2012 National strategy for suicide prevention: goals and objectives for action. Washington, DC: US Department of Health and Human Services, Office of the Surgeon General; 2012. <https://www.surgeongeneral.gov/library/reports/national-strategy-suicide-prevention/full-report.pdf>
6. Zalsman G, Hawton K, Wasserman D, et al. Suicide prevention strategies revisited: 10-year systematic review. *Lancet Psychiatry* 2016;3:646–59. [https://doi.org/10.1016/S2215-0366\(16\)30030-X](https://doi.org/10.1016/S2215-0366(16)30030-X)
7. Torguson K, O'Brien A. Leading suicide prevention efforts unite to address rising national suicide rate. Washington, DC: American Foundation for Suicide Prevention; 2017. <https://afsp.org/leading-suicide-prevention-efforts-unite-address-rising-national-suicide-rate/>
8. Crepeau-Hobson F. The psychological autopsy and determination of child suicides: a survey of medical examiners. *Arch Suicide Res* 2010;14:24–34. <https://doi.org/10.1080/13811110903479011>
9. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5). Washington, DC: American Psychiatric Association; 2013.
10. Caine ED, Reed J, Hindman J, Quinlan K. Comprehensive, integrated approaches to suicide prevention: practical guidance. *Inj Prev* 2017. Epub December 20, 2017. <https://doi.org/10.1136/injuryprev-2017-042366>
11. World Health Organization. Risks to mental health: an overview of vulnerabilities and risk factors. Geneva, Switzerland: World Health Organization; 2012.
12. Stone DM, Holland KM, Bartholow BN, Crosby AE, Davis SP, Wilkins N. Preventing suicide: a technical package of policy, programs, and practice. Atlanta, GA: US Department of Health and Human Services, CDC; 2017. <https://www.cdc.gov/violenceprevention/pdf/suicidetechnicalpackage.pdf>
13. Milner A, Svetlicic J, De Leo D. Suicide in the absence of mental disorder? A review of psychological autopsy studies across countries. *Int J Soc Psychiatry* 2013;59:545–54. <https://doi.org/10.1177/0020764012444259>
14. Pouliot L, De Leo D. Critical issues in psychological autopsy studies. *Suicide Life Threat Behav* 2006;36:491–510.



1 **Short title:** ~~Increasing Trends in State Suicide Rates and~~ Contributing Circumstances ~~to Suicide and Increasing~~  
2 ~~Trends in State Suicide Rates among people ≥10 years~~

3 Deborah M. Stone, ScD;<sup>1</sup> Thomas R. Simon PhD;<sup>1</sup> Katherine A. Fowler, PhD;<sup>1</sup> Scott R. Kegler, PhD;<sup>2</sup> Keming Yuan,  
4 MS;<sup>1</sup> Kristin M. Holland, PhD;<sup>1</sup> Asha Z. Ivey-Stephenson, PhD;<sup>1</sup> Alex E. Crosby, MD<sup>1</sup>

5 **Structured abstract (245/250 words—this word count is not included in the 1800 max for the remainder)**

6 **Background:** Suicide rates have risen nearly 30% since 1999. Mental health problems (MHP) are just one factor  
7 contributing to suicide. Examining state-level trends in suicide and other contributing circumstances can inform  
8 comprehensive state suicide prevention planning.

9 **Methods:** Trends in age-adjusted suicide rates among people aged ≥10 years, by state and sex, across six  
10 consecutive three-year periods (1999-2016), were assessed using data from the National Vital Statistics System  
11 for 50 states and Washington, D.C (D.C.). Data from the National Violent Death Reporting System, covering 27  
12 states in 2015, were used to examine contributing circumstances among decedents with and without known  
13 MHP.

14 **Results:** From 1999-2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases  
15 of 30% or more. Rates increased significantly among males and females, in 34 and 43 states, respectively. Over  
16 half (54.0%) of decedents did *not* have a known MHP. Among decedents with circumstance information, those  
17 without known MHP were more likely (all  $p \leq 0.05$ ) than those with a MHP to have relationship problems/loss  
18 (45.1% vs 39.6%), life stressors/loss (54.2% vs 49.7%) and recent/impending crises (32.9% vs 26.0%), but these  
19 circumstances were common across groups.

20 **Conclusions:** Suicide rates increased significantly across most states from 1999-2016. Various circumstances  
21 contributed to suicides among people with and without known MHP.

22 **Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach  
23 to prevent suicide risk before it occurs, identify and support people at risk, prevent reattempts, and help  
24 friends/family after a suicide occurs.

25 **INTRODUCTION**

26 **BACKGROUND AND PURPOSE (255/250 words)**

27 In 2016, nearly 45,000 suicides (15.6/100,000 [age-adjusted]) occurred in the United States (U.S.), among people  
28 ≥10 years old [1]. Between 1999 and 2016, suicide rates increased across sexes, racial/ethnic groups, and  
29 urbanization levels [2, 3]. Suicide is the 10<sup>th</sup> leading cause of death and is one of just three leading causes that  
30 are *increasing* [1, 4]. Additionally, rates of Emergency Department visits for nonfatal self-harm, a key risk factor  
31 for suicide, increased nearly 45% between 2001 and 2015 [1]. Together, suicides and self-harm injuries cost the  
32 nation more than \$69 billion in direct medical and work loss costs [1].

33 The *National Strategy for Suicide Prevention (NSSP)* [5] calls for a public health approach to suicide prevention  
34 with efforts spanning across multiple levels (i.e., individual, family/relationship, community, and societal). Such  
35 an approach underscores that suicide is rarely caused by any single factor, but rather, is multi-determined.  
36 Despite the NSSP guidance, suicide prevention efforts largely focus on identifying and treating individuals with  
37 mental health problems (MHP) [6]. Other contributing circumstances include social and economic problems,  
38 access to lethal means (e.g., substances, firearms, bridges) among people at risk, poor coping and problem-  
39 solving skills, and prior suicide attempts [5]. Expanded awareness of the additional circumstances that



contribute to suicide risk apart from MHP, and action to address them, can help reach the nation's goal of reducing suicide rates 20% by 2025 [7]. To assist states in achieving this goal, this study analyzes state-specific trends in suicide rates, assesses the multiple contributing factors, and provides recommendations for multi-level comprehensive suicide prevention.

## **METHODS (2526/250 words)**

Suicide rates were analyzed for people aged  $\geq 10$  years only, as attributions of suicidal intent in younger children are variable [8]. Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases 10<sup>th</sup> Revision*, underlying-cause-of death codes X60-X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods spanning 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Characteristics (Table 2) and circumstances (Table 3) of suicide decedents  $\geq 10$  years, with and without known MHP, were compared in the 27 states with complete data participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines MHP as disorders [and syndromes](#) listed in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition [9], [with the exception of alcohol and other substance dependence, which are captured separately in NVDRS. For this study, alcohol and other substance use disorders were not defined as MHP, and were examined in both groups.](#) NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known MHP were compared using Chi-square tests. Logistic regression analyses estimated adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and race/ethnicity.

## **RESULTS (58984/600 words)**

The most recent overall suicide rates (representing 2014-2016) varied four-fold, from 6.9 (D.C.) to 29.2 (Montana) per 100,000 persons per year (Table 1). Across the study period, rates increased in all states, except Nevada (with the 9<sup>th</sup> highest current suicide rate), with absolute increases ranging from +0.8 (Delaware) to +8.1 (Wyoming) per 100,000. Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with increases more than 30% observed in 25 states [\(Table 1, Figure 1\)](#).

Modeled suicide rate trends indicated significant increases for 44 states, [as well as for the U.S. overall \(Table 1\) and for males \(34 states\) and females \(43 states\), as well as for the U.S. overall \(Table 1\).](#) ~~By sex, modeled rate trends indicated significant increases in 34 states for males and in 43 states for females.~~ Nationally, the model-estimated AAPC for the overall suicide rate was +1.5%. By sex, the national AAPC was +1.1% for males and +2.6% for females.

Suicide decedents without known MHP (N=11,039) were compared to those with MHP (N=9,407; [all chi-square and logistic regression analyses significant at  \$p < .05\$](#) ). While all decedents were predominately male (Table 2; 76.8%) and non-Hispanic white (83.6%), those without known MHP, relative to those with MHP, were more likely male (83.6% vs. 68.8%; adjusted odds ratio (aOR)=2.3, 95% CI = 2.2-2.5) and racial/ethnic minorities (odds ratio [OR] range: 1.2-2.1; 95% CI range [1.0-1.3] – [1.6-2.0]). Suicide decedents without known MHP also had significantly greater odds of perpetrating homicide-suicide (aOR = 2.9, 95% CI = 2.2-3.8), of firearm suicide (aOR



= 1.6, 95% CI = 1.5-1.7), and of testing positive for alcohol (aOR = 1.2, 95% CI = 1.1-1.3). Among adult decedents, 20.1% and 15.3% of people without and with MHP, respectively, ever served, or were currently serving, in the U.S. military.

Although firearms were used most often, overall (48.5%), decedents with known MHP were more likely to die by suffocation (31.3 vs. 26.9%) and poisoning (19.8% vs. 10.4%) than those without known MHP.

All suicide decedents with known MHP (N=9,407) and approximately 85% without MHP (N=9,357) had available circumstances information (Table 3). People without known MHP were less likely to have any substance abuse problems (aOR=0.7, 95% CI=0.7-0.8). While two-thirds of those with known MHP had a history of mental health or substance abuse treatment (67.2%), just over half (54.0%) were in current treatment.

Decedents without known MHP, versus those with known MHP had a significantly greater likelihood (p<.01) of any relationship problem/loss (45.1% vs. 39.6%), specifically intimate partner problems (30.2% vs. 24.1%), arguments/conflicts (17.5% vs. 13.6%), and recently perpetrating interpersonal violence (3.0% vs. 1.4%). They were also significantly more likely to have experienced other life stressors (54.2% vs 49.7%), such as criminal-legal problems (10.7% vs. 6.2%) or eviction/loss of home (4.3% vs. 3.4%), and they were more likely to have had a crisis within the preceding or upcoming two weeks (32.9% vs. 26.0%). Among both groups, the most common crises were intimate partner (36.2% vs. 34.9%) and physical health problems (13.8% vs. 12.9%), respectively.

Decedents without known MHP had significantly lower odds of recent release (aOR=0.5 95% CI (0.4-0.5)) from any institution, but among those who were recently released (5.1%), ~~those without a known MHP~~ they were significantly more likely to be released from a correctional facility (25.7% vs. 8.7%) or hospital (43.7% vs. 33.0%) than those with a known MHP. Among decedents with known MHP who were recently released from an institution (10.2%), 462.78% of this group were released from psychiatric facilities.

Decedents without known MHP, compared to those with MHP, were less likely to have a history of suicidal ideation (aOR=0.4, 95% CI=0.4-0.5) and prior suicide attempt (aOR=0.3, 95% CI=0.3-0.3). More than 1 in five people in both groups disclosed suicide intent frequently, (22.4% vs. 24.5%), ~~respectively~~.

## 110 **Conclusions and Comments (67580/700 words)**

From 1999-2016, 44 states saw significant suicide rate increases. Half of the states experienced increases of 30% or more. ~~Rates increased significantly in 34 states among males and 43 states among females. More~~ Additional research into the specific causes of these trends is necessary [10]. Fortunately, data from the states participating in NVDRS can shed light on the understanding the contributing circumstances that contributed to of suicide recent suicides is essential for prevention practice and help guide prevention activities. decision-making.

117

Researchers and practitioners regularly state that suicide is not caused by a single factor, however, the focus of suicide research and prevention practices, almost solely, focus on identify and treating MHP. The current study found that more than half of suicide decedents in NVDRS did *not* have a known MHP. This group suffered more relationship problems and life stressors such as criminal-legal matters, eviction/loss of home, and recent or impending crises. This is particularly noteworthy in light of findings that suggest many suicides and attempts occur with minimal deliberation [10].

Among people with MHP, two-thirds had a history of mental health and/or substance abuse treatment and over half were in current treatment. This suggests that additional supports for this population are needed to keep



them safe. This includes broader implementation of affordable and effective treatment modalities such as doctor-patient collaborative care models and cognitive-behavioral therapy. Additionally, greater access to behavioral health providers, especially in underserved areas is needed, as is expansion of healthcare systems needed that integrate physical and behavioral health and that better support suicide prevention and patient safety, especially through care transitions [11].

Study findings indicate that people with known MHP also experienced other life stressors such as job/financial, relationship, and/or physical health problems. These findings point to the need to both prevent the conditions associated with mental health problems in the first place and the need to support people with known MHP to decrease their risk of poor social, health, and economic outcomes [12].

These results, together, underscore the importance of comprehensive statewide suicide prevention activities that address multiple factors associated with suicide. Prevention strategies may include: strengthening economic supports (e.g., housing stabilization policies, household financial support); teaching coping and problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in life; promoting social connectedness to increase a sense of belongingness and access to informational, tangible, emotional, and social support, and identifying and better supporting people at risk. Other strategies include creating protective environments (e.g., reducing access to lethal means among people at risk, creating organizational and workplace policies to promote help-seeking, easing transitions into and out of work for people with MHP and other life challenges), supporting family and friends after a suicide, and assuring safe reporting by the media in order to prevent suicide contagion [11]. Some states, such as Colorado, are planning and implementing such a comprehensive approach to suicide prevention [13].

These findings have at least three limitations. In the state-level analysis, rankings for four states (MD, MA, RI, UT) might have been impacted by large proportions of injury deaths of undetermined intent (i.e. decreasing suicide rates), or decreased percentages of such deaths over time (i.e. increasing suicide rates). Second, NVDRS is not yet nationally representative; the 27 states included in the current study represent 49.6% of the U.S. population. Third, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the extent of informant knowledge can impact data completeness and accuracy. Studies including more in-depth interviews with next-of-kin often see greater attributions to ~~MHP and substance abuse disorders, mental disorders~~ [14], however many methodological variations across studies exist [15]. It is likely that some people without known MHP in the current study were experiencing mental health challenges that were unknown, and hence unreported by key informants. However, any lack of awareness of decedent MHP suggests, even further, the importance of addressing the broad range of contributing circumstances.

Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are available. States and communities can use data from NVDRS and resources such as CDC's *Preventing Suicide: a Technical Package of Policies, Programs, and Practices* [11] to better understand their suicide problem and prioritize evidence-based comprehensive suicide prevention.

## Acknowledgments

The authors acknowledge Robert Anderson, Holly Hedegaard, and Margaret Warner from the Division of Vital Statistics, National Center for Health Statistics, CDC, for their statistical consultation.

**Conflict of Interest** No conflicts of interest were reported.

**Corresponding author:** Deborah M. Stone, [dstone3@cdc.gov](mailto:dstone3@cdc.gov), 770-488-3942



168

169 **Author Affiliations:**

170 <sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis,  
171 Research, and Practice Integration, National Center for Injury Prevention and Control, CDC

172 **References:**

- 173 1. Centers for Disease Control and Prevention, *Web-based Injury Statistics Query and Reporting System*  
174 *(WISQARS)*. Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018.  
175 2016.
- 176 2. Ivey-Stephenson, A.Z., et al., *Suicide Trends Among and Within Urbanization Levels by Sex,*  
177 *Race/Ethnicity, Age Group, and Mechanism of Death - United States, 2001-2015*. MMWR Surveill Summ,  
178 2017. **66**(18): p. 1-16.
- 179 3. Curtin, S.C., M. Warner, and H. Hedegaard, *Increase in suicide in the United States, 1999-2014*. 2016, US  
180 Department of Health and Human Services, Centers for Disease Control and Prevention, National Center  
181 for Health Statistics Hyattsville, MD.
- 182 4. Kochanek, K., et al., *Mortality in the United States, 2016*. NCHS Data Brief, no 293. National Center for  
183 Health Statistics, 2017.
- 184 5. Office of the Surgeon General and National Action Alliance for Suicide Prevention, *2012 National*  
185 *strategy for suicide prevention: goals and objectives for action: a report of the US Surgeon General and*  
186 *of the National Action Alliance for Suicide Prevention*. 2012.
- 187 6. Rosenman, S.J., *Preventing suicide: what will work and what will not*. The Medical Journal of Australia,  
188 1998. **169**(2): p. 100-102.
- 189 7. Torguson, K. and A. O'Brien, *Leading Suicide Prevention Efforts Unite to Address Rising National Suicide*  
190 *Rate*. 2017: Washington, D.C.
- 191 8. Crepeau-Hobson, F., *The Psychological Autopsy and Determination of Child Suicides: A Survey of Medical*  
192 *Examiners*. Archives of Suicide Research, 2010. **14**(1): p. 24-34.
- 193 9. American Psychiatric Association, *Diagnostic and statistical manual of mental disorders (DSM-5®)*. 2013:  
194 American Psychiatric Pub.
- 195 10. Simon, T.R., et al., *Characteristics of impulsive suicide attempts and attempters*. Suicide and Life-  
196 Threatening Behavior, 2002. **32**(s1): p. 49-59.
- 197 11. Stone, D.M., et al., *Preventing suicide: A technical package of policies, programs, and practice*. 2017.
- 198 12. World Health Organization, *Risks to mental health: An overview of vulnerabilities and risk factors*.  
199 Geneva: WHO, 2012.
- 200 13. Caine, E.D., et al., *Comprehensive, integrated approaches to suicide prevention: practical guidance*.  
201 Injury prevention, 2017: p. injuryprev-2017-042366.
- 202 14. Milner, A., J. Svetcic, and D. De Leo, *Suicide in the absence of mental disorder? A review of psychological*  
203 *autopsy studies across countries*. Int J Soc Psychiatry, 2013. **59**(6): p. 545-54.
- 204 15. Pouliot, L. and D. De Leo, *Critical issues in psychological autopsy studies*. Suicide Life Threat Behav, 2006.  
205 **36**(5): p. 491-510.

206 **Attachment:**

207 [Stone MMWR Suicide Vital Signs 3.26.18 \(Tables Fig, e-clearance\)](#)

208

209 **Word Count:** 177175/1800



1 **Short Title:** Vital Signs: Contributing Circumstances to Suicide and Increasing Trends in State Suicide Rates

2 Deborah M. Stone, ScD;<sup>1</sup> Thomas R. Simon PhD;<sup>1</sup> Katherine A. Fowler, PhD;<sup>1</sup> Scott R. Kegler, PhD;<sup>2</sup> Keming Yuan,  
3 MS;<sup>1</sup> Kristin M. Holland, PhD;<sup>1</sup> Asha Z. Ivey-Stephenson, PhD;<sup>1</sup> Alex E. Crosby, MD<sup>1</sup>

4 **Structured abstract (245/250 words—this word count is not included in the 1800 max for the remainder)**

5 **Background:** Suicide rates in the United States have risen nearly 30% since 1999. Mental health problems (MHP)  
6 are just one factor contributing to suicide. Examining state-level trends in suicide and other contributing  
7 circumstances can inform comprehensive state suicide prevention planning.

8 **Methods:** Trends in age-adjusted suicide rates among people aged ≥10 years, by state and sex, across six  
9 consecutive three-year periods (1999–2016), were assessed using data from the National Vital Statistics System  
10 for 50 states and Washington, D.C (D.C.). Data from the National Violent Death Reporting System, covering 27  
11 states in 2015, were used to examine contributing circumstances among decedents with and without known  
12 MHP.

13 **Results:** From 1999–2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases  
14 of 30% or more. Rates increased significantly among males and females, in 34 and 43 states, respectively. Over  
15 half (54.0%) of decedents did not have a known MHP. Among decedents with circumstance information, those  
16 without known MHP were more likely (all  $p \leq .01$ ) than those with a MHP to have relationship problems/loss  
17 (45.1% vs 39.6%), life stressors (54.2% vs 49.7%) and recent/impending crises (32.9% vs 26.0%), but these  
18 circumstances were common across groups.

19 **Conclusions:** Suicide rates increased significantly across most states from 1999–2016. Various circumstances  
20 contributed to suicides among people with and without known MHP.

21 **Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach  
22 to prevent suicide risk before it occurs, identify and support people at risk, prevent reattempts, and help  
23 friends/family after a suicide occurs.

24 **INTRODUCTION**

25 **BACKGROUND AND PURPOSE**

26 In 2016, nearly 45,000 suicides (15.6/100,000 [age-adjusted]) occurred in the United States (U.S.), among people  
27 ≥10 years old [1]. Between 1999 and 2015, suicide rates increased across sexes, racial/ethnic groups, and  
28 urbanization levels [2, 3]. Suicide is the 10<sup>th</sup> leading cause of death and is one of just three leading causes that  
29 are increasing [1, 4]. Additionally, rates of Emergency Department visits for nonfatal self-harm, a key risk factor  
30 for suicide, increased nearly 45% between 2001 and 2015 [1]. Together, suicides and self-harm injuries cost the  
31 nation more than \$69 billion in direct medical and work loss costs [1].

32 The *National Strategy for Suicide Prevention* (NSSP) [5] calls for a public health approach to suicide prevention  
33 with efforts spanning across multiple levels (i.e., individual, family/relationship, community, and societal). Such  
34 an approach underscores that suicide is rarely caused by any single factor, but rather, is multi-determined.  
35 Despite the NSSP guidance, suicide prevention efforts largely focus on identifying and treating individuals with  
36 mental health problems (MHP) [6]. Other contributing circumstances include social and economic problems,  
37 access to lethal means (e.g., substances, firearms, bridges) among people at risk, poor coping and problem-  
38 solving skills, and prior suicide attempts [5]. Expanded awareness of the additional circumstances that  
39 contribute to suicide risk apart from MHP, and action to address them, can help reach the nation's goal of

**Comment [snk6]:**

This title seems in opposition to the order of our presentation framework – first we present \*what\* – the trends – and then we talk about \*why\* – the contributing circumstances.

**Comment [snk6]:**

Without this, the context/geography isn't fully set.

The MMWR editors might want "U.S." and the study years included in the title at some point.

**Comment [snk6]:**

This important "factoid" appears in three places in this report. The phrase "30% or more" is technically correct, although the phrase "more than 30%" is even more correct (the lower limit to the range for the 25 highest states is about 32% -- and no state is right at 30% even when rounding). Regardless of which phrase we adopt, it seems that we should be consistent throughout. I made a suggested revision further below (in the Results) assuming that we are going with "30% or more".



reducing suicide rates 20% by 2025 [7]. To assist states in achieving this goal, this study analyzes state-specific trends in suicide rates, assesses the multiple contributing factors, and provides recommendations for multi-level comprehensive suicide prevention.

## METHODS

Suicide rates were analyzed for people aged  $\geq 10$  years only, as attributions of suicidal intent in younger children are variable [8]. Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases 10<sup>th</sup> Revision*, underlying-cause-of death codes X60-X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods spanning 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Characteristics (Table 2) and circumstances (Table 3) of suicide decedents  $\geq 10$  years, with and without known MHP, were compared in the 27 states with complete data participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines MHP as disorders and syndromes listed in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition [9], with the exception of alcohol and other substance dependence, which are captured separately in NVDRS. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known MHP were compared using Chi-square tests. Logistic regression analyses estimated adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and race/ethnicity.

## RESULTS

The most recent overall suicide rates (representing 2014-2016) varied four-fold, from 6.9 (D.C.) to 29.2 (Montana) per 100,000 persons per year (Table 1). Across the study period, rates increased in all states, except Nevada (with the 9<sup>th</sup> highest current suicide rate), with absolute increases ranging from +0.8 (Delaware) to +8.1 (Wyoming) per 100,000. Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with increases ~~more than 30% of 30% or more~~ observed in 25 states (Table 1, Figure 1).

Modeled suicide rate trends indicated significant increases for 44 states, for males (34 states) and females (43 states), as well as for the U.S. overall (Table 1). Nationally, the model-estimated AAPC for the overall suicide rate was +1.5%. By sex, the national AAPC was +1.1% for males and +2.6% for females.

Suicide decedents without known MHP (N=11,039) were compared to those with MHP (N=9,407; all chi-square and logistic regression analyses significant at  $p \leq .05$ ). While all decedents were predominately male (Table 2; 76.8%) and non-Hispanic white (83.6%), those without known MHP, relative to those with MHP, were more likely male (83.6% vs. 68.8%; adjusted odds ratio (aOR)=2.3, 95% CI = 2.2-2.5) and racial/ethnic minorities (odds ratio [OR] range: 1.2-2.1; 95% CI range [1.0-1.3] – [1.6-2.0]). Suicide decedents without known MHP also had significantly greater odds of perpetrating homicide-suicide (aOR = 2.9, 95% CI = 2.2-3.8), of firearm suicide (aOR = 1.6, 95% CI = 1.5-1.7), and of testing positive for alcohol (aOR = 1.2, 95% CI = 1.1-1.3). Among adult decedents, 20.1% and 15.3% of people without and with MHP, respectively, ever served, or were currently serving, in the U.S. military.

Comment [snk6]:

For consistency. See comments above.



85 Although firearms were used most often overall (48.5%), decedents with known MHP were more likely to die by  
86 suffocation (31.3 vs. 26.9%) and poisoning (19.8% vs. 10.4%) than those without known MHP.

87 All suicide decedents with known MHP (N=9,407) and approximately 85% without MHP (N=9,357) had available  
88 circumstances information (Table 3). People without known MHP were less likely to have any substance abuse  
89 problems (aOR=0.7, 95% CI=0.7-0.8). While two-thirds of those with known MHP had a history of mental health  
90 or substance abuse treatment (67.2%), just over half (54.0%) were in current treatment.

91 Decedents without known MHP, versus those with known MHP had a significantly greater likelihood ( $p<.01$ ) of  
92 any relationship problem/loss (45.1% vs. 39.6%), specifically intimate partner problems (30.2% vs. 24.1%),  
93 arguments/conflicts (17.5% vs. 13.6%), and recently perpetrating interpersonal violence (3.0% vs. 1.4%). They  
94 were also significantly more likely to have experienced other life stressors (54.2% vs 49.7%), such as criminal-  
95 legal problems (10.7% vs. 6.2%) or eviction/loss of home (4.3% vs. 3.4%), and they were more likely to have had  
96 a crisis within the preceding or upcoming two weeks (32.9% vs. 26.0%). Among both groups, the most common  
97 crises were intimate partner (36.2% vs. 34.9%) and physical health problems (13.8% vs. 12.9%), respectively.

98 Decedents without known MHP had significantly lower odds of recent release (aOR=0.5 95% CI (0.4-0.5) from  
99 any institution, but among those who were recently released (5.1%), they were significantly more likely to be  
100 released from a correctional facility (25.7% vs. 8.7%) or hospital (43.7% vs. 33.0%) than those with a known  
101 MHP. Among decedents with known MHP who were recently released from an institution (10.2%), 46.7% of this  
102 group were released from psychiatric facilities.

103 Decedents without known MHP, compared to those with MHP, were less likely to have a history of suicidal  
104 ideation (aOR=0.4, 95% CI=0.4-0.5) and prior suicide attempt (aOR=0.3, 95% CI=0.3-0.3). More than 1 in five  
105 people in both groups disclosed suicide intent (22.4% vs. 24.5%).

## 106 **Conclusions and Comments**

107 From 1999-2016, 44 states saw significant suicide rate increases. Half of the states experienced increases of 30%  
108 or more. Additional research into the specific causes of these trends is necessary. Fortunately, data from the  
109 states participating in NVDRS can shed light on the circumstances that contributed to recent suicides and help  
110 guide prevention activities.

111 Researchers and practitioners regularly state that suicide is not caused by a single factor, however, the focus of  
112 suicide research and prevention practices, almost solely, focus on identify and treating MHP. The current study  
113 found that more than half of suicide decedents in NVDRS did *not* have a known MHP. This group suffered more  
114 relationship problems and life stressors such as criminal-legal matters, eviction/loss of home, and recent or  
115 impending crises. This is particularly noteworthy in light of findings that suggest many suicides and attempts  
116 occur with minimal deliberation [10].

117 Among people with MHP, two-thirds had a history of mental health and/or substance abuse treatment and over  
118 half were in current treatment. This suggests that additional supports for this population are needed to keep  
119 them safe. This includes broader implementation of affordable and effective treatment modalities such as  
120 doctor-patient collaborative care models and cognitive-behavioral therapy. Additionally, greater access to  
121 behavioral health providers, especially in underserved areas is needed, as is expansion of healthcare systems  
122 needed that integrate physical and behavioral health and that better support suicide prevention and patient  
123 safety, especially through care transitions [11].

124 Study findings indicate that people with known MHP also experienced other life stressors such as job/financial,  
125 relationship, and/or physical health problems. These findings point to the need to both prevent the conditions



126 associated with mental health problems in the first place and the need to support people with known MHP to  
127 decrease their risk of poor social, health, and economic outcomes [12].

128 These results, together, underscore the importance of comprehensive statewide suicide prevention activities  
129 that address multiple factors associated with suicide. Prevention strategies may include: strengthening  
130 economic supports (e.g., housing stabilization policies, household financial support); teaching coping and  
131 problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in  
132 life; promoting social connectedness to increase a sense of belongingness and access to informational, tangible,  
133 emotional, and social support, and identifying and better supporting people at risk. Other strategies include  
134 creating protective environments (e.g., reducing access to lethal means among people at risk, creating  
135 organizational and workplace policies to promote help-seeking, easing transitions into and out of work for  
136 people with MHP and other life challenges), supporting family and friends after a suicide, and assuring safe  
137 reporting by the media in order to prevent suicide contagion [11]. Some states, such as Colorado, are planning  
138 and implementing such a comprehensive approach to suicide prevention [13].

139 These findings have at least three limitations. In the state-level analysis, rankings for four states (MD, MA, RI,  
140 UT) might have been impacted by large proportions of injury deaths of undetermined intent (i.e. decreasing  
141 suicide rates potentially biasing reported suicide rates downward), or decreased percentages of such deaths  
142 over time (i.e. increasing suicide rates potentially biasing estimated rate trends upward). Second, NVDRS is not  
143 yet nationally representative; the 27 states included in the current study represent 49.6% of the U.S. population  
144 [1]. Third, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore,  
145 the extent of informant knowledge can impact data completeness and accuracy. Studies including more in-depth  
146 interviews with next-of-kin often see greater attributions to mental disorders [14], however many  
147 methodological variations across studies exist [15]. It is likely that some people without known MHP in the  
148 current study were experiencing mental health challenges that were unknown, and hence unreported by key  
149 informants. However, any lack of awareness of decedent MHP suggests, even further, the importance of  
150 addressing the broad range of contributing circumstances.

151 Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are  
152 available. States and communities can use data from NVDRS and resources such as CDC's *Preventing Suicide: a*  
153 *Technical Package of Policies, Programs, and Practices* [11] to better understand their suicide problem and  
154 prioritize evidence-based comprehensive suicide prevention.

#### 155 Acknowledgments

156 The authors acknowledge Robert Anderson, Holly Hedegaard, and Margaret Warner from the Division of Vital  
157 Statistics, National Center for Health Statistics, CDC, for their statistical consultation.

158  
159 **Conflict of Interest** No conflicts of interest were reported.

160  
161 **Corresponding author:** Deborah M. Stone, [dstone3@cdc.gov](mailto:dstone3@cdc.gov), 770-488-3942

#### 162 163 Author Affiliations:

164 <sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis,  
165 Research, and Practice Integration, National Center for Injury Prevention and Control, CDC

#### 166 References:

#### Comment [snk6]:

These alternate parenthetical phrases might be considered again.

The current ones confused me when I first read them, and although I was able to determine what they were intended to convey, that might only be due to my participation in the discussion with NCHS.

In the first parenthetical phrase, which basically refers to Maryland, it sounds like we're saying that decreasing rates might be the anticipated result. But Maryland's reported rates didn't decrease – they increased despite the large and persistent percentage of injury deaths with undetermined intent. They might not have increased as much as they would have with more complete reporting of intent, and if that is true then we are looking at an increase that is biased downward. Or their reported rates might be biased downward across the board.

For the second parenthetical phrase, which basically refers to Massachusetts, Rhode Island, and Utah, it sounds as though we might be attributing the increase in reported rates to the decrease in the percentage of injury deaths of undetermined intent. But the observed increases, especially in Utah, might be too large to be explained by this alone. More likely, it would have biased already increasing rate trends further upwards.

- 167 1. Centers for Disease Control and Prevention, *Web-based Injury Statistics Query and Reporting System*  
168 *(WISQARS)*. Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018.  
169 2016.
- 170 2. Ivey-Stephenson, A.Z., et al., *Suicide Trends Among and Within Urbanization Levels by Sex,*  
171 *Race/Ethnicity, Age Group, and Mechanism of Death - United States, 2001-2015*. MMWR Surveill Summ,  
172 2017. **66**(18): p. 1-16.
- 173 3. Curtin, S.C., M. Warner, and H. Hedegaard, *Increase in suicide in the United States, 1999-2014*. 2016, US  
174 Department of Health and Human Services, Centers for Disease Control and Prevention, National Center  
175 for Health Statistics Hyattsville, MD.
- 176 4. Kochanek, K., et al., *Mortality in the United States, 2016*. NCHS Data Brief, no 293. National Center for  
177 Health Statistics, 2017.
- 178 5. Office of the Surgeon General and National Action Alliance for Suicide Prevention, *2012 National*  
179 *strategy for suicide prevention: goals and objectives for action: a report of the US Surgeon General and*  
180 *of the National Action Alliance for Suicide Prevention*. 2012.
- 181 6. Rosenman, S.J., *Preventing suicide: what will work and what will not*. The Medical Journal of Australia,  
182 1998. **169**(2): p. 100-102.
- 183 7. Torguson, K. and A. O'Brien, *Leading Suicide Prevention Efforts Unite to Address Rising National Suicide*  
184 *Rate*. 2017: Washington, D.C.
- 185 8. Crepeau-Hobson, F., *The Psychological Autopsy and Determination of Child Suicides: A Survey of Medical*  
186 *Examiners*. Archives of Suicide Research, 2010. **14**(1): p. 24-34.
- 187 9. American Psychiatric Association, *Diagnostic and statistical manual of mental disorders (DSM-5®)*. 2013:  
188 American Psychiatric Pub.
- 189 10. Simon, T.R., et al., *Characteristics of impulsive suicide attempts and attempters*. Suicide and Life-  
190 Threatening Behavior, 2002. **32**(s1): p. 49-59.
- 191 11. Stone, D.M., et al., *Preventing suicide: A technical package of policies, programs, and practice*. 2017.
- 192 12. World Health Organization, *Risks to mental health: An overview of vulnerabilities and risk factors*.  
193 Geneva: WHO, 2012.
- 194 13. Caine, E.D., et al., *Comprehensive, integrated approaches to suicide prevention: practical guidance*.  
195 Injury prevention, 2017: p. injuryprev-2017-042366.
- 196 14. Milner, A., J. Svetcic, and D. De Leo, *Suicide in the absence of mental disorder? A review of psychological*  
197 *autopsy studies across countries*. Int J Soc Psychiatry, 2013. **59**(6): p. 545-54.
- 198 15. Pouliot, L. and D. De Leo, *Critical issues in psychological autopsy studies*. Suicide Life Threat Behav, 2006.  
199 **36**(5): p. 491-510.

200 **Attachment:**

201 Stone\_MMWR Suicide Vital Signs 3.26.18 (Tables\_Fig, e-clearance)

202

203 **Word Count:** 1771/1800



1 **Short Title:** Vital Signs: Contributing Circumstances to Suicide and Increasing Trends in State Suicide Rates

2 Deborah M. Stone, ScD;<sup>1</sup> Thomas R. Simon PhD;<sup>1</sup> Katherine A. Fowler, PhD;<sup>1</sup> Scott R. Kegler, PhD;<sup>2</sup> Keming Yuan,  
3 MS;<sup>1</sup> Kristin M. Holland, PhD;<sup>1</sup> Asha Z. Ivey-Stephenson, PhD;<sup>1</sup> Alex E. Crosby, MD<sup>1</sup>

4 **Structured abstract (245/250 words—this word count is not included in the 1800 max for the remainder)**

5 **Background:** Suicide rates in the United States have risen nearly 30% since 1999. Mental health problems (MHP)  
6 are just one factor contributing to suicide. Examining state-level trends in suicide and other contributing  
7 circumstances can inform comprehensive state suicide prevention planning.

8 **Methods:** Trends in age-adjusted suicide rates among people aged ≥10 years, by state and sex, across six  
9 consecutive three-year periods (1999–2016), were assessed using data from the National Vital Statistics System  
10 for 50 states and Washington, D.C (D.C.). Data from the National Violent Death Reporting System, covering 27  
11 states in 2015, were used to examine contributing circumstances among decedents with and without known  
12 MHP.

13 **Results:** From 1999–2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases  
14 of 30% or more of more than 30%. Rates increased significantly among males and females, in 34 and 43 states,  
15 respectively. Over half (54.0%) of decedents did not have a known MHP. Among decedents with circumstance  
16 information, several circumstances, including those without known MHP were more likely (all  $p < .01$ ) than those  
17 with a MHP to have relationship problems/loss (45.1% vs 39.6%), life stressors (54.2% vs 49.7%) and  
18 recent/impending crises (32.9% vs 26.0%), were significantly more likely among those without a known MHP,  
19 but these circumstances were common across groups.

20 **Conclusions:** Suicide rates increased significantly across most states from 1999–2016. Various circumstances  
21 contributed to suicides among people with and without known MHP.

22 **Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach  
23 to prevent suicide risk before it occurs, identify and support people at risk, prevent reattempts, and help  
24 friends/family after a suicide occurs.

25 **INTRODUCTION**

26 **BACKGROUND AND PURPOSE**

27 In 2016, nearly 45,000 suicides (15.6/100,000 [age-adjusted]) occurred in the United States (U.S.), among people  
28 ≥10 years old [1]. Between 1999 and 2015, suicide rates increased across sexes, racial/ethnic groups, and  
29 urbanization levels [2, 3]. Suicide is the 10<sup>th</sup> leading cause of death and is one of just three leading causes that  
30 are increasing [1, 4]. Additionally, rates of Emergency Department visits for nonfatal self-harm, a key risk factor  
31 for suicide, increased nearly 45% between 2001 and 2015 [1]. Together, suicides and self-harm injuries cost the  
32 nation more than \$69 billion in direct medical and work loss costs [1].

33 The *National Strategy for Suicide Prevention* (NSSP) [5] calls for a public health approach to suicide prevention  
34 with efforts spanning across multiple levels (i.e., individual, family/relationship, community, and societal). Such  
35 an approach underscores that suicide is rarely caused by any single factor, but rather, is multi-determined.  
36 Despite the NSSP guidance, suicide prevention efforts largely focus on identifying and treating individuals with  
37 mental health problems (MHP) [6]. Other contributing circumstances include social and economic problems,  
38 access to lethal means (e.g., substances, firearms, bridges) among people at risk, poor coping and problem-  
39 solving skills, and prior suicide attempts [5]. Expanded awareness of the additional circumstances that

**Comment [tgs9]:** I think we need a transition like this to avoid implying that the circumstances listed are the only significant differences.

**Comment [tgs9]:** You had changed this to .05. I don't think we need this in the abstract since we say they were significant. Just saying this is consistent with the aOR too.



contribute to suicide risk apart from MHP, and action to address them, can help reach the nation's goal of reducing suicide rates 20% by 2025 [7]. To assist states in achieving this goal, this study analyzes state-specific trends in suicide rates, assesses the multiple contributing factors, and provides recommendations for multi-level comprehensive suicide prevention.

## METHODS

Suicide rates were analyzed for people aged  $\geq 10$  years only, as attributions of suicidal intent in younger children are variable [8]. Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases 10<sup>th</sup> Revision*, underlying-cause-of death codes X60-X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods spanning 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Characteristics (Table 2) and circumstances (Table 3) of suicide decedents  $\geq 10$  years, with and without known MHP, were compared in the 27 states with complete data participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines MHP as disorders and syndromes listed in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition [9], with the exception of alcohol and other substance dependence, which are captured separately in NVDRS. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known MHP were compared using Chi-square tests. Logistic regression analyses estimated adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and race/ethnicity.

## RESULTS

The most recent overall suicide rates (representing 2014-2016) varied four-fold, from 6.9 (D.C.) to 29.2 (Montana) per 100,000 persons per year (Table 1). Across the study period, rates increased in all states, except Nevada (with the 9<sup>th</sup> highest current suicide rate), with absolute increases ranging from +0.8 (Delaware) to +8.1 (Wyoming) per 100,000. Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with increases of more than 30% observed in 25 states (Table 1, Figure 1).

Modeled suicide rate trends indicated significant increases for 44 states, for males (34 states) and females (43 states), as well as for the U.S. overall (Table 1). Nationally, the model-estimated AAPC for the overall suicide rate was +1.5%. By sex, the national AAPC was significant for +1.1% for males (+1.1%) and females (+2.6%) for females.

Suicide decedents without known MHP (N=11,039) were compared to those with MHP (N=9,407); all chi-square and logistic regression analyses significant at  $p \leq .05$ . While all decedents were predominately male (Table 2; 76.8%) and non-Hispanic white (83.6%), those without known MHP, relative to those with MHP, were more likely male (83.6% vs. 68.8%; adjusted odds ratio (aOR)=2.3, 95% CI = 2.2-2.5) and racial/ethnic minorities (aOR range: 1.2-2.1; 95% CI range [1.0-1.3] – [1.6-2.0]). Suicide decedents without known MHP also had significantly greater odds of perpetrating homicide-suicide (adjusted odds ratio aOR = 2.9, 95% CI = 2.2-3.8), of firearm suicide (aOR = 1.6, 95% CI = 1.5-1.7), and of testing positive for alcohol (aOR = 1.2, 95% CI = 1.1-1.3).

**Comment [tgs9]:** We can't include this here because not all of the comparisons were significant. I added some text below to address this.

**Comment [tgs9]:** I realized that we split up the results about methods and that our toxicology results are incomplete. I suggest moving these down.



Among adult decedents, 20.1% and 15.3% of people without and with MHP, respectively, ever served, or were currently serving, in the U.S. military.

~~Although While~~ firearms were ~~the most common method overall used most often overall~~ (48.5%) ~~and for both groups~~, decedents without known MHP were more likely to die by ~~firearm~~ (55.3% vs. 40.6%) ~~and less likely to die by~~ suffocation (~~26.9% vs 31.3%~~) ~~vs. 26.9%~~ ~~or and~~ poisoning (~~10.4% vs 19.8%~~) ~~vs. 10.4%~~ than those without known MHP. These differences remained significant in the adjusted models.

Decedents without known MHP were less likely to receive toxicology testing. Among those with toxicology results, decedents without known MHP were less likely to test positive for any substance overall (aOR=0.8, 95% CI=0.7-0.8) but more likely to test positive for alcohol (aOR=1.2, 95% CI=1.1-1.3).

All suicide decedents with ~~known~~-MHP (N=9,407) and approximately 85% without ~~known~~ MHP (N=9,357) had available circumstances information (Table 3). People without known MHP were less likely to have any substance abuse problems (aOR=0.7, 95% CI=0.7-0.8). While two-thirds of those with known MHP had a history of mental health or substance abuse treatment (67.2%), just over half (54.0%) were in current treatment.

Decedents without known MHP, versus those with known MHP had a ~~significantly~~ greater likelihood (~~p<.01~~) of any relationship problem/loss (45.1% vs. 39.6%), specifically intimate partner problems (30.2% vs. 24.1%), arguments/conflicts (17.5% vs. 13.6%), and recently perpetrating interpersonal violence (3.0% vs. 1.4%). They were also ~~significantly~~ more likely to have experienced other life stressors (54.2% vs 49.7%), such as criminal-legal problems (10.7% vs. 6.2%) or eviction/loss of home (4.3% vs. 3.4%), and they were more likely to have had a crisis within the preceding or upcoming two weeks (32.9% vs. 26.0%). All of these differences remained significant in the adjusted models. Among those with crises, intimate partner and physical health problems were the most common types for both groups and did not differ between them. Among both groups, the most common crises were intimate partner (36.2% vs. 34.9%) and physical health problems (13.8% vs. 12.9%), respectively.

Decedents without known MHP had significantly lower odds of recent release (aOR=0.5 95% CI (0.4-0.5) from any institution, but among those who were recently released (5.1%), they were significantly more likely to be released from a correctional facility (25.7% vs. 8.7%) or hospital (43.7% vs. 33.0%) than those with a known MHP. Among decedents with known MHP who were recently released from an institution (10.2%), 46.7% of this group were released from psychiatric facilities.

Decedents without known MHP, compared to those with MHP, were less likely to have a history of suicidal ideation (aOR=0.4, 95% CI=0.4-0.5) and prior suicide attempt (aOR=0.3, 95% CI=0.3-0.3). More than 1 in five people in both groups disclosed suicide intent (22.4% vs. 24.5%).

## Conclusions and Comments

From 1999-2016, 44 states saw significant suicide rate increases. Half of the states experienced increases of ~~30% more than 30% or more~~. Additional research into the specific causes of these trends is necessary. Fortunately, data from the states participating in NVDRS can shed light on the circumstances that contributed to recent suicides and help guide prevention activities.

Researchers and practitioners regularly state that suicide is not caused by a single factor, however, the focus of suicide research and prevention practices, almost solely, focus on identify and treating MHP. The current study found that more than half of suicide decedents in NVDRS did *not* have a known MHP. This group suffered more



125 relationship problems and life stressors such as criminal-legal matters, eviction/loss of home, and recent or  
126 impending crises. This is particularly noteworthy in light of findings that suggest many suicides and attempts  
127 occur with minimal deliberation [10].

128 Among people with MHP, two-thirds had a history of mental health and/or substance abuse treatment and over  
129 half were in current treatment. This suggests that additional supports for this population are needed to keep  
130 them safe. This includes broader implementation of affordable and effective treatment modalities such as  
131 doctor-patient collaborative care models and cognitive-behavioral therapy. Additionally, greater access to  
132 behavioral health providers, especially in underserved areas is needed, as is expansion of healthcare systems  
133 needed that integrate physical and behavioral health and that better support suicide prevention and patient  
134 safety, especially through care transitions [11].

135 Study findings indicate that people with known MHP also experienced other life stressors such as job/financial,  
136 relationship, and/or physical health problems. These findings point to the need to both prevent the conditions  
137 associated with mental health problems in the first place and the need to support people with known MHP to  
138 decrease their risk of poor social, health, and economic outcomes [12].

139 These results, together, underscore the importance of comprehensive statewide suicide prevention activities  
140 that address multiple factors associated with suicide. Prevention strategies may include: strengthening  
141 economic supports (e.g., housing stabilization policies, household financial support); teaching coping and  
142 problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in  
143 life; promoting social connectedness to increase a sense of belongingness and access to informational, tangible,  
144 emotional, and social support, and identifying and better supporting people at risk. Other strategies include  
145 creating protective environments (e.g., reducing access to lethal means among people at risk, creating  
146 organizational and workplace policies to promote help-seeking, easing transitions into and out of work for  
147 people with MHP and other life challenges), supporting family and friends after a suicide, and assuring safe  
148 reporting by the media in order to prevent suicide contagion [11]. Some states, such as Colorado, are planning  
149 and implementing such a comprehensive approach to suicide prevention [13].

150 These findings have at least three limitations. In the state-level analysis, rankings for four states (MD, MA, RI,  
151 UT) might have been impacted by large proportions of injury deaths of undetermined intent (~~i.e. decreasing~~  
152 ~~suicide rates~~), ~~potentially biasing reported suicide rates downward~~) or decreased percentages of such deaths  
153 over time (~~i.e. increasing suicide rates potentially biasing estimated rate trends upward~~). Second, NVDRS is not  
154 yet nationally representative; the 27 states included in the current study represent 49.6% of the U.S. population  
155 [1]. Third, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore,  
156 the extent of informant knowledge can impact data completeness and accuracy. Studies including more in-depth  
157 interviews with next-of-kin often see greater attributions to mental disorders [14], however many  
158 methodological variations across studies exist [15]. It is likely that some people without known MHP in the  
159 current study were experiencing mental health challenges that were unknown, and hence unreported by key  
160 informants. However, any lack of awareness of decedent MHP suggests, even further, the importance of  
161 addressing the broad range of contributing circumstances.

162 Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are  
163 available. States and communities can use data from NVDRS and resources such as CDC's *Preventing Suicide: a*  
164 *Technical Package of Policies, Programs, and Practices* [11] to better understand their suicide problem and  
165 prioritize evidence-based comprehensive suicide prevention.

## 166 Acknowledgments



The authors acknowledge Robert Anderson, Holly Hedegaard, and Margaret Warner from the Division of Vital Statistics, National Center for Health Statistics, CDC, for their statistical consultation.

**Conflict of Interest** No conflicts of interest were reported.

**Corresponding author:** Deborah M. Stone, [dstone3@cdc.gov](mailto:dstone3@cdc.gov), 770-488-3942

**Author Affiliations:**

<sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis, Research, and Practice Integration, National Center for Injury Prevention and Control, CDC

**References:**

1. Centers for Disease Control and Prevention, *Web-based Injury Statistics Query and Reporting System (WISQARS)*. Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018. 2016.
2. Ivey-Stephenson, A.Z., et al., *Suicide Trends Among and Within Urbanization Levels by Sex, Race/Ethnicity, Age Group, and Mechanism of Death - United States, 2001-2015*. MMWR Surveill Summ, 2017. **66**(18): p. 1-16.
3. Curtin, S.C., M. Warner, and H. Hedegaard, *Increase in suicide in the United States, 1999-2014*. 2016, US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics Hyattsville, MD.
4. Kochanek, K., et al., *Mortality in the United States, 2016*. NCHS Data Brief, no 293. National Center for Health Statistics, 2017.
5. Office of the Surgeon General and National Action Alliance for Suicide Prevention, *2012 National strategy for suicide prevention: goals and objectives for action: a report of the US Surgeon General and of the National Action Alliance for Suicide Prevention*. 2012.
6. Rosenman, S.J., *Preventing suicide: what will work and what will not*. The Medical Journal of Australia, 1998. **169**(2): p. 100-102.
7. Torguson, K. and A. O'Brien, *Leading Suicide Prevention Efforts Unite to Address Rising National Suicide Rate*. 2017: Washington, D.C.
8. Crepeau-Hobson, F., *The Psychological Autopsy and Determination of Child Suicides: A Survey of Medical Examiners*. Archives of Suicide Research, 2010. **14**(1): p. 24-34.
9. American Psychiatric Association, *Diagnostic and statistical manual of mental disorders (DSM-5®)*. 2013: American Psychiatric Pub.
10. Simon, T.R., et al., *Characteristics of impulsive suicide attempts and attempters*. Suicide and Life-Threatening Behavior, 2002. **32**(s1): p. 49-59.
11. Stone, D.M., et al., *Preventing suicide: A technical package of policies, programs, and practice*. 2017.
12. World Health Organization, *Risks to mental health: An overview of vulnerabilities and risk factors*. Geneva: WHO, 2012.
13. Caine, E.D., et al., *Comprehensive, integrated approaches to suicide prevention: practical guidance*. Injury prevention, 2017: p. injuryprev-2017-042366.
14. Milner, A., J. Svetlicic, and D. De Leo, *Suicide in the absence of mental disorder? A review of psychological autopsy studies across countries*. Int J Soc Psychiatry, 2013. **59**(6): p. 545-54.
15. Pouliot, L. and D. De Leo, *Critical issues in psychological autopsy studies*. Suicide Life Threat Behav, 2006. **36**(5): p. 491-510.

**Attachment:**

Stone\_MMWR Suicide Vital Signs 3.26.18 (Tables\_Fig, e-clearance)



Rev 3.26.18, e-clearance

213

214 **Word Count:** 1771/1800



1 **Short Title:** Vital Signs: Contributing Circumstances to Suicide and Increasing Trends in State Suicide Rates

2 Deborah M. Stone, ScD;<sup>1</sup> Thomas R. Simon PhD;<sup>1</sup> Katherine A. Fowler, PhD;<sup>1</sup> Scott R. Kegler, PhD;<sup>2</sup> Keming Yuan,  
3 MS;<sup>1</sup> Kristin M. Holland, PhD;<sup>1</sup> Asha Z. Ivey-Stephenson, PhD;<sup>1</sup> Alex E. Crosby, MD<sup>1</sup>

4 **Structured abstract (245/250 words—this word count is not included in the 1800 max for the remainder)**

5 **Background:** Suicide rates have risen nearly 30% since 1999. Mental health problems (MHP) are just one factor  
6 contributing to suicide. Examining state-level trends in suicide and other contributing circumstances can inform  
7 comprehensive state suicide prevention planning.

8 **Methods:** Trends in age-adjusted suicide rates among people aged ≥10 years, by state and sex, across six  
9 consecutive three-year periods (1999-2016), were assessed using data from the National Vital Statistics System  
10 for 50 states and Washington, D.C (D.C.). Data from the National Violent Death Reporting System, covering 27  
11 states in 2015, were used to examine contributing circumstances among decedents with and without known  
12 MHP.

13 **Results:** From 1999-2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases  
14 of 30% or more. Rates increased significantly among males and females, in 34 and 43 states, respectively. Over  
15 half (54.0%) of decedents did *not* have a known MHP. Among decedents with circumstance information, several  
16 circumstances, including those without known MHP were more likely (all  $p < .01$ ) than those with a MHP to have  
17 relationship problems/loss (45.1% vs 39.6%), life stressors (54.2% vs 49.7%) and recent/impending crises (32.9%  
18 vs 26.0%), were significantly more likely among those without a known MHP, but these circumstances were  
19 common across groups.

20 **Conclusions:** Suicide rates increased significantly across most states from 1999-2016. Various circumstances  
21 contributed to suicides among people with and without known MHP.

22 **Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach  
23 to prevent suicide risk before it occurs, identify and support people at risk, prevent reattempts, and help  
24 friends/family after a suicide occurs.

## 25 INTRODUCTION

### 26 BACKGROUND AND PURPOSE

27 In 2016, nearly 45,000 suicides (15.6/100,000 [age-adjusted]) occurred in the United States (U.S.), among people  
28 ≥10 years old [1]. Between 1999 and 2015, suicide rates increased across sexes, racial/ethnic groups, and  
29 urbanization levels [2, 3]. Suicide is the 10<sup>th</sup> leading cause of death and is one of just three leading causes that  
30 are *increasing* [1, 4]. Additionally, rates of Emergency Department visits for nonfatal self-harm, a key risk factor  
31 for suicide, increased nearly 45% between 2001 and 2015 [1]. Together, suicides and self-harm injuries cost the  
32 nation more than \$69 billion in direct medical and work loss costs [1].

33 The *National Strategy for Suicide Prevention*(NSSP) [5] calls for a public health approach to suicide prevention  
34 with efforts spanning across multiple levels (i.e., individual, family/relationship, community, and societal). Such  
35 an approach underscores that suicide is rarely caused by any single factor, but rather, is multi-determined.  
36 Despite the NSSP guidance, suicide prevention efforts largely focus on identifying and treating individuals with  
37 mental health problems (MHP) [6]. Other contributing circumstances include social and economic problems,  
38 access to lethal means (e.g., substances, firearms, bridges) among people at risk, poor coping and problem-  
39 solving skills, and prior suicide attempts [5]. Expanded awareness of the additional circumstances that

**Comment [tgs9]:** I think we need a transition like this to avoid implying that the circumstances listed are the only significant differences.

**Comment [tgs9]:** You had changed this to .05. I don't think we need this in the abstract since we say they were significant. Just saying this is consistent with the aOR too.



contribute to suicide risk apart from MHP, and action to address them, can help reach the nation's goal of reducing suicide rates 20% by 2025 [7]. To assist states in achieving this goal, this study analyzes state-specific trends in suicide rates, assesses the multiple contributing factors, and provides recommendations for multi-level comprehensive suicide prevention.

## METHODS

Suicide rates were analyzed for people aged  $\geq 10$  years only, as attributions of suicidal intent in younger children are variable [8]. Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases 10<sup>th</sup> Revision*, underlying-cause-of death codes X60-X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods spanning 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Characteristics (Table 2) and circumstances (Table 3) of suicide decedents  $\geq 10$  years, with and without known MHP, were compared in the 27 states with complete data participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines MHP as disorders and syndromes listed in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition [9], with the exception of alcohol and other substance dependence, which are captured separately in NVDRS. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known MHP were compared using Chi-square tests. Logistic regression analyses estimated adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and race/ethnicity.

## RESULTS

The most recent overall suicide rates (representing 2014-2016) varied four-fold, from 6.9 (D.C.) to 29.2 (Montana) per 100,000 persons per year (Table 1). Across the study period, rates increased in all states, except Nevada (with the 9<sup>th</sup> highest current suicide rate), with absolute increases ranging from +0.8 (Delaware) to +8.1 (Wyoming) per 100,000. Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with increases more than 30% observed in 25 states (Table 1, Figure 1).

Modeled suicide rate trends indicated significant increases for 44 states, for males (34 states) and females (43 states), as well as for the U.S. overall (Table 1). Nationally, the model-estimated AAPC for the overall suicide rate was +1.5%. By sex, the national AAPC was significant for +1.1% for males (+1.1%) and females (+2.6%) for females.

Suicide decedents without known MHP (N=11,039) were compared to those with MHP (N=9,407); all chi-square and logistic regression analyses significant at  $p \leq .05$ . While all decedents were predominately male (Table 2; 76.8%) and non-Hispanic white (83.6%), those without known MHP, relative to those with MHP, were more likely male (83.6% vs. 68.8%; adjusted odds ratio (aOR)=2.3, 95% CI = 2.2-2.5) and racial/ethnic minorities (odds ratio (OR) range: 1.2-2.1; 95% CI range [1.0-1.3] – [1.6-2.0]). Suicide decedents without known MHP also had significantly greater odds of perpetrating homicide-suicide (adjusted odds ratio aOR = 2.9, 95% CI = 2.2-3.8), of firearm suicide (aOR = 1.6, 95% CI = 1.5-1.7), and of testing positive for alcohol (aOR = 1.2, 95% CI = 1.1-1.3).

**Comment [tgs9]:** We can't include this here because not all of the comparisons were significant. I added some text below to address this.

**Comment [tgs9]:** I realized that we split up the results about methods and that our toxicology results are incomplete. I suggest moving these down.



85 Among adult decedents, 20.1% and 15.3% of people without and with MHP, respectively, ever served, or were  
86 currently serving, in the U.S. military.

87

88 ~~Although While~~ firearms were ~~the most common method overall used most often overall~~ (48.5%) ~~and for both~~  
89 ~~groups~~, decedents without known MHP were more likely to die by ~~firearm~~ (55.3% vs. 40.6%) ~~and less likely to~~  
90 ~~die by~~ suffocation (~~26.9% vs 31.3%~~) ~~vs. 26.9%~~ ~~or and~~ poisoning (~~10.4% vs 19.8%~~) ~~vs. 10.4%~~ than those without  
91 known MHP. These differences remained significant in the adjusted models.

92 Decedents without known MHP were less likely to receive toxicology testing. Among those with toxicology  
93 results, decedents without known MHP were less likely to test positive for any substance overall (aOR=0.8, 95%  
94 CI=0.7-0.8) but more likely to test positive for alcohol (aOR=1.2, 95% CI=1.1-1.3).

95 All suicide decedents with ~~known~~-MHP (N=9,407) and approximately 85% without ~~known~~ MHP (N=9,357) had  
96 available circumstances information (Table 3). People without known MHP were less likely to have any  
97 substance abuse problems (aOR=0.7, 95% CI=0.7-0.8). While two-thirds of those with known MHP had a history  
98 of mental health or substance abuse treatment (67.2%), just over half (54.0%) were in current treatment.

99 Decedents without known MHP, versus those with known MHP had a ~~significantly~~ greater likelihood (~~p<.01~~) of  
100 any relationship problem/loss (45.1% vs. 39.6%), specifically intimate partner problems (30.2% vs. 24.1%),  
101 arguments/conflicts (17.5% vs. 13.6%), and recently perpetrating interpersonal violence (3.0% vs. 1.4%). They  
102 were also ~~significantly~~ more likely to have experienced other life stressors (54.2% vs 49.7%), such as criminal-  
103 legal problems (10.7% vs. 6.2%) or eviction/loss of home (4.3% vs. 3.4%), and they were more likely to have had  
104 a crisis within the preceding or upcoming two weeks (32.9% vs. 26.0%). All of these differences remained  
105 significant in the adjusted models. Among those with crises, intimate partner and physical health problems were  
106 the most common types for both groups and did not differ between them. Among both groups, the most  
107 common crises were intimate partner (36.2% vs. 34.9%) and physical health problems (13.8% vs. 12.9%),  
108 respectively.

109 Decedents without known MHP had significantly lower odds of recent release (aOR=0.5 95% CI (0.4-0.5) from  
110 any institution, but among those who were recently released (5.1%), they were significantly more likely to be  
111 released from a correctional facility (25.7% vs. 8.7%) or hospital (43.7% vs. 33.0%) than those with a known  
112 MHP. Among decedents with known MHP who were recently released from an institution (10.2%), 46.7% of this  
113 group were released from psychiatric facilities.

114 Decedents without known MHP, compared to those with MHP, were less likely to have a history of suicidal  
115 ideation (aOR=0.4, 95% CI=0.4-0.5) and prior suicide attempt (aOR=0.3, 95% CI=0.3-0.3). More than 1 in five  
116 people in both groups disclosed suicide intent (22.4% vs. 24.5%).

## 117 Conclusions and Comments

118 From 1999-2016, 44 states saw significant suicide rate increases. Half of the states experienced increases of 30%  
119 or more. Additional research into the specific causes of these trends is necessary. Fortunately, data from the  
120 states participating in NVDRS can shed light on the circumstances that contributed to recent suicides and help  
121 guide prevention activities.

122 Researchers and practitioners regularly state that suicide is not caused by a single factor, however, the focus of  
123 suicide research and prevention practices, almost solely, focus on identify and treating MHP. The current study  
124 found that more than half of suicide decedents in NVDRS did *not* have a known MHP. This group suffered more

relationship problems and life stressors such as criminal-legal matters, eviction/loss of home, and recent or impending crises. This is particularly noteworthy in light of findings that suggest many suicides and attempts occur with minimal deliberation [10].

Among people with MHP, two-thirds had a history of mental health and/or substance abuse treatment and over half were in current treatment. This suggests that additional supports for this population are needed to keep them safe. This includes broader implementation of affordable and effective treatment modalities such as doctor-patient collaborative care models and cognitive-behavioral therapy. Additionally, greater access to behavioral health providers, especially in underserved areas is needed, as is expansion of healthcare systems needed that integrate physical and behavioral health and that better support suicide prevention and patient safety, especially through care transitions [11].

Study findings indicate that people with known MHP also experienced other life stressors such as job/financial, relationship, and/or physical health problems. These findings point to the need to both prevent the conditions associated with mental health problems in the first place and the need to support people with known MHP to decrease their risk of poor social, health, and economic outcomes [12].

These results, together, underscore the importance of comprehensive statewide suicide prevention activities that address multiple factors associated with suicide. Prevention strategies may include: strengthening economic supports (e.g., housing stabilization policies, household financial support); teaching coping and problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in life; promoting social connectedness to increase a sense of belongingness and access to informational, tangible, emotional, and social support, and identifying and better supporting people at risk. Other strategies include creating protective environments (e.g., reducing access to lethal means among people at risk, creating organizational and workplace policies to promote help-seeking, easing transitions into and out of work for people with MHP and other life challenges), supporting family and friends after a suicide, and assuring safe reporting by the media in order to prevent suicide contagion [11]. Some states, such as Colorado, are planning and implementing such a comprehensive approach to suicide prevention [13].

These findings have at least three limitations. In the state-level analysis, rankings for four states (MD, MA, RI, UT) might have been impacted by large proportions of injury deaths of undetermined intent (i.e. decreasing suicide rates), or decreased percentages of such deaths over time (i.e. increasing suicide rates). Second, NVDRS is not yet nationally representative; the 27 states included in the current study represent 49.6% of the U.S. population [1]. Third, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the extent of informant knowledge can impact data completeness and accuracy. Studies including more in-depth interviews with next-of-kin often see greater attributions to mental disorders [14], however many methodological variations across studies exist [15]. It is likely that some people without known MHP in the current study were experiencing mental health challenges that were unknown, and hence unreported by key informants. However, any lack of awareness of decedent MHP suggests, even further, the importance of addressing the broad range of contributing circumstances.

Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are available. States and communities can use data from NVDRS and resources such as CDC's *Preventing Suicide: a Technical Package of Policies, Programs, and Practices* [11] to better understand their suicide problem and prioritize evidence-based comprehensive suicide prevention.

## Acknowledgments



The authors acknowledge Robert Anderson, Holly Hedegaard, and Margaret Warner from the Division of Vital Statistics, National Center for Health Statistics, CDC, for their statistical consultation.

**Conflict of Interest** No conflicts of interest were reported.

**Corresponding author:** Deborah M. Stone, [dstone3@cdc.gov](mailto:dstone3@cdc.gov), 770-488-3942

**Author Affiliations:**

<sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis, Research, and Practice Integration, National Center for Injury Prevention and Control, CDC

**References:**

1. Centers for Disease Control and Prevention, *Web-based Injury Statistics Query and Reporting System (WISQARS)*. Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018. 2016.
2. Ivey-Stephenson, A.Z., et al., *Suicide Trends Among and Within Urbanization Levels by Sex, Race/Ethnicity, Age Group, and Mechanism of Death - United States, 2001-2015*. MMWR Surveill Summ, 2017. **66**(18): p. 1-16.
3. Curtin, S.C., M. Warner, and H. Hedegaard, *Increase in suicide in the United States, 1999-2014*. 2016, US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics Hyattsville, MD.
4. Kochanek, K., et al., *Mortality in the United States, 2016*. NCHS Data Brief, no 293. National Center for Health Statistics, 2017.
5. Office of the Surgeon General and National Action Alliance for Suicide Prevention, *2012 National strategy for suicide prevention: goals and objectives for action: a report of the US Surgeon General and of the National Action Alliance for Suicide Prevention*. 2012.
6. Rosenman, S.J., *Preventing suicide: what will work and what will not*. The Medical Journal of Australia, 1998. **169**(2): p. 100-102.
7. Torguson, K. and A. O'Brien, *Leading Suicide Prevention Efforts Unite to Address Rising National Suicide Rate*. 2017: Washington, D.C.
8. Crepeau-Hobson, F., *The Psychological Autopsy and Determination of Child Suicides: A Survey of Medical Examiners*. Archives of Suicide Research, 2010. **14**(1): p. 24-34.
9. American Psychiatric Association, *Diagnostic and statistical manual of mental disorders (DSM-5®)*. 2013: American Psychiatric Pub.
10. Simon, T.R., et al., *Characteristics of impulsive suicide attempts and attempters*. Suicide and Life-Threatening Behavior, 2002. **32**(s1): p. 49-59.
11. Stone, D.M., et al., *Preventing suicide: A technical package of policies, programs, and practice*. 2017.
12. World Health Organization, *Risks to mental health: An overview of vulnerabilities and risk factors*. Geneva: WHO, 2012.
13. Caine, E.D., et al., *Comprehensive, integrated approaches to suicide prevention: practical guidance*. Injury prevention, 2017: p. injuryprev-2017-042366.
14. Milner, A., J. Svetcic, and D. De Leo, *Suicide in the absence of mental disorder? A review of psychological autopsy studies across countries*. Int J Soc Psychiatry, 2013. **59**(6): p. 545-54.
15. Pouliot, L. and D. De Leo, *Critical issues in psychological autopsy studies*. Suicide Life Threat Behav, 2006. **36**(5): p. 491-510.

**Attachment:**

Stone\_MMWR Suicide Vital Signs 3.26.18 (Tables\_Fig, e-clearance)

Rev 3.26.18, e-clearance

212

213 **Word Count:** 1771/1800



1 **Short Title:** Vital Signs: Contributing Circumstances to Suicide and Increasing Trends in State Suicide Rates

2 Deborah M. Stone, ScD;<sup>1</sup> Thomas R. Simon PhD;<sup>1</sup> Katherine A. Fowler, PhD;<sup>1</sup> Scott R. Kegler, PhD;<sup>2</sup> Keming Yuan,  
3 MS;<sup>1</sup> Kristin M. Holland, PhD;<sup>1</sup> Asha Z. Ivey-Stephenson, PhD;<sup>1</sup> Alex E. Crosby, MD<sup>1</sup>

4 **Structured abstract (245/250 words—this word count is not included in the 1800 max for the remainder)**

5 **Background:** Suicide rates have risen nearly 30% since 1999. Mental health problems (MHP) are just one factor  
6 contributing to suicide. Examining state-level trends in suicide and other contributing circumstances can inform  
7 comprehensive state suicide prevention planning.

8 **Methods:** Trends in age-adjusted suicide rates among people aged ≥10 years, by state and sex, across six  
9 consecutive three-year periods (1999-2016), were assessed using data from the National Vital Statistics System  
10 for 50 states and Washington, D.C (D.C.). Data from the National Violent Death Reporting System, covering 27  
11 states in 2015, were used to examine contributing circumstances among decedents with and without known  
12 MHP.

13 **Results:** From 1999-2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases  
14 of 30% or more. Rates increased significantly among males and females, in 34 and 43 states, respectively. Over  
15 half (54.0%) of decedents did *not* have a known MHP. Among decedents with circumstance information, those  
16 without known MHP were more likely (all  $p \leq .01$ ) than those with a MHP to have relationship problems/loss  
17 (45.1% vs 39.6%), life stressors (54.2% vs 49.7%) and recent/impending crises (32.9% vs 26.0%), but these  
18 circumstances were common across groups.

19 **Conclusions:** Suicide rates increased significantly across most states from 1999-2016. Various circumstances  
20 contributed to suicides among people with and without known MHP.

21 **Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach  
22 to prevent suicide risk before it occurs, identify and support people at risk, prevent reattempts, and help  
23 friends/family after a suicide occurs.

## 24 INTRODUCTION

### 25 BACKGROUND AND PURPOSE

26 In 2016, nearly 45,000 suicides (15.6/100,000 [age-adjusted]) occurred in the United States (U.S.), among people  
27 ≥10 years old [1]. Between 1999 and 2015, suicide rates increased across sexes, racial/ethnic groups, and  
28 urbanization levels [2, 3]. Suicide is the 10<sup>th</sup> leading cause of death and is one of just three leading causes that  
29 are *increasing* [1, 4]. Additionally, rates of Emergency Department visits for nonfatal self-harm, a key risk factor  
30 for suicide, increased nearly 45% between 2001 and 2015 [1]. Together, suicides and self-harm injuries cost the  
31 nation more than \$69 billion in direct medical and work loss costs [1].

32 The *National Strategy for Suicide Prevention*(NSSP) [5] calls for a public health approach to suicide prevention  
33 with efforts spanning across multiple levels (i.e., individual, family/relationship, community, and societal). Such  
34 an approach underscores that suicide is rarely caused by any single factor, but rather, is multi-determined.  
35 Despite the NSSP guidance, suicide prevention efforts largely focus on identifying and treating individuals with  
36 mental health problems (MHP) [6]. Other contributing circumstances include social and economic problems,  
37 access to lethal means (e.g., substances, firearms, bridges) among people at risk, poor coping and problem-  
38 solving skills, and prior suicide attempts [5]. Expanded awareness of the additional circumstances that  
39 contribute to suicide risk apart from MHP, and action to address them, can help reach the nation's goal of

reducing suicide rates 20% by 2025 [7]. To assist states in achieving this goal, this study analyzes state-specific trends in suicide rates, assesses the multiple contributing factors, and provides recommendations for multi-level comprehensive suicide prevention.

## METHODS

Suicide rates were analyzed for people aged  $\geq 10$  years only, as attributions of suicidal intent in younger children are variable [8]. Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases 10<sup>th</sup> Revision*, underlying-cause-of death codes X60-X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods spanning 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Characteristics (Table 2) and circumstances (Table 3) of suicide decedents  $\geq 10$  years, with and without known MHP, were compared in the 27 states with complete data participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines MHP as disorders and syndromes listed in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition [9], with the exception of alcohol and other substance dependence, which are captured separately in NVDRS. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known MHP were compared using Chi-square tests. Logistic regression analyses estimated adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and race/ethnicity.

## RESULTS

The most recent overall suicide rates (representing 2014-2016) varied four-fold, from 6.9 (D.C.) to 29.2 (Montana) per 100,000 persons per year (Table 1). Across the study period, rates increased in all states, except Nevada (with the 9<sup>th</sup> highest current suicide rate), with absolute increases ranging from +0.8 (Delaware) to +8.1 (Wyoming) per 100,000. Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with increases more than 30% observed in 25 states (Table 1, Figure 1).

Modeled suicide rate trends indicated significant increases for 44 states, for males (34 states) and females (43 states), as well as for the U.S. overall (Table 1). Nationally, the model-estimated AAPC for the overall suicide rate was +1.5%. By sex, the national AAPC was +1.1% for males and +2.6% for females.

Suicide decedents without known MHP (N=11,039) were compared to those with MHP (N=9,407; all chi-square and logistic regression analyses significant at  $p \leq .05$ ). While all decedents were predominately male (Table 2; 76.8%) and non-Hispanic white (83.6%), those without known MHP, relative to those with MHP, were more likely male (83.6% vs. 68.8%; adjusted odds ratio (aOR)=2.3, 95% CI = 2.2-2.5) and racial/ethnic minorities (odds ratio [OR] range: 1.2-2.1; 95% CI range [1.0-1.3] – [1.6-2.0]). Suicide decedents without known MHP also had significantly greater odds of perpetrating homicide-suicide (aOR = 2.9, 95% CI = 2.2-3.8), of firearm suicide (aOR = 1.6, 95% CI = 1.5-1.7), and of testing positive for alcohol (aOR = 1.2, 95% CI = 1.1-1.3). Among adult decedents, 20.1% and 15.3% of people without and with MHP, respectively, ever served, or were currently serving, in the U.S. military.



85 Although firearms were used most often overall (48.5%), decedents with known MHP were more likely to die by  
86 suffocation (31.3 vs. 26.9%) and poisoning (19.8% vs. 10.4%) than those without known MHP.

87 All suicide decedents with known MHP (N=9,407) and approximately 85% without MHP (N=9,357) had available  
88 circumstances information (Table 3). People without known MHP were less likely to have any substance abuse  
89 problems (aOR=0.7, 95% CI=0.7-0.8). While two-thirds of those with known MHP had a history of mental health  
90 or substance abuse treatment (67.2%), just over half (54.0%) were in current treatment.

91 Decedents without known MHP, versus those with known MHP had a significantly greater likelihood ( $p<.01$ ) of  
92 any relationship problem/loss (45.1% vs. 39.6%), specifically intimate partner problems (30.2% vs. 24.1%),  
93 arguments/conflicts (17.5% vs. 13.6%), and recently perpetrating interpersonal violence (3.0% vs. 1.4%). They  
94 were also significantly more likely to have experienced other life stressors (54.2% vs 49.7%), such as criminal-  
95 legal problems (10.7% vs. 6.2%) or eviction/loss of home (4.3% vs. 3.4%), and they were more likely to have had  
96 a crisis within the preceding or upcoming two weeks (32.9% vs. 26.0%). Among both groups, the most common  
97 crises were intimate partner (36.2% vs. 34.9%) and physical health problems (13.8% vs. 12.9%), respectively.

98 Decedents without known MHP had significantly lower odds of recent release (aOR=0.5 95% CI (0.4-0.5) from  
99 any institution, but among those who were recently released (5.1%), they were significantly more likely to be  
100 released from a correctional facility (25.7% vs. 8.7%) or hospital (43.7% vs. 33.0%) than those with a known  
101 MHP. Among decedents with known MHP who were recently released from an institution (10.2%), 46.7% of this  
102 group were released from psychiatric facilities.

103 Decedents without known MHP, compared to those with MHP, were less likely to have a history of suicidal  
104 ideation (aOR=0.4, 95% CI=0.4-0.5) and prior suicide attempt (aOR=0.3, 95% CI=0.3-0.3). More than 1 in five  
105 people in both groups disclosed suicide intent (22.4% vs. 24.5%).

## 106 **Conclusions and Comments**

107 From 1999-2016, 44 states saw significant suicide rate increases. Half of the states experienced increases of 30%  
108 or more. Additional research into the specific causes of these trends is necessary. Fortunately, data from the  
109 states participating in NVDRS can shed light on the circumstances that contributed to recent suicides and help  
110 guide prevention activities.

111 Researchers and practitioners regularly state that suicide is not caused by a single factor, however, the focus of  
112 suicide research and prevention practices, almost solely, focus on identify and treating MHP. The current study  
113 found that more than half of suicide decedents in NVDRS did *not* have a known MHP. This group suffered more  
114 relationship problems and life stressors such as criminal-legal matters, eviction/loss of home, and recent or  
115 impending crises. This is particularly noteworthy in light of findings that suggest many suicides and attempts  
116 occur with minimal deliberation [10].

117 Among people with MHP, two-thirds had a history of mental health and/or substance abuse treatment and over  
118 half were in current treatment. This suggests that additional supports for this population are needed to keep  
119 them safe. This includes broader implementation of affordable and effective treatment modalities such as  
120 doctor-patient collaborative care models and cognitive-behavioral therapy. Additionally, greater access to  
121 behavioral health providers, especially in underserved areas is needed, as is expansion of healthcare systems  
122 needed that integrate physical and behavioral health and that better support suicide prevention and patient  
123 safety, especially through care transitions [11].

124 Study findings indicate that people with known MHP also experienced other life stressors such as job/financial,  
125 relationship, and/or physical health problems. These findings point to the need to both prevent the conditions

associated with mental health problems in the first place and the need to support people with known MHP to decrease their risk of poor social, health, and economic outcomes [12].

These results, together, underscore the importance of comprehensive statewide suicide prevention activities that address multiple factors associated with suicide. Prevention strategies may include: strengthening economic supports (e.g., housing stabilization policies, household financial support); teaching coping and problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in life; promoting social connectedness to increase a sense of belongingness and access to informational, tangible, emotional, and social support, and identifying and better supporting people at risk. Other strategies include creating protective environments (e.g., reducing access to lethal means among people at risk, creating organizational and workplace policies to promote help-seeking, easing transitions into and out of work for people with MHP and other life challenges), supporting family and friends after a suicide, and assuring safe reporting by the media in order to prevent suicide contagion [11]. Some states, such as Colorado, are planning and implementing such a comprehensive approach to suicide prevention [13].

These findings have at least three limitations. In the state-level analysis, rankings for four states (MD, MA, RI, UT) might have been impacted by large proportions of injury deaths of undetermined intent (i.e. decreasing suicide rates), or decreased percentages of such deaths over time (i.e. increasing suicide rates). Second, NVDRS is not yet nationally representative; the 27 states included in the current study represent 49.6% of the U.S. population [1]. Third, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the extent of informant knowledge can impact data completeness and accuracy. Studies including more in-depth interviews with next-of-kin often see greater attributions to mental disorders [14], however many methodological variations across studies exist [15]. It is likely that some people without known MHP in the current study were experiencing mental health challenges that were unknown, and hence unreported by key informants. However, any lack of awareness of decedent MHP suggests, even further, the importance of addressing the broad range of contributing circumstances.

Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are available. States and communities can use data from NVDRS and resources such as CDC's *Preventing Suicide: a Technical Package of Policies, Programs, and Practices* [11] to better understand their suicide problem and prioritize evidence-based comprehensive suicide prevention.

#### **Acknowledgments**

The authors acknowledge Robert Anderson, Holly Hedegaard, and Margaret Warner from the Division of Vital Statistics, National Center for Health Statistics, CDC, for their statistical consultation.

**Conflict of Interest** No conflicts of interest were reported.

**Corresponding author:** Deborah M. Stone, [dstone3@cdc.gov](mailto:dstone3@cdc.gov), 770-488-3942

#### **Author Affiliations:**

<sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis, Research, and Practice Integration, National Center for Injury Prevention and Control, CDC

#### **References:**



- 166 1. Centers for Disease Control and Prevention, *Web-based Injury Statistics Query and Reporting System*  
167 *(WISQARS)*. Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018.  
168 2016.
- 169 2. Ivey-Stephenson, A.Z., et al., *Suicide Trends Among and Within Urbanization Levels by Sex,*  
170 *Race/Ethnicity, Age Group, and Mechanism of Death - United States, 2001-2015*. MMWR Surveill Summ,  
171 2017. **66**(18): p. 1-16.
- 172 3. Curtin, S.C., M. Warner, and H. Hedegaard, *Increase in suicide in the United States, 1999-2014*. 2016, US  
173 Department of Health and Human Services, Centers for Disease Control and Prevention, National Center  
174 for Health Statistics Hyattsville, MD.
- 175 4. Kochanek, K., et al., *Mortality in the United States, 2016*. NCHS Data Brief, no 293. National Center for  
176 Health Statistics, 2017.
- 177 5. Office of the Surgeon General and National Action Alliance for Suicide Prevention, *2012 National*  
178 *strategy for suicide prevention: goals and objectives for action: a report of the US Surgeon General and*  
179 *of the National Action Alliance for Suicide Prevention*. 2012.
- 180 6. Rosenman, S.J., *Preventing suicide: what will work and what will not*. The Medical Journal of Australia,  
181 1998. **169**(2): p. 100-102.
- 182 7. Torguson, K. and A. O'Brien, *Leading Suicide Prevention Efforts Unite to Address Rising National Suicide*  
183 *Rate*. 2017: Washington, D.C.
- 184 8. Crepeau-Hobson, F., *The Psychological Autopsy and Determination of Child Suicides: A Survey of Medical*  
185 *Examiners*. Archives of Suicide Research, 2010. **14**(1): p. 24-34.
- 186 9. American Psychiatric Association, *Diagnostic and statistical manual of mental disorders (DSM-5®)*. 2013:  
187 American Psychiatric Pub.
- 188 10. Simon, T.R., et al., *Characteristics of impulsive suicide attempts and attempters*. Suicide and Life-  
189 Threatening Behavior, 2002. **32**(s1): p. 49-59.
- 190 11. Stone, D.M., et al., *Preventing suicide: A technical package of policies, programs, and practice*. 2017.
- 191 12. World Health Organization, *Risks to mental health: An overview of vulnerabilities and risk factors*.  
192 Geneva: WHO, 2012.
- 193 13. Caine, E.D., et al., *Comprehensive, integrated approaches to suicide prevention: practical guidance*.  
194 Injury prevention, 2017: p. injuryprev-2017-042366.
- 195 14. Milner, A., J. Svetcic, and D. De Leo, *Suicide in the absence of mental disorder? A review of psychological*  
196 *autopsy studies across countries*. Int J Soc Psychiatry, 2013. **59**(6): p. 545-54.
- 197 15. Pouliot, L. and D. De Leo, *Critical issues in psychological autopsy studies*. Suicide Life Threat Behav, 2006.  
198 **36**(5): p. 491-510.

199 **Attachment:**

200 Stone\_MMWR Suicide Vital Signs 3.26.18 (Tables\_Fig, e-clearance)

201

202 **Word Count:** 1771/1800

**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
U.S.	Both	12.3 (n/a)	12.7 (+ 0.4)	12.9 (+ 0.2)	13.8 (+ 0.9)	14.5 (+ 0.8)	15.4 (+ 0.9)	+ 1.5 % (p<.01)	n/a	+ 3.1 (n/a)	+ 25.4 % (n/a)
	Male	20.9 (n/a)	21.2 (+ 0.4)	21.3 (+ 0.0)	22.5 (+1.3)	23.5 (+ 1.0)	24.5 (+ 1.0)	+ 1.1 % (p<.01)			
	Female	4.7 (n/a)	5.0 (+ 0.3)	5.3 (+ 0.2)	5.7 (+ 0.4)	6.2 (+ 0.5)	6.9 (+ 0.7)	+ 2.6 % (p<.01)			
AL	Both	14.3 (n/a)	13.4 (- 0.9)	14.1 (+ 0.6)	15.6 (+ 1.6)	16.4 (+ 0.7)	17.5 (+ 1.1)	+ 1.6 % (p<.05)	25	+ 3.1 (31)	+ 21.9 % (33)
	Male	25.1 (n/a)	23.4 (- 1.7)	24.4 (+ 1.0)	26.4 (+ 2.0)	27.6 (+ 1.1)	29.1 (+ 1.5)	+ 1.3 % (p<.05)			
	Female	5.1 (n/a)	4.8 (- 0.3)	5.0 (+ 0.2)	6.1 (+ 1.1)	6.4 (+ 0.3)	7.0 (+ 0.7)	+ 2.6 % (p<.01)			
AK	Both	21.0 (n/a)	24.8 (+ 3.8)	24.2 (- 0.6)	26.0 (+ 1.7)	25.4 (- 0.5)	28.8 (+ 3.4)	+ 1.7 % (p<.05)	2	+ 7.8 ( 4)	+ 37.4 % (13)
	Male	33.2 (n/a)	38.1 (+ 4.9)	38.9 (+ 0.8)	40.1 (+ 1.2)	40.1 (- 0.1)	42.9 (+ 2.8)	+ 1.4 % (p<.01)			
	Female	8.6 (n/a)	11.4 (+ 2.9)	9.8 (- 1.6)	11.1 (+ 1.2)	9.9 (- 1.2)	13.2 (+ 3.4)	+ 1.7 % n/s			
AZ	Both	17.8 (n/a)	18.5 (+ 0.7)	19.1 (+ 0.5)	19.1 (- 0.0)	20.4 (+ 1.3)	20.9 (+ 0.5)	+ 1.0 % (p<.01)	15	+ 3.1 (32)	+ 17.3 % (42)
	Male	29.3 (n/a)	30.2 (+ 1.0)	30.6 (+ 0.4)	30.2 (- 0.5)	32.0 (+ 1.9)	32.4 (+ 0.4)	+ 0.6 % (p<.05)			
	Female	7.1 (n/a)	7.5 (+ 0.4)	8.2 (+ 0.7)	8.6 (+ 0.5)	9.2 (+ 0.6)	9.9 (+ 0.6)	+ 2.2 % (p<.01)			
AR	Both	15.5 (n/a)	15.8 (+ 0.3)	16.2 (+ 0.5)	17.6 (+ 1.4)	19.2 (+ 1.6)	21.2 (+ 2.0)	+ 2.2 % (p<.01)	12	+ 5.7 (14)	+ 36.8 % (15)
	Male	26.7 (n/a)	26.7 (+ 0.0)	27.2 (+ 0.5)	28.2 (+ 1.0)	31.7 (+ 3.5)	33.5 (+ 1.9)	+ 1.6 % (p<.05)			
	Female	5.6 (n/a)	5.9 (+ 0.3)	6.2 (+ 0.4)	7.9 (+ 1.7)	7.5 (- 0.4)	9.6 (+ 2.1)	+ 3.6 % (p<.01)			
CA	Both	10.6 (n/a)	11.3 (+ 0.7)	11.0 (- 0.3)	12.0 (+ 1.0)	11.8 (- 0.1)	12.1 (+ 0.3)	+ 0.9 % (p<.05)	45	+ 1.6 (46)	+ 14.8 % (46)
	Male	17.9 (n/a)	18.4 (+ 0.5)	17.7 (- 0.7)	19.1 (+ 1.4)	18.9 (- 0.2)	19.2 (+ 0.3)	+ 0.5 % n/s			
	Female	4.1 (n/a)	5.0 (+ 0.9)	4.9 (- 0.1)	5.4 (+ 0.5)	5.3 (- 0.1)	5.6 (+ 0.3)	+ 1.7 % (p<.05)			
CO	Both	17.3 (n/a)	19.2 (+ 1.9)	19.0 (- 0.2)	20.0 (+ 1.0)	21.6 (+ 1.5)	23.2 (+ 1.6)	+ 1.8 % (p<.01)	8	+ 5.9 (12)	+ 34.1 % (22)
	Male	28.6 (n/a)	30.9 (+ 2.3)	30.5 (- 0.4)	31.5 (+ 1.0)	33.4 (+ 1.9)	36.3 (+ 2.9)	+ 1.4 % (p<.01)			
	Female	7.0 (n/a)	8.2 (+ 1.3)	8.2 (+ 0.0)	9.1 (+ 0.9)	10.1 (+ 1.0)	10.4 (+ 0.3)	+ 2.6 % (p<.01)			
CT	Both	9.6 (n/a)	8.9 (- 0.7)	9.1 (+ 0.2)	10.2 (+ 1.1)	11.0 (+ 0.8)	11.5 (+ 0.5)	+ 1.6 % (p<.05)	46	+ 1.9 (43)	+ 19.2 % (34)
	Male	16.4 (n/a)	14.6 (- 1.8)	15.0 (+ 0.4)	16.6 (+ 1.6)	17.6 (+ 1.0)	17.3 (- 0.3)	+ 0.9 % n/s			
	Female	3.6 (n/a)	3.8 (+ 0.2)	3.7 (- 0.2)	4.4 (+ 0.7)	4.9 (+ 0.5)	6.2 (+ 1.3)	+ 3.5 % (p<.05)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.



# Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, 1999 – 2016

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
DE	Both	13.6 (n/a)	13.2 (+ 1.4)	12.9 (- 0.3)	13.0 (+ 1.7)	15.2 (+ 0.6)	16.0 (+ 0.2)	+ 0.9 % (p<.01)	32	+ 0.8 (20)	+ 36.9 % (50)
	Male	20.0 (n/a)	20.3 (+ 2.5)	20.9 (- 0.4)	23.3 (+ 2.2)	22.7 (+ 2.7)	23.5 (+ 0.3)	+ 0.6 % (p<.05)			
	Female	5.3 (n/a)	5.0 (+ 0.2)	4.5 (+ 0.6)	5.9 (+ 0.2)	6.4 (+ 0.6)	6.2 (+ 0.2)	+ 3.6 % (p<.01)			
DS	Both	13.9 (n/a)	16.4 (+ 0.8)	15.4 (+ 0.7)	15.3 (+ 0.8)	15.5 (+ 2.7)	10.9 (+ 0.6)	+ 0.2 % (p<.01)	59	+ 6.0 (48)	+ 46.0 % (45)
	Male	20.7 (n/a)	25.0 (+ 0.3)	26.5 (+ 0.5)	25.5 (+ 2.9)	29.0 (+ 2.5)	30.7 (+ 1.6)	+ 0.9 % (p<.01)			
	Female	14.0 (n/a)††	2.8 (- 0.6)††	3.3 (+ 0.3)	2.8 (- 0.3)	6.6 (+ 1.0)	2.4 (+ 0.8)	+ 3.2 % (p<.05)			
KY	Both	14.3 (n/a)	15.2 (+ 0.3)	14.9 (+ 0.3)	16.2 (+ 0.3)	18.2 (+ 2.0)	10.3 (+ 0.1)	+ 0.9 % (p<.05)	29	+ 5.8 (46)	+ 30.6 % (48)
	Male	25.0 (n/a)	26.8 (+ 0.9)	28.5 (+ 0.8)	27.2 (+ 2.6)	35.6 (+ 2.6)	25.5 (+ 0.6)	+ 0.5 % (p<.01)			
	Female	6.8 (n/a)	6.8 (+ 0.5)	6.8 (+ 0.8)	6.1 (+ 0.3)	7.6 (+ 0.9)	7.8 (+ 0.6)	+ 3.2 % (p<.01)			
GA	Both	12.9 (n/a)	12.9 (+ 0.2)	12.4 (+ 0.4)	13.0 (+ 0.9)	13.7 (+ 0.8)	13.0 (+ 2.5)	+ 0.0 % (p<.05)	20	+ 2.3 (20)	+ 20.2 % (26)
	Male	22.9 (n/a)	22.3 (+ 0.6)	22.4 (+ 0.8)	23.9 (+ 0.6)	22.6 (+ 0.3)	27.3 (+ 3.6)	+ 0.5 % n/s			
	Female	5.0 (n/a)	4.8 (- 0.2)	4.2 (+ 0.2)	4.9 (+ 0.2)	6.8 (+ 0.2)	6.6 (+ 0.8)	+ 2.8 % (p<.05)			
ME	Both	12.9 (n/a)	13.6 (- 0.8)	14.4 (+ 0.3)	15.5 (+ 4.0)	18.4 (+ 3.5)	15.3 (+ 0.4)	+ 2.0 % (p<.05)	25	+ 2.0 (25)	+ 28.3 % (20)
	Male	20.0 (n/a)	22.2 (- 2.1)	24.6 (+ 1.9)	25.9 (+ 6.7)	22.5 (+ 6.6)	29.3 (+ 1.3)	+ 2.8 % (p<.05)			
	Female	5.3 (n/a)	5.0 (- 0.0)	5.2 (+ 0.5)	6.0 (+ 0.3)	6.2 (+ 0.6)	5.9 (+ 0.3)	+ 3.2 % (p<.05)			
MD	Both	10.0 (n/a)	10.2 (+ 0.0)	10.3 (- 0.2)	20.0 (+ 0.3)	20.9 (+ 0.5)	20.8 (+ 0.3)	+ 0.5 % (p<.05)	40 §§	+ 0.8 (46)§§	+ 43.5% (49)¶¶
	Male	28.6 (n/a)	32.8 (+ 0.7)	37.3 (- 0.6)	37.9 (+ 0.8)	38.2 (+ 0.2)	38.0 (+ 3.2)	+ 0.8 % (p<.05)			
	Female	3.2 (n/a)	3.8 (+ 0.4)	6.9 (+ 0.0)	3.7 (+ 2.2)	0.5 (+ 0.4)	14.8 (+ 0.3)	+ 4.3 % (p<.05)			
MA	Both	9.0 (n/a)	9.6 (+ 0.2)	9.7 (+ 0.8)	10.6 (+ 0.8)	19.2 (+ 0.6)	10.0 (+ 0.0)	+ 2.5 % (p<.05)	48	+ 2.6 (38)¶¶	+ 38.2% (40)¶¶
	Male	12.1 (n/a)	12.8 (+ 0.7)	15.2 (+ 0.6)	15.6 (+ 2.4)	15.2 (+ 0.2)	10.8 (+ 0.8)	+ 2.0 % (p<.05)			
	Female	3.3 (n/a)	2.0 (- 0.0)	3.0 (+ 0.0)	4.2 (+ 0.4)	4.6 (+ 0.0)	4.2 (+ 0.2)	+ 2.0 % (p<.05)			
WI	Both	13.0 (n/a)	12.5 (+ 0.7)	12.0 (+ 0.7)	13.9 (+ 0.6)	16.5 (+ 0.7)	15.6 (+ 0.7)	+ 1.9 % (p<.01)	26	+ 3.9 (26)	+ 32.9 % (25)
	Male	20.0 (n/a)	20.2 (+ 0.8)	24.6 (+ 0.2)	22.8 (+ 0.3)	26.9 (+ 2.0)	28.0 (+ 1.0)	+ 1.5 % (p<.01)			
	Female	4.6 (n/a)	5.0 (+ 0.4)	5.0 (+ 0.2)	5.0 (+ 0.6)	6.8 (+ 0.9)	6.6 (+ 0.2)	+ 2.8 % (p<.01)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.

### Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, 1999 – 2016

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
MN	Both	10.7 (n/a)	11.5 (+ 0.9)	12.4 (+ 0.8)	12.9 (+ 0.5)	14.2 (+ 1.3)	15.0 (+ 0.9)	+ 2.3 % (p<.01)	38	+ 4.3 (19)	+ 40.6 % ( 8)
	Male	18.3 (n/a)	19.3 (+ 1.1)	20.4 (+ 1.0)	20.9 (+ 0.6)	22.9 (+ 1.9)	23.3 (+ 0.4)	+ 1.7 % (p<.01)			
	Female	3.6 (n/a)	4.2 (+ 0.6)	4.8 (+ 0.6)	5.1 (+ 0.4)	5.8 (+ 0.6)	6.9 (+ 1.2)	+ 4.2 % (p<.01)			
MS	Both	12.9 (n/a)	14.1 (+ 1.2)	14.7 (+ 0.6)	15.5 (+ 0.8)	15.6 (+ 0.1)	15.2 (- 0.3)	+ 1.1 % (p<.05)	36	+ 2.3 (36)	+ 17.8 % (40)
	Male	22.9 (n/a)	24.6 (+ 1.7)	25.1 (+ 0.6)	26.8 (+ 1.7)	25.9 (- 0.9)	25.3 (- 0.6)	+ 0.7 % n/s			
	Female	4.3 (n/a)	5.0 (+ 0.7)	5.5 (+ 0.5)	5.5 (- 0.0)	6.4 (+ 0.9)	6.2 (- 0.2)	+ 2.4 % (p<.01)			
MO	Both	14.7 (n/a)	14.1 (- 0.6)	15.4 (+ 1.3)	16.0 (+ 0.7)	17.8 (+ 1.7)	20.0 (+ 2.3)	+ 2.2 % (p<.01)	16	+ 5.3 (15)	+ 36.4 % (17)
	Male	25.3 (n/a)	23.7 (- 1.6)	25.6 (+ 1.9)	26.6 (+ 1.0)	28.9 (+ 2.3)	32.2 (+ 3.3)	+ 1.8 % (p<.05)			
	Female	5.4 (n/a)	5.4 (+ 0.1)	6.1 (+ 0.7)	6.3 (+ 0.2)	7.4 (+ 1.1)	8.6 (+ 1.2)	+ 3.2 % (p<.01)			
MT	Both	21.1 (n/a)	22.6 (+ 1.4)	23.6 (+ 1.0)	24.7 (+ 1.1)	26.7 (+ 2.0)	29.2 (+ 2.5)	+ 2.1 % (p<.01)	1	+ 8.0 ( 2)	+ 38.0 % (11)
	Male	36.9 (n/a)	37.3 (+ 0.4)	39.8 (+ 2.5)	39.7 (- 0.1)	41.0 (+ 1.4)	45.5 (+ 4.4)	+ 1.3 % (p<.01)			
	Female	6.7 (n/a)	8.4 (+ 1.8)	8.4 (- 0.1)	10.0 (+ 1.6)	12.6 (+ 2.6)	13.1 (+ 0.5)	+ 4.6 % (p<.01)			
NE	Both	12.7 (n/a)	12.2 (- 0.5)	12.6 (+ 0.4)	11.7 (- 0.8)	13.5 (+ 1.8)	14.8 (+ 1.3)	+ 1.0 % n/s	40	+ 2.1 (42)	+ 16.2 % (43)
	Male	22.2 (n/a)	20.7 (- 1.5)	20.3 (- 0.4)	19.8 (- 0.5)	22.0 (+ 2.2)	23.9 (+ 1.9)	+ 0.6 % n/s			
	Female	3.8 (n/a)	4.2 (+ 0.4)	5.1 (+ 0.9)	4.0 (- 1.1)	5.5 (+ 1.4)	5.8 (+ 0.3)	+ 2.6 % n/s			
NV	Both	23.3 (n/a)	22.6 (- 0.6)	22.1 (- 0.5)	22.6 (+ 0.5)	21.4 (- 1.2)	23.1 (+ 1.6)	- 0.2 % n/s	9	- 0.2 (51)	- 1.0 % (51)
	Male	38.3 (n/a)	36.7 (- 1.7)	35.1 (- 1.6)	35.6 (+ 0.5)	32.5 (- 3.0)	35.4 (+ 2.8)	- 0.7 % n/s			
	Female	8.9 (n/a)	9.5 (+ 0.5)	9.6 (+ 0.1)	10.0 (+ 0.4)	10.6 (+ 0.6)	11.2 (+ 0.6)	+ 1.5 % (p<.01)			
NH	Both	13.5 (n/a)	12.5 (- 1.0)	13.3 (+ 0.8)	15.2 (+ 1.9)	15.8 (+ 0.6)	20.0 (+ 4.2)	+ 2.7 % (p<.05)	17	+ 6.5 ( 8)	+ 48.3 % ( 3)
	Male	22.5 (n/a)	21.1 (- 1.4)	21.7 (+ 0.6)	24.8 (+ 3.1)	25.4 (+ 0.6)	30.6 (+ 5.2)	+ 2.2 % (p<.05)			
	Female	5.3 (n/a)	4.8 (- 0.5)	5.9 (+ 1.0)	6.2 (+ 0.4)	6.6 (+ 0.4)	9.8 (+ 3.2)	+ 3.9 % (p<.05)			
NJ	Both	7.8 (n/a)	7.7 (- 0.1)	7.5 (- 0.2)	8.0 (+ 0.5)	8.9 (+ 0.9)	9.2 (+ 0.4)	+ 1.3 % (p<.05)	50	+ 1.5 (47)	+ 19.2 % (35)
	Male	13.0 (n/a)	13.1 (+ 0.0)	12.6 (- 0.5)	13.7 (+ 1.1)	14.5 (+ 0.8)	14.6 (+ 0.1)	+ 0.9 % (p<.05)			
	Female	3.2 (n/a)	2.9 (- 0.3)	3.0 (+ 0.0)	2.9 (- 0.1)	3.8 (+ 0.9)	4.4 (+ 0.6)	+ 2.3 % n/s			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.



### Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, 1999 – 2016

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
NM	Both	22.0 (n/a)	22.0 (- 0.1)	21.8 (- 0.2)	23.0 (+ 1.2)	24.1 (+ 1.1)	26.0 (+ 1.9)	+ 1.1 % (p<.05)	4	+ 4.0 (24)	+ 18.3 % (39)
	Male	36.8 (n/a)	37.7 (+ 0.9)	36.4 (- 1.2)	35.8 (- 0.6)	37.1 (+ 1.3)	40.7 (+ 3.6)	+ 0.4 % n/s			
	Female	8.5 (n/a)	7.4 (- 1.1)	8.2 (+ 0.7)	10.7 (+ 2.6)	11.7 (+ 0.9)	12.0 (+ 0.3)	+ 3.3 % (p<.05)			
NY	Both	7.2 (n/a)	7.1 (- 0.1)	7.7 (+ 0.6)	8.4 (+ 0.8)	9.5 (+ 1.1)	9.3 (- 0.1)	+ 2.1 % (p<.01)	49	+ 2.1 (41)	+ 28.8 % (27)
	Male	12.5 (n/a)	12.2 (- 0.3)	12.9 (+ 0.7)	13.9 (+ 1.0)	15.4 (+ 1.4)	14.5 (- 0.9)	+ 1.4 % (p<.05)			
	Female	2.7 (n/a)	2.6 (- 0.1)	3.0 (+ 0.3)	3.5 (+ 0.5)	4.2 (+ 0.7)	4.6 (+ 0.5)	+ 4.2 % (p<.01)			
NC	Both	13.6 (n/a)	13.5 (- 0.1)	13.7 (+ 0.1)	14.2 (+ 0.5)	14.5 (+ 0.4)	15.3 (+ 0.8)	+ 0.8 % (p<.01)	34	+ 1.7 (44)	+ 12.7 % (47)
	Male	22.7 (n/a)	22.7 (+ 0.0)	22.2 (- 0.6)	23.3 (+ 1.1)	23.3 (+ 0.0)	23.9 (+ 0.6)	+ 0.4 % n/s			
	Female	5.6 (n/a)	5.5 (- 0.2)	6.2 (+ 0.8)	6.0 (- 0.2)	6.7 (+ 0.7)	7.6 (+ 0.9)	+ 2.0 % (p<.05)			
ND	Both	13.3 (n/a)	14.6 (+ 1.3)	16.0 (+ 1.4)	16.6 (+ 0.6)	18.4 (+ 1.9)	20.9 (+ 2.5)	+ 2.9 % (p<.01)	14	+ 7.6 ( 5)	+ 57.6 % ( 1)
	Male	21.4 (n/a)	24.6 (+ 3.2)	28.0 (+ 3.4)	27.1 (- 0.9)	29.6 (+ 2.5)	32.7 (+ 3.0)	+ 2.5 % (p<.01)			
	Female	5.6 (n/a)	4.5 (- 1.0)	3.7 (- 0.8)	5.7 (+ 2.0)	6.7 (+ 1.0)	8.5 (+ 1.8)	+ 3.9 % n/s			
OH	Both	11.6 (n/a)	12.3 (+ 0.8)	13.1 (+ 0.8)	13.4 (+ 0.2)	14.8 (+ 1.4)	15.8 (+ 1.0)	+ 2.0 % (p<.01)	32	+ 4.2 (21)	+ 36.0 % (19)
	Male	20.4 (n/a)	20.9 (+ 0.5)	22.2 (+ 1.3)	22.1 (- 0.1)	24.2 (+ 2.1)	25.5 (+ 1.3)	+ 1.5 % (p<.01)			
	Female	4.0 (n/a)	4.7 (+ 0.7)	4.9 (+ 0.1)	5.3 (+ 0.5)	6.2 (+ 0.9)	6.7 (+ 0.6)	+ 3.4 % (p<.01)			
OK	Both	17.0 (n/a)	16.5 (- 0.6)	17.2 (+ 0.8)	18.4 (+ 1.1)	20.7 (+ 2.3)	23.5 (+ 2.8)	+ 2.3 % (p<.05)	7	+ 6.4 (10)	+ 37.6 % (12)
	Male	28.5 (n/a)	27.3 (- 1.2)	27.8 (+ 0.5)	30.3 (+ 2.5)	33.4 (+ 3.1)	37.3 (+ 3.8)	+ 2.0 % (p<.05)			
	Female	6.6 (n/a)	6.4 (- 0.2)	7.5 (+ 1.1)	7.0 (- 0.5)	8.5 (+ 1.6)	10.3 (+ 1.8)	+ 2.9 % (p<.05)			
OR	Both	16.4 (n/a)	17.7 (+ 1.3)	17.7 (- 0.0)	18.6 (+ 0.9)	19.8 (+ 1.2)	21.1 (+ 1.3)	+ 1.6 % (p<.01)	13	+ 4.6 (18)	+ 28.2 % (28)
	Male	27.4 (n/a)	29.5 (+ 2.1)	28.5 (- 0.9)	29.5 (+ 1.0)	31.4 (+ 1.8)	33.0 (+ 1.6)	+ 1.1 % (p<.01)			
	Female	6.5 (n/a)	7.1 (+ 0.6)	7.7 (+ 0.6)	8.4 (+ 0.7)	8.8 (+ 0.4)	9.8 (+ 0.9)	+ 2.7 % (p<.01)			
PA	Both	12.1 (n/a)	12.5 (+ 0.4)	12.8 (+ 0.3)	13.9 (+ 1.1)	15.0 (+ 1.1)	16.3 (+ 1.2)	+ 2.0 % (p<.01)	30	+ 4.1 (22)	+ 34.3 % (21)
	Male	21.0 (n/a)	21.3 (+ 0.3)	21.9 (+ 0.6)	23.1 (+ 1.2)	24.7 (+ 1.7)	26.1 (+ 1.3)	+ 1.5 % (p<.01)			
	Female	4.2 (n/a)	4.6 (+ 0.3)	4.6 (+ 0.0)	5.4 (+ 0.9)	6.0 (+ 0.6)	7.1 (+ 1.1)	+ 3.5 % (p<.01)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.

# Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, 1999 – 2016

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
RI	Both	9.4 (n/a)	9.0 (- 0.3)	9.0 (- 0.0)	12.8 (+ 3.8)	11.9 (- 0.9)	12.6 (+ 0.7)	+ 2.6 % (p<.05)	43	+ 3.2 (30 ¶¶)	+ 34.1 % (23 ¶¶)
	Male	15.4 (n/a)	15.2 (- 0.2)	14.8 (- 0.3)	21.2 (+ 6.4)	19.2 (- 2.0)	19.6 (+ 0.4)	+ 2.2 % n/s			
	Female	4.0 (n/a)	3.3 (- 0.7)	3.8 (+ 0.4)	5.1 (+ 1.3)	5.1 (+ 0.0)	6.1 (+ 1.0)	+ 3.7 % (p<.05)			
SC	Both	12.8 (n/a)	13.0 (+ 0.2)	13.7 (+ 0.7)	14.9 (+ 1.2)	16.0 (+ 1.1)	17.7 (+ 1.7)	+ 2.3 % (p<.01)	23	+ 4.9 (17)	+ 38.3 % (10)
	Male	21.3 (n/a)	22.5 (+ 1.2)	22.3 (- 0.1)	24.6 (+ 2.2)	26.1 (+ 1.5)	28.0 (+ 1.9)	+ 1.8 % (p<.01)			
	Female	5.4 (n/a)	4.7 (- 0.7)	6.0 (+ 1.3)	6.2 (+ 0.2)	7.0 (+ 0.8)	8.4 (+ 1.4)	+ 3.4 % (p<.05)			
SD	Both	15.7 (n/a)	15.8 (+ 0.1)	17.1 (+ 1.3)	19.3 (+ 2.2)	19.7 (+ 0.4)	22.6 (+ 2.9)	+ 2.5 % (p<.01)	10	+ 7.0 ( 7)	+ 44.5 % ( 6)
	Male	27.6 (n/a)	26.3 (- 1.3)	27.9 (+ 1.6)	30.1 (+ 2.2)	32.0 (+ 1.9)	33.6 (+ 1.6)	+ 1.6 % (p<.01)			
	Female	4.2 (n/a)	5.8 (+ 1.6)	6.4 (+ 0.6)	8.3 (+ 2.0)	7.3 (- 1.0)	11.3 (+ 4.0)	+ 5.8 % (p<.01)			
TN	Both	14.6 (n/a)	15.2 (+ 0.6)	16.1 (+ 0.8)	17.2 (+ 1.1)	17.2 (+ 0.0)	18.2 (+ 1.0)	+ 1.4 % (p<.01)	22	+ 3.5 (28)	+ 24.2 % (31)
	Male	25.1 (n/a)	25.4 (+ 0.3)	26.8 (+ 1.3)	28.0 (+ 1.2)	28.6 (+ 0.6)	29.8 (+ 1.2)	+ 1.2 % (p<.01)			
	Female	5.4 (n/a)	6.3 (+ 0.9)	6.7 (+ 0.4)	7.5 (+ 0.8)	6.9 (- 0.6)	7.6 (+ 0.7)	+ 1.9 % (p<.05)			
TX	Both	12.2 (n/a)	12.7 (+ 0.6)	12.3 (- 0.4)	13.2 (+ 0.9)	13.6 (+ 0.3)	14.5 (+ 0.9)	+ 1.1 % (p<.01)	41	+ 2.3 (37)	+ 18.9 % (36)
	Male	20.4 (n/a)	20.9 (+ 0.5)	20.4 (- 0.6)	22.0 (+ 1.6)	22.2 (+ 0.3)	23.1 (+ 0.9)	+ 0.9 % (p<.05)			
	Female	4.8 (n/a)	5.4 (+ 0.6)	5.0 (- 0.4)	5.2 (+ 0.2)	5.6 (+ 0.4)	6.4 (+ 0.8)	+ 1.6 % (p<.05)			
UT	Both	17.2 (n/a)	19.0 (+ 1.8)	18.2 (- 0.7)	20.2 (+ 2.0)	24.0 (+ 3.8)	25.2 (+ 1.2)	+ 2.7 % (p<.01)	5	+ 8.0 ( 3 ¶¶)	+ 46.5 % ( 4 ¶¶)
	Male	28.2 (n/a)	31.1 (+ 2.9)	29.4 (- 1.7)	32.1 (+ 2.7)	37.8 (+ 5.7)	38.0 (+ 0.2)	+ 2.1 % (p<.05)			
	Female	6.8 (n/a)	7.4 (+ 0.6)	7.5 (+ 0.1)	8.5 (+ 1.0)	10.6 (+ 2.1)	12.6 (+ 2.0)	+ 4.4 % (p<.01)			
VT	Both	13.2 (n/a)	16.2 (+ 3.0)	14.9 (- 1.3)	16.6 (+ 1.7)	18.7 (+ 2.1)	19.7 (+ 1.0)	+ 2.4 % (p<.01)	18	+ 6.4 ( 9)	+ 48.6 % ( 2)
	Male	23.6 (n/a)	28.3 (+ 4.6)	24.3 (- 4.0)	27.3 (+ 3.0)	31.0 (+ 3.7)	32.5 (+ 1.5)	+ 1.9 % (p<.05)			
	Female	4.3 (n/a)	5.2 (+ 0.9)	6.4 (+ 1.3)	6.6 (+ 0.2)	7.3 (+ 0.7)	7.6 (+ 0.3)	+ 3.8 % (p<.01)			
VA	Both	12.8 (n/a)	12.7 (- 0.1)	12.9 (+ 0.3)	13.6 (+ 0.7)	14.6 (+ 0.9)	15.0 (+ 0.5)	+ 1.2 % (p<.01)	37	+ 2.2 (39)	+ 17.4 % (41)
	Male	21.6 (n/a)	21.3 (- 0.2)	21.0 (- 0.4)	22.5 (+ 1.5)	23.6 (+ 1.2)	23.9 (+ 0.2)	+ 0.9 % (p<.05)			
	Female	5.3 (n/a)	5.2 (- 0.1)	5.9 (+ 0.7)	5.6 (- 0.3)	6.4 (+ 0.8)	6.9 (+ 0.5)	+ 1.8 % (p<.05)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.



### Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, 1999 – 2016

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
WA	Both	14.8 (n/a)	15.4 (+ 0.5)	14.8 (- 0.6)	15.7 (+ 0.9)	16.6 (+ 0.9)	17.6 (+ 1.0)	+ 1.1 % (p<.05)	24	+ 2.8 (33)	+ 18.8 % (37)
	Male	24.7 (n/a)	25.2 (+ 0.5)	24.1 (- 1.1)	25.1 (+ 1.0)	26.0 (+ 0.9)	27.1 (+ 1.1)	+ 0.6 % n/s			
	Female	5.9 (n/a)	6.4 (+ 0.6)	6.2 (- 0.2)	6.9 (+ 0.7)	7.7 (+ 0.8)	8.5 (+ 0.8)	+ 2.5 % (p<.01)			
WV	Both	15.6 (n/a)	17.2 (+ 1.6)	16.7 (- 0.5)	16.0 (- 0.7)	19.2 (+ 3.2)	21.4 (+ 2.2)	+ 1.8 % n/s	11	+ 5.8 (13)	+ 37.1 % (14)
	Male	27.2 (n/a)	30.1 (+ 2.9)	28.6 (- 1.5)	27.6 (- 1.0)	31.5 (+ 3.9)	33.5 (+ 2.0)	+ 1.1 % n/s			
	Female	5.3 (n/a)	5.5 (+ 0.1)	5.8 (+ 0.3)	5.3 (- 0.5)	7.6 (+ 2.3)	9.8 (+ 2.2)	+ 3.7 % n/s			
WI	Both	13.1 (n/a)	13.5 (+ 0.4)	14.0 (+ 0.5)	15.0 (+ 1.0)	15.3 (+ 0.3)	16.5 (+ 1.2)	+ 1.5 % (p<.01)	28	+ 3.4 (29)	+ 25.8 % (30)
	Male	21.7 (n/a)	22.2 (+ 0.5)	22.7 (+ 0.5)	24.0 (+ 1.2)	24.4 (+ 0.4)	25.7 (+ 1.3)	+ 1.1 % (p<.01)			
	Female	5.1 (n/a)	5.3 (+ 0.2)	5.6 (+ 0.4)	6.4 (+ 0.7)	6.5 (+ 0.1)	7.5 (+ 1.0)	+ 2.5 % (p<.01)			
WY	Both	20.7 (n/a)	23.4 (+ 2.7)	22.5 (- 0.9)	25.4 (+ 2.8)	28.9 (+ 3.5)	28.8 (- 0.1)	+ 2.3 % (p<.01)	3	+ 8.1 ( 1)	+ 39.0 % ( 9)
	Male	34.8 (n/a)	39.3 (+ 4.5)	36.3 (- 3.0)	41.5 (+ 5.2)	47.1 (+ 5.6)	44.6 (- 2.4)	+ 1.8 % (p<.05)			
	Female	7.7 (n/a)	8.2 (+ 0.6)	9.2 (+ 0.9)	9.4 (+ 0.2)	10.7 (+ 1.4)	12.6 (+ 1.9)	+ 3.2 % (p<.01)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

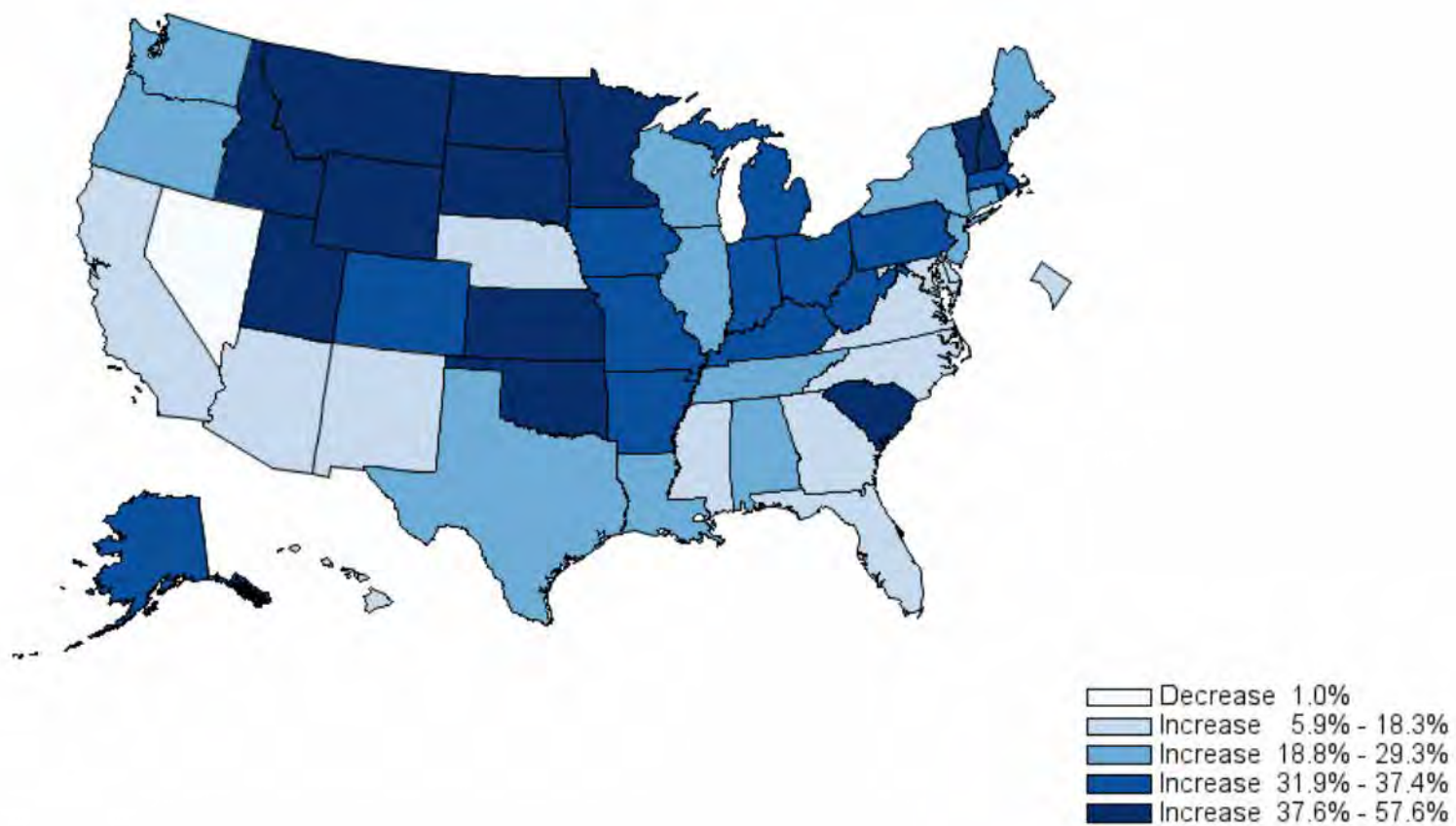
\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.

**Percentage Changes in Annual Suicide Rates (per 100,000, Age-Adjusted)**  
2014-2016 Compared Against 1999-2001





**Table 2. Select Demographic and Descriptive Characteristics of Suicides among Decedents  $\geq 10$  years of age with and without Known Mental Health Problems--National Violent Death Reporting System, 27 states\*, 2015**

Characteristics	Total (n=20,446)	Known Mental Health Problem <sup>†</sup> (n=9,407)	No Known Mental Health Problem (n=11,039)	Chi- Square	OR (95% CI)	Adjusted OR <sup>§</sup> (95% CI)
<b>Sex</b>						
Male	15,702(76.8)	6,469(68.8)	9,233(83.6)	p<.01	2.3(2.2-2.5)	
Female	4,744(23.2)	2,938(31.2)	1,806(16.4)	p<.01	0.4(0.4-0.5)	
<b>Age<sup>¶</sup></b>						
10-24	2,804(13.7)	1,211(12.9)	1,593(14.4)	p<.01	1.1(1.1-1.2)	
25-44	6,456(31.6)	3,036(32.3)	3,420(31.0)	p<.05	0.9(0.9-1.0)	
45-64	7,718(37.7)	3,820(40.6)	3,898(35.3)	p<.01	0.8(0.8-0.8)	
65+	3,468(17.0)	1,340(14.2)	2,128(19.3)	p<.01	1.4(1.3-1.5)	
<b>Race/ethnicity</b>						
White, non-Hispanic	17,102(83.6)	8,165(86.8)	8,937(81.0)	p<.01	0.6(0.6-0.7)	
Black, non-Hispanic	1,228(6.0)	411(4.4)	817(7.4)	p<.01	1.7(1.5-2.0)	
American Indian/Alaska Native, non-Hispanic	378(1.8)	112(1.2)	266(2.4)	p<.01	2.0(1.6-2.6)	
Asian, non-Hispanic	576(2.8)	235(2.5)	341(3.1)	p<.05	1.2(1.1-1.5)	
Hispanic	1,096(5.4)	463(4.9)	633(5.7)	p<.05	1.2(1.0-1.3)	
Other	66(0.3)	21(0.2)	45(0.4)	p<.05	1.8(1.1-3.1)	
<b>Extended demographics</b>						
Ever served in military**	3,429(17.8)	1,354(15.3)	2,075(20.1)	p<.01	1.4(1.3-1.5)	1.1(1.0-1.1)
Homeless	240(1.2)	104(1.1)	136(1.3)		1.1(0.9-1.5)	1.2(0.9-1.5)
<b>Incident Type</b>						
Single suicide	20,063(98.2)	9,318(99.1)	10,745(97.4)	p<.01	0.3(0.3-0.4)	0.4(0.3-0.5)
Homicide followed by suicide	319(1.6)	64(0.7)	255(2.3)	p<.01	3.5(2.6-4.5)	2.9(2.2-3.8)
Multiple suicide	64(0.3)	25(0.3)	39(0.4)		1.3(0.8-2.2)	1.6(0.9-2.6)
<b>Method</b>						
Firearm	9,909(48.5)	3,821(40.6)	6,088(55.3)	p<.01	1.8(1.7-1.9)	1.6(1.5-1.7)
Hanging/Strangulation/Suffocation	5,907(28.9)	2,940(31.3)	2,967(26.9)	p<.01	0.8(0.8-0.9)	0.8(0.7-0.8)
Poisoning	3,003(14.7)	1,861(19.8)	1,142(10.4)	p<.01	0.5(0.4-0.5)	0.6(0.6-0.7)
Substance class causing death <sup>††</sup>						
Other (e.g., over-the-counter)	1,021(34.0)	666(35.8)	355(31.1)	p<.01	0.8(0.7-0.9)	0.9(0.7-1.0)

	Opioids	944(31.4)	608(32.7)	336(29.4)		0.9(0.7-1.0)	0.9(0.8-1.1)
	Antidepressants	800(26.6)	644(34.6)	156(13.7)	p<.01	0.3(0.2-0.4)	0.3(0.3-0.4)
	Benzodiazepines	624(20.8)	468(25.1)	156(13.7)	p<.01	0.5(0.4-0.6)	0.5(0.4-0.6)
	Antipsychotics	219(7.3)	195(10.5)	24(2.1)	p<.01	0.2(0.1-0.3)	0.2(0.1-0.3)
	Other	1,595(7.8)	780(8.3)	815(7.4)	p<.05	0.9(0.8-1.0)	0.9(0.8-1.0)
<b>Toxicology Results</b>							
	Any toxicology testing	13,317(65.1)	6,658(70.8)	6,659(60.3)	p<.01	0.6(0.6-0.7)	0.7(0.6-0.7)
	<b>Positive for ≥ 1 substance<sup>§§</sup></b>	9,913(74.4)	5,192(78.0)	4,721(70.9)	p<.01	0.7(0.6-0.7)	0.8(0.7-0.8)
	Substance detected <sup>¶¶</sup>						
	Alcohol						
	Tested	10,950(53.6)	5,409(57.5)	5,541(50.2)	p<.01	0.7(0.7-0.8)	0.8(0.7-0.8)
	Positive	4,442(40.6)	2,115(39.1)	2,327(42.0)	p<.01	1.1(1.0-1.2)	1.2(1.1-1.3)
	Opioids						
	Tested	8,554(41.8)	4,258(45.3)	4,296(38.9)	p<.01	0.8(0.7-0.8)	0.8(0.8-0.9)
	Positive	2,279(26.6)	1,238(29.1)	1,041(24.2)	p<.01	0.8(0.7-0.9)	0.9(0.8-1.0)
	Benzodiazepines						
	Tested	8,124(39.7)	4,226(44.9)	3,898(35.3)	p<.01	0.7(0.6-0.7)	0.7(0.7-0.8)
	Positive	2,464(30.3)	1,639(38.8)	825(21.2)	p<.01	0.4(0.4-0.5)	0.5(0.5-0.6)
	Cocaine						
	Tested	7,978(39.0)	3,866(41.1)	4,112(37.2)	p<.01	0.9(0.8-0.9)	0.9(0.9-1.0)
	Positive	499(6.3)	216(5.6)	283(6.9)	p<.05	1.2(1.0-1.5)	1.2(1.0-1.5)
	Amphetamines						
	Tested	7,615(37.2)	3,696(39.3)	3,919(35.5)	p<.01	0.9(0.8-0.9)	0.9(0.8-0.9)
	Positive	736(9.7)	376(10.2)	360(9.2)		0.9(0.8-1.0)	1.0(0.8-1.1)
	Marijuana						
	Tested	6,569(32.1)	3,127(33.2)	3,442(31.2)	p<.01	0.9(0.9-1.0)	0.9(0.9-1.0)
	Positive	1,471(22.4)	710(22.7)	761(22.1)		1.0(0.9-1.1)	0.9(0.8-1.0)
	Antidepressants						
	Tested	5,425(26.5)	3,103(33.0)	2,322(21.0)	p<.01	0.5(0.5-0.6)	0.6(0.6-0.7)
	Positive	2,214(40.8)	1,735(55.9)	479(20.6)	p<.01	0.2(0.2-0.2)	0.2(0.2-0.3)

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

<sup>†</sup> Decedent had been identified as having a current diagnosis of mental health problem in coroner/medical examiner or law enforcement reports.

<sup>§</sup> Logistic regression was used to estimate adjusted odds ratio with 95% CIs after controlling for age, sex, race and ethnicity.

<sup>¶</sup> Decedents were aged 10 years and older, as per standard in the suicide prevention literature.

\*\*Denominator is decedents aged 18 years of age and older with reported military service status.



†† Denominator is decedents who died by poisoning, including overdose.

§§ Denominator is decedents with any toxicology tested.

¶¶ Denominator for each positive group is the number tested for the substance in that group.

---

**Table 3. Circumstances Preceding Suicide among Decedents  $\geq 10$  years of age with and without Known Mental Health Problems--National Violent Death Reporting System, 27 states\*, 2015**

Characteristics	Total	Known Mental Health Problem <sup>†</sup>	No Known Mental Health Problem	Chi-Square	OR (95% CI)	Adjusted OR <sup>§</sup> (95% CI)
Suicide with known circumstances	18,764(91.8)	9,407(100)	9,357(84.8)	p<.01		
<b>Mental Health/Substance Problems</b>						
Any Current Mental Health Diagnosis <sup>¶</sup>						
Depression/dysthymia	7,076(75.2)	7,076(75.2)				
Anxiety disorder	1,579(16.8)	1,579(16.8)				
Bipolar disorder	1,431(15.2)	1,431(15.2)				
Schizophrenia	509(5.4)	509(5.4)				
PTSD	424(4.5)	424(4.5)				
ADD/ADHD	226(2.4)	226(2.4)				
Unknown	760(8.1)	760(8.1)				
Current depressed mood	7,038(37.5)	3,962(42.1)	3,076(32.9)	p<.01	0.7(0.6-0.7)	0.7(0.6-0.7)
<b>Substance Problems</b>						
<b>Any Current substance problem</b>	5,319(28.3)	2,976(31.6)	2,343(25.0)	p<.01	0.7(0.7-0.8)	0.7(0.7-0.8)
Alcohol problem	3,268(17.4)	1,862(19.8)	1,406(15.0)	p<.01	0.7(0.7-0.8)	0.7(0.7-0.8)
Other substance problem	3,084(16.4)	1,768(18.8)	1,316(14.1)	p<.01	0.7(0.7-0.8)	0.7(0.7-0.8)
<b>Treatment</b>						
Current mental health/substance abuse treatment	5,141(27.4)	5,077(54.0)	64(0.7)	p<.01	0.0(0.0-0.0)	0.0(0.0-0.0)
Ever treated for mental health/substance problem	6,717(35.8)	6,323(67.2)	394(4.2)	p<.01	0.0(0.0-0.0)	0.0(0.0-0.0)
<b>Relationship Problems/Loss</b>						
<b>Any relationship problem/loss</b>	7,948(42.4)	3,726(39.6)	4,222(45.1)	p<.01	1.3(1.2-1.3)	1.3(1.2-1.4)
Intimate partner problem	5,098(27.2)	2,270(24.1)	2,828(30.2)	p<.01	1.4(1.3-1.5)	1.4(1.3-1.5)
Perpetrator of interpersonal violence past month	414(2.2)	131(1.4)	283(3.0)	p<.01	2.2(1.8-2.7)	2.0(1.6-2.4)
Victim of interpersonal violence within past month	84(0.4)	53(0.6)	31(0.3)	p<.05	0.6(0.4-0.9)	0.8(0.5-1.2)
Family relationship problem	1,671(8.9)	873(9.3)	798(8.5)		0.9(0.8-1.0)	1.0(0.9-1.1)
Other relationship problem (non-intimate)	403(2.1)	202(2.1)	201(2.1)		1.0(0.8-1.2)	1.1(0.9-1.3)
Argument or conflict (not specified)	2,914(15.5)	1,278(13.6)	1,636(17.5)	p<.01	1.3(1.2-1.5)	1.4(1.3-1.5)
<b>Death of a loved one (any)</b>	1,497(8.0)	826(8.8)	671(7.2)	p<.01	0.8(0.7-0.9)	0.9(0.8-0.9)
Non-suicide death	1,181(6.3)	647(6.9)	534(5.7)	p<.01	0.8(0.7-0.9)	0.9(0.8-1.0)



Suicide of family or friend	379(2.0)	217(2.3)	162(1.7)	p<.01	0.7(0.6-0.9)	0.8(0.7-1.0)
<b>Other Life Stressors</b>						
<b>Any life stressor</b>	9,743(51.9)	4,675(49.7)	5,068(54.2)	p<.01	1.2(1.1-1.3)	1.1(1.1-1.2)
Recent criminal legal problem	1,588(8.5)	586(6.2)	1,002(10.7)	p<.01	1.8(1.6-2.0)	1.7(1.5-1.9)
Other legal problem	748(4.0)	378(4.0)	370(4.0)		1.0(0.8-1.1)	1.0(0.9-1.2)
Physical health problem	4,179(22.3)	2,012(21.4)	2,167(23.2)	p<.01	1.1(1.0-1.2)	1.0(1.0-1.1)
Job/Financial problem**	2941(16.2)	1530(16.8)	1411(15.6)	p<.05	0.9(0.8-1.0)	0.9(0.8-1.0)
Eviction or loss of home	722(3.8)	317(3.4)	405(4.3)	p<.01	1.3(1.1-1.5)	1.4(1.2-1.6)
School problem††	162(19.9)	70(17.8)	92(21.9)		1.3(0.9-1.8)	1.3(0.9-1.9)
Recent release from an institution§§	1,412(7.6)	941(10.2)	471(5.1)	p<.01	0.5(0.4-0.5)	0.5(0.4-0.5)
Jail/prison/detention facility	203(14.4)	82(8.7)	121(25.7)	p<.01	3.6(2.7-4.9)	4.5(3.2-6.4)
Hospital	517(36.6)	311(33.0)	206(43.7)	p<.01	1.6(1.3-2.0)	1.3(1.0-1.7)
Psychiatric hospital/institution	469(33.2)	439(46.7)	30(6.4)	p<.01	0.1(0.1-0.1)	0.1(0.1-0.1)
Other (includes alc/SA treatment facilities)	223(15.8)	109(11.6)	114(24.2)	p<.01	2.4(1.8-3.3)	2.5(1.8-3.3)
<b>Recent or Impending Crisis</b>						
Crisis within past or upcoming two weeks¶¶	5,525(29.4)	2,444(26.0)	3,081(32.9)	p<.01	1.4(1.3-1.5)	1.4(1.3-1.5)
Intimate partner problem crisis	1968(35.6)	854(34.9)	1114(36.2)		1.1(0.9-1.2)	1.1(0.9-1.2)
Physical health problem crisis	739(13.4)	315(12.9)	424(13.8)		1.1(0.9-1.3)	1.0(0.8-1.2)
Criminal legal problem crisis	621(11.2)	203(8.3)	418(13.6)	p<.01	1.7(1.5-2.1)	1.6(1.3-1.9)
Family relationship problem crisis	430(7.8)	212(8.7)	218(7.1)	p<.05	0.8(0.7-1.0)	0.9(0.7-1.1)
Job problem crisis	354(6.4)	191(7.8)	163(5.3)	p<.01	0.7(0.5-0.8)	0.7(0.5-0.8)
<b>Suicide Event/History</b>						
Left a note	6,468(34.5)	3,182(33.8)	3,286(35.1)		1.1(1.0-1.1)	1.2(1.1-1.2)
Disclosed suicide intent	4,405(23.5)	2,306(24.5)	2,099(22.4)	p<.01	0.9(0.8-1.0)	0.9(0.8-0.9)
History of ideation	5,990(31.9)	3,838(40.8)	2,152(23.0)	p<.01	0.4(0.4-0.5)	0.4(0.4-0.5)
History of attempts	3,732(19.9)	2,770(29.4)	962(10.3)	p<.01	0.3(0.3-0.3)	0.3(0.3-0.3)

\*Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

† Decedent had been identified as having a current diagnosis of mental health problem in coroner/medical examiner or law enforcement reports.

§ Logistic regression was used to estimate adjusted odds ratio with 95% CIs after controlling for age, sex, race and ethnicity.

\*\*Denominator is decedents aged 18 years of age and older.

†† Denominator is decedents aged 10-18 years.

§§ Denominator of institution subgroup is decedents with recent release from an institution. Recent release from an institution is defined as having occurred within the past month.

¶¶ Denominator of crisis subgroup is decedents with any crisis within past or upcoming two weeks. Crises depicted here represent the most commonly occurring categories.

**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, National Vital Statistics System, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
U.S.	Both	12.3 (n/a)	12.7 (+ 0.4)	12.9 (+ 0.2)	13.8 (+ 0.9)	14.5 (+ 0.8)	15.4 (+ 0.9)	+ 1.5 % (p<.01)	n/a	+ 3.1 (n/a)	+ 25.4 % (n/a)
	Male	20.9 (n/a)	21.2 (+ 0.4)	21.3 (+ 0.0)	22.5 (+1.3)	23.5 (+ 1.0)	24.5 (+ 1.0)	+ 1.1 % (p<.01)			
	Female	4.7 (n/a)	5.0 (+ 0.3)	5.3 (+ 0.2)	5.7 (+ 0.4)	6.2 (+ 0.5)	6.9 (+ 0.7)	+ 2.6 % (p<.01)			
AL	Both	14.3 (n/a)	13.4 (- 0.9)	14.1 (+ 0.6)	15.6 (+ 1.6)	16.4 (+ 0.7)	17.5 (+ 1.1)	+ 1.6 % (p<.05)	25	+ 3.1 (31)	+ 21.9 % (33)
	Male	25.1 (n/a)	23.4 (- 1.7)	24.4 (+ 1.0)	26.4 (+ 2.0)	27.6 (+ 1.1)	29.1 (+ 1.5)	+ 1.3 % (p<.05)			
	Female	5.1 (n/a)	4.8 (- 0.3)	5.0 (+ 0.2)	6.1 (+ 1.1)	6.4 (+ 0.3)	7.0 (+ 0.7)	+ 2.6 % (p<.01)			
AK	Both	21.0 (n/a)	24.8 (+ 3.8)	24.2 (- 0.6)	26.0 (+ 1.7)	25.4 (- 0.5)	28.8 (+ 3.4)	+ 1.7 % (p<.05)	2	+ 7.8 ( 4)	+ 37.4 % (13)
	Male	33.2 (n/a)	38.1 (+ 4.9)	38.9 (+ 0.8)	40.1 (+ 1.2)	40.1 (- 0.1)	42.9 (+ 2.8)	+ 1.4 % (p<.01)			
	Female	8.6 (n/a)	11.4 (+ 2.9)	9.8 (- 1.6)	11.1 (+ 1.2)	9.9 (- 1.2)	13.2 (+ 3.4)	+ 1.7 % n/s			
AZ	Both	17.8 (n/a)	18.5 (+ 0.7)	19.1 (+ 0.5)	19.1 (- 0.0)	20.4 (+ 1.3)	20.9 (+ 0.5)	+ 1.0 % (p<.01)	15	+ 3.1 (32)	+ 17.3 % (42)
	Male	29.3 (n/a)	30.2 (+ 1.0)	30.6 (+ 0.4)	30.2 (- 0.5)	32.0 (+ 1.9)	32.4 (+ 0.4)	+ 0.6 % (p<.05)			
	Female	7.1 (n/a)	7.5 (+ 0.4)	8.2 (+ 0.7)	8.6 (+ 0.5)	9.2 (+ 0.6)	9.9 (+ 0.6)	+ 2.2 % (p<.01)			
AR	Both	15.5 (n/a)	15.8 (+ 0.3)	16.2 (+ 0.5)	17.6 (+ 1.4)	19.2 (+ 1.6)	21.2 (+ 2.0)	+ 2.2 % (p<.01)	12	+ 5.7 (14)	+ 36.8 % (15)
	Male	26.7 (n/a)	26.7 (+ 0.0)	27.2 (+ 0.5)	28.2 (+ 1.0)	31.7 (+ 3.5)	33.5 (+ 1.9)	+ 1.6 % (p<.05)			
	Female	5.6 (n/a)	5.9 (+ 0.3)	6.2 (+ 0.4)	7.9 (+ 1.7)	7.5 (- 0.4)	9.6 (+ 2.1)	+ 3.6 % (p<.01)			
CA	Both	10.6 (n/a)	11.3 (+ 0.7)	11.0 (- 0.3)	12.0 (+ 1.0)	11.8 (- 0.1)	12.1 (+ 0.3)	+ 0.9 % (p<.05)	45	+ 1.6 (46)	+ 14.8 % (46)
	Male	17.9 (n/a)	18.4 (+ 0.5)	17.7 (- 0.7)	19.1 (+ 1.4)	18.9 (- 0.2)	19.2 (+ 0.3)	+ 0.5 % n/s			
	Female	4.1 (n/a)	5.0 (+ 0.9)	4.9 (- 0.1)	5.4 (+ 0.5)	5.3 (- 0.1)	5.6 (+ 0.3)	+ 1.7 % (p<.05)			
CO	Both	17.3 (n/a)	19.2 (+ 1.9)	19.0 (- 0.2)	20.0 (+ 1.0)	21.6 (+ 1.5)	23.2 (+ 1.6)	+ 1.8 % (p<.01)	8	+ 5.9 (12)	+ 34.1 % (22)
	Male	28.6 (n/a)	30.9 (+ 2.3)	30.5 (- 0.4)	31.5 (+ 1.0)	33.4 (+ 1.9)	36.3 (+ 2.9)	+ 1.4 % (p<.01)			
	Female	7.0 (n/a)	8.2 (+ 1.3)	8.2 (+ 0.0)	9.1 (+ 0.9)	10.1 (+ 1.0)	10.4 (+ 0.3)	+ 2.6 % (p<.01)			
CT	Both	9.6 (n/a)	8.9 (- 0.7)	9.1 (+ 0.2)	10.2 (+ 1.1)	11.0 (+ 0.8)	11.5 (+ 0.5)	+ 1.6 % (p<.05)	46	+ 1.9 (43)	+ 19.2 % (34)
	Male	16.4 (n/a)	14.6 (- 1.8)	15.0 (+ 0.4)	16.6 (+ 1.6)	17.6 (+ 1.0)	17.3 (- 0.3)	+ 0.9 % n/s			
	Female	3.6 (n/a)	3.8 (+ 0.2)	3.7 (- 0.2)	4.4 (+ 0.7)	4.9 (+ 0.5)	6.2 (+ 1.3)	+ 3.5 % (p<.05)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.



**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, National Vital Statistics System, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
DE	Both	13.6 (n/a)	12.2 (- 1.4)	11.9 (- 0.3)	13.6 (+ 1.7)	14.2 (+ 0.6)	14.4 (+ 0.2)	+ 0.9 % n/s	42	+ 0.8 (50)	+ 5.9 % (50)
	Male	23.0 (n/a)	20.3 (- 2.7)	19.9 (- 0.4)	23.1 (+ 3.2)	22.7 (- 0.4)	23.5 (+ 0.8)	+ 0.6 % n/s			
	Female	5.3 (n/a)	5.0 (- 0.2)	4.6 (- 0.4)	4.9 (+ 0.3)	6.4 (+ 1.5)	6.2 (- 0.2)	+ 1.6 % n/s			
DC	Both	5.9 (n/a)	6.4 (+ 0.5)	6.4 (- 0.0)	7.3 (+ 0.8)	6.6 (- 0.7)	6.9 (+ 0.3)	+ 0.9 % n/s	51	+ 1.0 (48)	+ 16.1 % (45)
	Male	10.7 (n/a)	11.1 (+ 0.4)	10.3 (- 0.8)	12.7 (+ 2.4)	10.0 (- 2.6)	11.7 (+ 1.7)	+ 0.3 % n/s			
	Female	1.7 (n/a) ††	2.3 (+ 0.6) ††	3.3 (+ 1.0)	2.6 (- 0.7)	3.6 (+ 1.0)	2.8 (- 0.8)	+ 3.5 % n/s			
FL	Both	14.8 (n/a)	15.2 (+ 0.4)	14.9 (- 0.3)	16.3 (+ 1.4)	16.3 (- 0.0)	16.4 (+ 0.1)	+ 0.8 % (p<.05)	29	+ 1.6 (45)	+ 10.6 % (48)
	Male	24.3 (n/a)	24.4 (+ 0.1)	23.6 (- 0.8)	26.2 (+ 2.6)	25.6 (- 0.6)	25.6 (- 0.1)	+ 0.5 % n/s			
	Female	6.3 (n/a)	6.8 (+ 0.5)	6.8 (+ 0.0)	7.1 (+ 0.3)	7.6 (+ 0.5)	7.8 (+ 0.3)	+ 1.4 % (p<.01)			
GA	Both	12.9 (n/a)	13.2 (+ 0.3)	12.3 (- 0.9)	13.2 (+ 0.9)	13.7 (+ 0.5)	15.0 (+ 1.3)	+ 0.9 % n/s	39	+ 2.1 (40)	+ 16.2 % (44)
	Male	22.1 (n/a)	23.1 (+ 1.0)	21.3 (- 1.8)	21.9 (+ 0.6)	22.6 (+ 0.7)	24.4 (+ 1.7)	+ 0.5 % n/s			
	Female	5.0 (n/a)	4.8 (- 0.2)	4.6 (- 0.2)	5.5 (+ 0.9)	5.8 (+ 0.3)	6.6 (+ 0.8)	+ 2.1 % (p<.05)			
HI	Both	12.9 (n/a)	11.1 (- 1.8)	10.3 (- 0.7)	14.5 (+ 4.1)	14.4 (- 0.1)	15.2 (+ 0.8)	+ 2.0 % n/s	35	+ 2.4 (35)	+ 18.3 % (38)
	Male	20.4 (n/a)	17.2 (- 3.1)	15.3 (- 1.9)	21.9 (+ 6.7)	22.5 (+ 0.5)	24.3 (+ 1.8)	+ 2.1 % n/s			
	Female	5.4 (n/a)	5.0 (- 0.4)	5.5 (+ 0.5)	7.1 (+ 1.5)	6.2 (- 0.9)	5.9 (- 0.3)	+ 1.2 % n/s			
ID	Both	17.3 (n/a)	19.2 (+ 2.0)	18.3 (- 0.9)	21.6 (+ 3.3)	21.9 (+ 0.3)	24.7 (+ 2.8)	+ 2.3 % (p<.01)	6	+ 7.5 ( 6)	+ 43.2 % ( 7)
	Male	28.4 (n/a)	33.1 (+ 4.7)	31.1 (- 2.0)	34.9 (+ 3.8)	34.7 (- 0.2)	38.0 (+ 3.3)	+ 1.6 % (p<.05)			
	Female	7.2 (n/a)	6.1 (- 1.1)	6.1 (+ 0.0)	9.0 (+ 2.9)	9.5 (+ 0.5)	11.8 (+ 2.3)	+ 4.4 % (p<.05)			
IL	Both	9.9 (n/a)	9.8 (- 0.1)	9.7 (- 0.1)	10.6 (+ 0.8)	11.2 (+ 0.6)	12.2 (+ 1.0)	+ 1.5 % (p<.05)	44	+ 2.3 (38)	+ 22.8 % (32)
	Male	17.1 (n/a)	16.7 (- 0.4)	16.2 (- 0.4)	17.6 (+ 1.4)	18.5 (+ 0.9)	19.8 (+ 1.3)	+ 1.1 % (p<.05)			
	Female	3.7 (n/a)	3.6 (- 0.0)	3.8 (+ 0.2)	4.2 (+ 0.4)	4.5 (+ 0.4)	5.2 (+ 0.6)	+ 2.4 % (p<.01)			
IN	Both	13.0 (n/a)	13.7 (+ 0.7)	14.4 (+ 0.7)	14.9 (+ 0.5)	16.4 (+ 1.4)	17.1 (+ 0.7)	+ 1.9 % (p<.01)	26	+ 4.1 (23)	+ 31.9 % (25)
	Male	22.4 (n/a)	23.2 (+ 0.8)	24.4 (+ 1.2)	24.7 (+ 0.4)	26.7 (+ 2.0)	28.3 (+ 1.6)	+ 1.5 % (p<.01)			
	Female	4.6 (n/a)	5.0 (+ 0.4)	5.3 (+ 0.2)	5.9 (+ 0.6)	6.8 (+ 0.9)	6.6 (- 0.2)	+ 2.7 % (p<.01)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.

**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, National Vital Statistics System, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
IA	Both	11.8 (n/a)	13.2 (+ 1.4)	12.8 (- 0.4)	14.2 (+ 1.4)	15.9 (+ 1.7)	16.0 (+ 0.1)	+ 2.1 % (p<.01)	31	+ 4.3 (20)	+ 36.2 % (18)
	Male	20.6 (n/a)	22.1 (+ 1.5)	20.8 (- 1.4)	23.3 (+ 2.5)	26.0 (+ 2.7)	25.7 (- 0.3)	+ 1.6 % (p<.05)			
	Female	3.7 (n/a)	4.7 (+ 1.0)	5.3 (+ 0.6)	5.5 (+ 0.2)	6.1 (+ 0.6)	6.7 (+ 0.6)	+ 3.8 % (p<.01)			
KS	Both	13.3 (n/a)	15.1 (+ 1.8)	15.8 (+ 0.7)	15.3 (- 0.5)	17.7 (+ 2.4)	19.4 (+ 1.6)	+ 2.2 % (p<.01)	19	+ 6.0 (11)	+ 45.0 % ( 5)
	Male	22.7 (n/a)	25.0 (+ 2.3)	26.5 (+ 1.5)	25.6 (- 0.9)	29.1 (+ 3.5)	30.7 (+ 1.6)	+ 1.9 % (p<.01)			
	Female	4.6 (n/a)	6.0 (+ 1.4)	5.7 (- 0.3)	5.4 (- 0.3)	6.8 (+ 1.4)	8.4 (+ 1.6)	+ 3.2 % (p<.05)			
KY	Both	14.1 (n/a)	15.4 (+ 1.3)	16.7 (+ 1.3)	16.2 (- 0.5)	18.2 (+ 2.0)	19.3 (+ 1.1)	+ 1.9 % (p<.01)	20	+ 5.2 (16)	+ 36.6 % (16)
	Male	25.0 (n/a)	26.8 (+ 1.9)	28.3 (+ 1.4)	27.2 (- 1.0)	30.1 (+ 2.9)	31.7 (+ 1.6)	+ 1.4 % (p<.01)			
	Female	4.8 (n/a)	5.2 (+ 0.4)	6.1 (+ 0.8)	6.1 (+ 0.1)	7.1 (+ 0.9)	7.7 (+ 0.6)	+ 3.2 % (p<.01)			
LA	Both	13.1 (n/a)	12.9 (- 0.2)	13.4 (+ 0.4)	13.6 (+ 0.3)	14.4 (+ 0.8)	17.0 (+ 2.5)	+ 1.6 % (p<.05)	27	+ 3.8 (27)	+ 29.3 % (26)
	Male	22.9 (n/a)	22.3 (- 0.6)	22.4 (+ 0.1)	23.3 (+ 0.8)	23.7 (+ 0.5)	27.3 (+ 3.6)	+ 1.1 % n/s			
	Female	4.8 (n/a)	4.7 (- 0.1)	5.2 (+ 0.5)	4.9 (- 0.2)	6.1 (+ 1.2)	7.5 (+ 1.4)	+ 2.8 % (p<.05)			
ME	Both	14.5 (n/a)	13.6 (- 0.9)	14.4 (+ 0.8)	15.4 (+ 1.0)	18.9 (+ 3.5)	18.5 (- 0.4)	+ 2.2 % (p<.05)	21	+ 4.0 (25)	+ 27.4 % (29)
	Male	25.0 (n/a)	22.9 (- 2.1)	24.6 (+ 1.7)	25.7 (+ 1.1)	31.1 (+ 5.4)	29.8 (- 1.3)	+ 1.8 % (p<.05)			
	Female	5.3 (n/a)	5.3 (- 0.0)	5.2 (- 0.1)	6.0 (+ 0.7)	7.6 (+ 1.6)	7.9 (+ 0.3)	+ 3.1 % (p<.05)			
MD	Both	10.0 (n/a)	10.3 (+ 0.3)	10.1 (- 0.2)	10.2 (+ 0.1)	10.7 (+ 0.5)	10.8 (+ 0.1)	+ 0.5 % (p<.05)	47 §§	+ 0.8 (49 §§)	+ 8.5 % (49 §§)
	Male	17.6 (n/a)	17.8 (+ 0.1)	17.3 (- 0.5)	17.7 (+ 0.4)	18.2 (+ 0.5)	18.0 (- 0.2)	+ 0.2 % n/s			
	Female	3.5 (n/a)	3.8 (+ 0.4)	3.9 (+ 0.0)	3.7 (- 0.2)	4.1 (+ 0.4)	4.5 (+ 0.4)	+ 1.3 % (p<.05)			
MA	Both	7.4 (n/a)	7.6 (+ 0.2)	8.4 (+ 0.8)	9.3 (+ 1.0)	9.8 (+ 0.4)	10.0 (+ 0.3)	+ 2.3 % (p<.01)	48	+ 2.6 (34 ¶¶)	+ 35.3 % (20 ¶¶)
	Male	12.1 (n/a)	12.8 (+ 0.7)	13.3 (+ 0.5)	15.4 (+ 2.1)	15.2 (- 0.2)	16.0 (+ 0.8)	+ 2.0 % (p<.01)			
	Female	3.3 (n/a)	2.9 (- 0.4)	4.0 (+ 1.0)	3.8 (- 0.1)	4.8 (+ 1.0)	4.6 (- 0.2)	+ 3.0 % (p<.05)			
MI	Both	11.8 (n/a)	12.5 (+ 0.7)	12.9 (+ 0.4)	13.9 (+ 1.0)	14.5 (+ 0.7)	15.6 (+ 1.1)	+ 1.9 % (p<.01)	33	+ 3.9 (26)	+ 32.9 % (24)
	Male	20.0 (n/a)	20.9 (+ 0.9)	21.6 (+ 0.7)	22.8 (+ 1.3)	23.9 (+ 1.0)	25.0 (+ 1.2)	+ 1.5 % (p<.01)			
	Female	4.4 (n/a)	4.8 (+ 0.4)	5.0 (+ 0.2)	5.6 (+ 0.6)	5.9 (+ 0.3)	6.7 (+ 0.9)	+ 2.8 % (p<.01)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.



**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, National Vital Statistics System, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
MN	Both	10.7 (n/a)	11.5 (+ 0.9)	12.4 (+ 0.8)	12.9 (+ 0.5)	14.2 (+ 1.3)	15.0 (+ 0.9)	+ 2.3 % (p<.01)	38	+ 4.3 (19)	+ 40.6 % ( 8)
	Male	18.3 (n/a)	19.3 (+ 1.1)	20.4 (+ 1.0)	20.9 (+ 0.6)	22.9 (+ 1.9)	23.3 (+ 0.4)	+ 1.7 % (p<.01)			
	Female	3.6 (n/a)	4.2 (+ 0.6)	4.8 (+ 0.6)	5.1 (+ 0.4)	5.8 (+ 0.6)	6.9 (+ 1.2)	+ 4.2 % (p<.01)			
MS	Both	12.9 (n/a)	14.1 (+ 1.2)	14.7 (+ 0.6)	15.5 (+ 0.8)	15.6 (+ 0.1)	15.2 (- 0.3)	+ 1.1 % (p<.05)	36	+ 2.3 (36)	+ 17.8 % (40)
	Male	22.9 (n/a)	24.6 (+ 1.7)	25.1 (+ 0.6)	26.8 (+ 1.7)	25.9 (- 0.9)	25.3 (- 0.6)	+ 0.7 % n/s			
	Female	4.3 (n/a)	5.0 (+ 0.7)	5.5 (+ 0.5)	5.5 (- 0.0)	6.4 (+ 0.9)	6.2 (- 0.2)	+ 2.4 % (p<.01)			
MO	Both	14.7 (n/a)	14.1 (- 0.6)	15.4 (+ 1.3)	16.0 (+ 0.7)	17.8 (+ 1.7)	20.0 (+ 2.3)	+ 2.2 % (p<.01)	16	+ 5.3 (15)	+ 36.4 % (17)
	Male	25.3 (n/a)	23.7 (- 1.6)	25.6 (+ 1.9)	26.6 (+ 1.0)	28.9 (+ 2.3)	32.2 (+ 3.3)	+ 1.8 % (p<.05)			
	Female	5.4 (n/a)	5.4 (+ 0.1)	6.1 (+ 0.7)	6.3 (+ 0.2)	7.4 (+ 1.1)	8.6 (+ 1.2)	+ 3.2 % (p<.01)			
MT	Both	21.1 (n/a)	22.6 (+ 1.4)	23.6 (+ 1.0)	24.7 (+ 1.1)	26.7 (+ 2.0)	29.2 (+ 2.5)	+ 2.1 % (p<.01)	1	+ 8.0 ( 2)	+ 38.0 % (11)
	Male	36.9 (n/a)	37.3 (+ 0.4)	39.8 (+ 2.5)	39.7 (- 0.1)	41.0 (+ 1.4)	45.5 (+ 4.4)	+ 1.3 % (p<.01)			
	Female	6.7 (n/a)	8.4 (+ 1.8)	8.4 (- 0.1)	10.0 (+ 1.6)	12.6 (+ 2.6)	13.1 (+ 0.5)	+ 4.6 % (p<.01)			
NE	Both	12.7 (n/a)	12.2 (- 0.5)	12.6 (+ 0.4)	11.7 (- 0.8)	13.5 (+ 1.8)	14.8 (+ 1.3)	+ 1.0 % n/s	40	+ 2.1 (42)	+ 16.2 % (43)
	Male	22.2 (n/a)	20.7 (- 1.5)	20.3 (- 0.4)	19.8 (- 0.5)	22.0 (+ 2.2)	23.9 (+ 1.9)	+ 0.6 % n/s			
	Female	3.8 (n/a)	4.2 (+ 0.4)	5.1 (+ 0.9)	4.0 (- 1.1)	5.5 (+ 1.4)	5.8 (+ 0.3)	+ 2.6 % n/s			
NV	Both	23.3 (n/a)	22.6 (- 0.6)	22.1 (- 0.5)	22.6 (+ 0.5)	21.4 (- 1.2)	23.1 (+ 1.6)	- 0.2 % n/s	9	- 0.2 (51)	- 1.0 % (51)
	Male	38.3 (n/a)	36.7 (- 1.7)	35.1 (- 1.6)	35.6 (+ 0.5)	32.5 (- 3.0)	35.4 (+ 2.8)	- 0.7 % n/s			
	Female	8.9 (n/a)	9.5 (+ 0.5)	9.6 (+ 0.1)	10.0 (+ 0.4)	10.6 (+ 0.6)	11.2 (+ 0.6)	+ 1.5 % (p<.01)			
NH	Both	13.5 (n/a)	12.5 (- 1.0)	13.3 (+ 0.8)	15.2 (+ 1.9)	15.8 (+ 0.6)	20.0 (+ 4.2)	+ 2.7 % (p<.05)	17	+ 6.5 ( 8)	+ 48.3 % ( 3)
	Male	22.5 (n/a)	21.1 (- 1.4)	21.7 (+ 0.6)	24.8 (+ 3.1)	25.4 (+ 0.6)	30.6 (+ 5.2)	+ 2.2 % (p<.05)			
	Female	5.3 (n/a)	4.8 (- 0.5)	5.9 (+ 1.0)	6.2 (+ 0.4)	6.6 (+ 0.4)	9.8 (+ 3.2)	+ 3.9 % (p<.05)			
NJ	Both	7.8 (n/a)	7.7 (- 0.1)	7.5 (- 0.2)	8.0 (+ 0.5)	8.9 (+ 0.9)	9.2 (+ 0.4)	+ 1.3 % (p<.05)	50	+ 1.5 (47)	+ 19.2 % (35)
	Male	13.0 (n/a)	13.1 (+ 0.0)	12.6 (- 0.5)	13.7 (+ 1.1)	14.5 (+ 0.8)	14.6 (+ 0.1)	+ 0.9 % (p<.05)			
	Female	3.2 (n/a)	2.9 (- 0.3)	3.0 (+ 0.0)	2.9 (- 0.1)	3.8 (+ 0.9)	4.4 (+ 0.6)	+ 2.3 % n/s			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.

**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, National Vital Statistics System, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
NM	Both	22.0 (n/a)	22.0 (- 0.1)	21.8 (- 0.2)	23.0 (+ 1.2)	24.1 (+ 1.1)	26.0 (+ 1.9)	+ 1.1 % (p<.05)	4	+ 4.0 (24)	+ 18.3 % (39)
	Male	36.8 (n/a)	37.7 (+ 0.9)	36.4 (- 1.2)	35.8 (- 0.6)	37.1 (+ 1.3)	40.7 (+ 3.6)	+ 0.4 % n/s			
	Female	8.5 (n/a)	7.4 (- 1.1)	8.2 (+ 0.7)	10.7 (+ 2.6)	11.7 (+ 0.9)	12.0 (+ 0.3)	+ 3.3 % (p<.05)			
NY	Both	7.2 (n/a)	7.1 (- 0.1)	7.7 (+ 0.6)	8.4 (+ 0.8)	9.5 (+ 1.1)	9.3 (- 0.1)	+ 2.1 % (p<.01)	49	+ 2.1 (41)	+ 28.8 % (27)
	Male	12.5 (n/a)	12.2 (- 0.3)	12.9 (+ 0.7)	13.9 (+ 1.0)	15.4 (+ 1.4)	14.5 (- 0.9)	+ 1.4 % (p<.05)			
	Female	2.7 (n/a)	2.6 (- 0.1)	3.0 (+ 0.3)	3.5 (+ 0.5)	4.2 (+ 0.7)	4.6 (+ 0.5)	+ 4.2 % (p<.01)			
NC	Both	13.6 (n/a)	13.5 (- 0.1)	13.7 (+ 0.1)	14.2 (+ 0.5)	14.5 (+ 0.4)	15.3 (+ 0.8)	+ 0.8 % (p<.01)	34	+ 1.7 (44)	+ 12.7 % (47)
	Male	22.7 (n/a)	22.7 (+ 0.0)	22.2 (- 0.6)	23.3 (+ 1.1)	23.3 (+ 0.0)	23.9 (+ 0.6)	+ 0.4 % n/s			
	Female	5.6 (n/a)	5.5 (- 0.2)	6.2 (+ 0.8)	6.0 (- 0.2)	6.7 (+ 0.7)	7.6 (+ 0.9)	+ 2.0 % (p<.05)			
ND	Both	13.3 (n/a)	14.6 (+ 1.3)	16.0 (+ 1.4)	16.6 (+ 0.6)	18.4 (+ 1.9)	20.9 (+ 2.5)	+ 2.9 % (p<.01)	14	+ 7.6 ( 5)	+ 57.6 % ( 1)
	Male	21.4 (n/a)	24.6 (+ 3.2)	28.0 (+ 3.4)	27.1 (- 0.9)	29.6 (+ 2.5)	32.7 (+ 3.0)	+ 2.5 % (p<.01)			
	Female	5.6 (n/a)	4.5 (- 1.0)	3.7 (- 0.8)	5.7 (+ 2.0)	6.7 (+ 1.0)	8.5 (+ 1.8)	+ 3.9 % n/s			
OH	Both	11.6 (n/a)	12.3 (+ 0.8)	13.1 (+ 0.8)	13.4 (+ 0.2)	14.8 (+ 1.4)	15.8 (+ 1.0)	+ 2.0 % (p<.01)	32	+ 4.2 (21)	+ 36.0 % (19)
	Male	20.4 (n/a)	20.9 (+ 0.5)	22.2 (+ 1.3)	22.1 (- 0.1)	24.2 (+ 2.1)	25.5 (+ 1.3)	+ 1.5 % (p<.01)			
	Female	4.0 (n/a)	4.7 (+ 0.7)	4.9 (+ 0.1)	5.3 (+ 0.5)	6.2 (+ 0.9)	6.7 (+ 0.6)	+ 3.4 % (p<.01)			
OK	Both	17.0 (n/a)	16.5 (- 0.6)	17.2 (+ 0.8)	18.4 (+ 1.1)	20.7 (+ 2.3)	23.5 (+ 2.8)	+ 2.3 % (p<.05)	7	+ 6.4 (10)	+ 37.6 % (12)
	Male	28.5 (n/a)	27.3 (- 1.2)	27.8 (+ 0.5)	30.3 (+ 2.5)	33.4 (+ 3.1)	37.3 (+ 3.8)	+ 2.0 % (p<.05)			
	Female	6.6 (n/a)	6.4 (- 0.2)	7.5 (+ 1.1)	7.0 (- 0.5)	8.5 (+ 1.6)	10.3 (+ 1.8)	+ 2.9 % (p<.05)			
OR	Both	16.4 (n/a)	17.7 (+ 1.3)	17.7 (- 0.0)	18.6 (+ 0.9)	19.8 (+ 1.2)	21.1 (+ 1.3)	+ 1.6 % (p<.01)	13	+ 4.6 (18)	+ 28.2 % (28)
	Male	27.4 (n/a)	29.5 (+ 2.1)	28.5 (- 0.9)	29.5 (+ 1.0)	31.4 (+ 1.8)	33.0 (+ 1.6)	+ 1.1 % (p<.01)			
	Female	6.5 (n/a)	7.1 (+ 0.6)	7.7 (+ 0.6)	8.4 (+ 0.7)	8.8 (+ 0.4)	9.8 (+ 0.9)	+ 2.7 % (p<.01)			
PA	Both	12.1 (n/a)	12.5 (+ 0.4)	12.8 (+ 0.3)	13.9 (+ 1.1)	15.0 (+ 1.1)	16.3 (+ 1.2)	+ 2.0 % (p<.01)	30	+ 4.1 (22)	+ 34.3 % (21)
	Male	21.0 (n/a)	21.3 (+ 0.3)	21.9 (+ 0.6)	23.1 (+ 1.2)	24.7 (+ 1.7)	26.1 (+ 1.3)	+ 1.5 % (p<.01)			
	Female	4.2 (n/a)	4.6 (+ 0.3)	4.6 (+ 0.0)	5.4 (+ 0.9)	6.0 (+ 0.6)	7.1 (+ 1.1)	+ 3.5 % (p<.01)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.



**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, National Vital Statistics System, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
RI	Both	9.4 (n/a)	9.0 (- 0.3)	9.0 (- 0.0)	12.8 (+ 3.8)	11.9 (- 0.9)	12.6 (+ 0.7)	+ 2.6 % (p<.05)	43	+ 3.2 (30 ¶¶)	+ 34.1 % (23 ¶¶)
	Male	15.4 (n/a)	15.2 (- 0.2)	14.8 (- 0.3)	21.2 (+ 6.4)	19.2 (- 2.0)	19.6 (+ 0.4)	+ 2.2 % n/s			
	Female	4.0 (n/a)	3.3 (- 0.7)	3.8 (+ 0.4)	5.1 (+ 1.3)	5.1 (+ 0.0)	6.1 (+ 1.0)	+ 3.7 % (p<.05)			
SC	Both	12.8 (n/a)	13.0 (+ 0.2)	13.7 (+ 0.7)	14.9 (+ 1.2)	16.0 (+ 1.1)	17.7 (+ 1.7)	+ 2.3 % (p<.01)	23	+ 4.9 (17)	+ 38.3 % (10)
	Male	21.3 (n/a)	22.5 (+ 1.2)	22.3 (- 0.1)	24.6 (+ 2.2)	26.1 (+ 1.5)	28.0 (+ 1.9)	+ 1.8 % (p<.01)			
	Female	5.4 (n/a)	4.7 (- 0.7)	6.0 (+ 1.3)	6.2 (+ 0.2)	7.0 (+ 0.8)	8.4 (+ 1.4)	+ 3.4 % (p<.05)			
SD	Both	15.7 (n/a)	15.8 (+ 0.1)	17.1 (+ 1.3)	19.3 (+ 2.2)	19.7 (+ 0.4)	22.6 (+ 2.9)	+ 2.5 % (p<.01)	10	+ 7.0 ( 7)	+ 44.5 % ( 6)
	Male	27.6 (n/a)	26.3 (- 1.3)	27.9 (+ 1.6)	30.1 (+ 2.2)	32.0 (+ 1.9)	33.6 (+ 1.6)	+ 1.6 % (p<.01)			
	Female	4.2 (n/a)	5.8 (+ 1.6)	6.4 (+ 0.6)	8.3 (+ 2.0)	7.3 (- 1.0)	11.3 (+ 4.0)	+ 5.8 % (p<.01)			
TN	Both	14.6 (n/a)	15.2 (+ 0.6)	16.1 (+ 0.8)	17.2 (+ 1.1)	17.2 (+ 0.0)	18.2 (+ 1.0)	+ 1.4 % (p<.01)	22	+ 3.5 (28)	+ 24.2 % (31)
	Male	25.1 (n/a)	25.4 (+ 0.3)	26.8 (+ 1.3)	28.0 (+ 1.2)	28.6 (+ 0.6)	29.8 (+ 1.2)	+ 1.2 % (p<.01)			
	Female	5.4 (n/a)	6.3 (+ 0.9)	6.7 (+ 0.4)	7.5 (+ 0.8)	6.9 (- 0.6)	7.6 (+ 0.7)	+ 1.9 % (p<.05)			
TX	Both	12.2 (n/a)	12.7 (+ 0.6)	12.3 (- 0.4)	13.2 (+ 0.9)	13.6 (+ 0.3)	14.5 (+ 0.9)	+ 1.1 % (p<.01)	41	+ 2.3 (37)	+ 18.9 % (36)
	Male	20.4 (n/a)	20.9 (+ 0.5)	20.4 (- 0.6)	22.0 (+ 1.6)	22.2 (+ 0.3)	23.1 (+ 0.9)	+ 0.9 % (p<.05)			
	Female	4.8 (n/a)	5.4 (+ 0.6)	5.0 (- 0.4)	5.2 (+ 0.2)	5.6 (+ 0.4)	6.4 (+ 0.8)	+ 1.6 % (p<.05)			
UT	Both	17.2 (n/a)	19.0 (+ 1.8)	18.2 (- 0.7)	20.2 (+ 2.0)	24.0 (+ 3.8)	25.2 (+ 1.2)	+ 2.7 % (p<.01)	5	+ 8.0 ( 3 ¶¶)	+ 46.5 % ( 4 ¶¶)
	Male	28.2 (n/a)	31.1 (+ 2.9)	29.4 (- 1.7)	32.1 (+ 2.7)	37.8 (+ 5.7)	38.0 (+ 0.2)	+ 2.1 % (p<.05)			
	Female	6.8 (n/a)	7.4 (+ 0.6)	7.5 (+ 0.1)	8.5 (+ 1.0)	10.6 (+ 2.1)	12.6 (+ 2.0)	+ 4.4 % (p<.01)			
VT	Both	13.2 (n/a)	16.2 (+ 3.0)	14.9 (- 1.3)	16.6 (+ 1.7)	18.7 (+ 2.1)	19.7 (+ 1.0)	+ 2.4 % (p<.01)	18	+ 6.4 ( 9)	+ 48.6 % ( 2)
	Male	23.6 (n/a)	28.3 (+ 4.6)	24.3 (- 4.0)	27.3 (+ 3.0)	31.0 (+ 3.7)	32.5 (+ 1.5)	+ 1.9 % (p<.05)			
	Female	4.3 (n/a)	5.2 (+ 0.9)	6.4 (+ 1.3)	6.6 (+ 0.2)	7.3 (+ 0.7)	7.6 (+ 0.3)	+ 3.8 % (p<.01)			
VA	Both	12.8 (n/a)	12.7 (- 0.1)	12.9 (+ 0.3)	13.6 (+ 0.7)	14.6 (+ 0.9)	15.0 (+ 0.5)	+ 1.2 % (p<.01)	37	+ 2.2 (39)	+ 17.4 % (41)
	Male	21.6 (n/a)	21.3 (- 0.2)	21.0 (- 0.4)	22.5 (+ 1.5)	23.6 (+ 1.2)	23.9 (+ 0.2)	+ 0.9 % (p<.05)			
	Female	5.3 (n/a)	5.2 (- 0.1)	5.9 (+ 0.7)	5.6 (- 0.3)	6.4 (+ 0.8)	6.9 (+ 0.5)	+ 1.8 % (p<.05)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.

**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, National Vital Statistics System, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
WA	Both	14.8 (n/a)	15.4 (+ 0.5)	14.8 (- 0.6)	15.7 (+ 0.9)	16.6 (+ 0.9)	17.6 (+ 1.0)	+ 1.1 % (p<.05)	24	+ 2.8 (33)	+ 18.8 % (37)
	Male	24.7 (n/a)	25.2 (+ 0.5)	24.1 (- 1.1)	25.1 (+ 1.0)	26.0 (+ 0.9)	27.1 (+ 1.1)	+ 0.6 % n/s			
	Female	5.9 (n/a)	6.4 (+ 0.6)	6.2 (- 0.2)	6.9 (+ 0.7)	7.7 (+ 0.8)	8.5 (+ 0.8)	+ 2.5 % (p<.01)			
WV	Both	15.6 (n/a)	17.2 (+ 1.6)	16.7 (- 0.5)	16.0 (- 0.7)	19.2 (+ 3.2)	21.4 (+ 2.2)	+ 1.8 % n/s	11	+ 5.8 (13)	+ 37.1 % (14)
	Male	27.2 (n/a)	30.1 (+ 2.9)	28.6 (- 1.5)	27.6 (- 1.0)	31.5 (+ 3.9)	33.5 (+ 2.0)	+ 1.1 % n/s			
	Female	5.3 (n/a)	5.5 (+ 0.1)	5.8 (+ 0.3)	5.3 (- 0.5)	7.6 (+ 2.3)	9.8 (+ 2.2)	+ 3.7 % n/s			
WI	Both	13.1 (n/a)	13.5 (+ 0.4)	14.0 (+ 0.5)	15.0 (+ 1.0)	15.3 (+ 0.3)	16.5 (+ 1.2)	+ 1.5 % (p<.01)	28	+ 3.4 (29)	+ 25.8 % (30)
	Male	21.7 (n/a)	22.2 (+ 0.5)	22.7 (+ 0.5)	24.0 (+ 1.2)	24.4 (+ 0.4)	25.7 (+ 1.3)	+ 1.1 % (p<.01)			
	Female	5.1 (n/a)	5.3 (+ 0.2)	5.6 (+ 0.4)	6.4 (+ 0.7)	6.5 (+ 0.1)	7.5 (+ 1.0)	+ 2.5 % (p<.01)			
WY	Both	20.7 (n/a)	23.4 (+ 2.7)	22.5 (- 0.9)	25.4 (+ 2.8)	28.9 (+ 3.5)	28.8 (- 0.1)	+ 2.3 % (p<.01)	3	+ 8.1 ( 1)	+ 39.0 % ( 9)
	Male	34.8 (n/a)	39.3 (+ 4.5)	36.3 (- 3.0)	41.5 (+ 5.2)	47.1 (+ 5.6)	44.6 (- 2.4)	+ 1.8 % (p<.05)			
	Female	7.7 (n/a)	8.2 (+ 0.6)	9.2 (+ 0.9)	9.4 (+ 0.2)	10.7 (+ 1.4)	12.6 (+ 1.9)	+ 3.2 % (p<.01)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

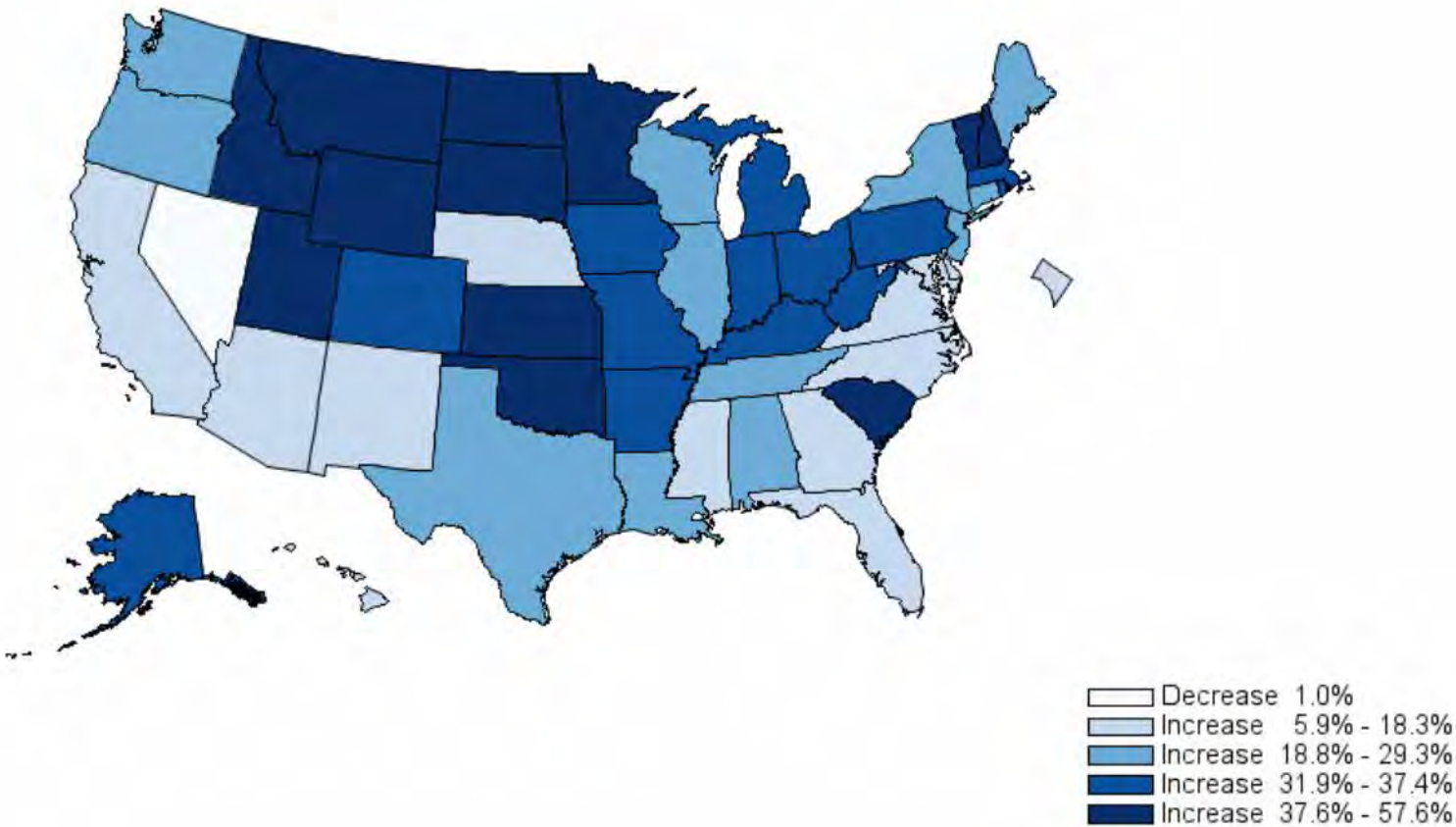
§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.



Figure 1

**Percentage Changes in Annual Suicide Rates (per 100,000, Age-Adjusted)**  
2014-2016 Compared Against 1999-2001



**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank)
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
U.S.	Both	12.3 (n/a)	12.7 (+ 0.4)	12.9 (+ 0.2)	13.8 (+ 0.9)	14.5 (+ 0.8)	15.4 (+ 0.9)	+ 1.5 % (p<.01)	n/a	+ 3.1 (n/a)	+ 25.4 % (n/a)
	Male	20.9 (n/a)	21.2 (+ 0.4)	21.3 (+ 0.0)	22.5 (+1.3)	23.5 (+ 1.0)	24.5 (+ 1.0)	+ 1.1 % (p<.01)			
	Female	4.7 (n/a)	5.0 (+ 0.3)	5.3 (+ 0.2)	5.7 (+ 0.4)	6.2 (+ 0.5)	6.9 (+ 0.7)	+ 2.6 % (p<.01)			
AL	Both	14.3 (n/a)	13.4 (- 0.9)	14.1 (+ 0.6)	15.6 (+ 1.6)	16.4 (+ 0.7)	17.5 (+ 1.1)	+ 1.6 % (p<.05)	25	+ 3.1 (31)	+ 21.9 % (33)
	Male	25.1 (n/a)	23.4 (- 1.7)	24.4 (+ 1.0)	26.4 (+ 2.0)	27.6 (+ 1.1)	29.1 (+ 1.5)	+ 1.3 % (p<.05)			
	Female	5.1 (n/a)	4.8 (- 0.3)	5.0 (+ 0.2)	6.1 (+ 1.1)	6.4 (+ 0.3)	7.0 (+ 0.7)	+ 2.6 % (p<.01)			
AK	Both	21.0 (n/a)	24.8 (+ 3.8)	24.2 (- 0.6)	26.0 (+ 1.7)	25.4 (- 0.5)	28.8 (+ 3.4)	+ 1.7 % (p<.05)	2	+ 7.8 ( 4)	+ 37.4 % (13)
	Male	33.2 (n/a)	38.1 (+ 4.9)	38.9 (+ 0.8)	40.1 (+ 1.2)	40.1 (- 0.1)	42.9 (+ 2.8)	+ 1.4 % (p<.01)			
	Female	8.6 (n/a)	11.4 (+ 2.9)	9.8 (- 1.6)	11.1 (+ 1.2)	9.9 (- 1.2)	13.2 (+ 3.4)	+ 1.7 % n/s			
AZ	Both	17.8 (n/a)	18.5 (+ 0.7)	19.1 (+ 0.5)	19.1 (- 0.0)	20.4 (+ 1.3)	20.9 (+ 0.5)	+ 1.0 % (p<.01)	15	+ 3.1 (32)	+ 17.3 % (42)
	Male	29.3 (n/a)	30.2 (+ 1.0)	30.6 (+ 0.4)	30.2 (- 0.5)	32.0 (+ 1.9)	32.4 (+ 0.4)	+ 0.6 % (p<.05)			
	Female	7.1 (n/a)	7.5 (+ 0.4)	8.2 (+ 0.7)	8.6 (+ 0.5)	9.2 (+ 0.6)	9.9 (+ 0.6)	+ 2.2 % (p<.01)			
AR	Both	15.5 (n/a)	15.8 (+ 0.3)	16.2 (+ 0.5)	17.6 (+ 1.4)	19.2 (+ 1.6)	21.2 (+ 2.0)	+ 2.2 % (p<.01)	12	+ 5.7 (14)	+ 36.8 % (15)
	Male	26.7 (n/a)	26.7 (+ 0.0)	27.2 (+ 0.5)	28.2 (+ 1.0)	31.7 (+ 3.5)	33.5 (+ 1.9)	+ 1.6 % (p<.05)			
	Female	5.6 (n/a)	5.9 (+ 0.3)	6.2 (+ 0.4)	7.9 (+ 1.7)	7.5 (- 0.4)	9.6 (+ 2.1)	+ 3.6 % (p<.01)			
CA	Both	10.6 (n/a)	11.3 (+ 0.7)	11.0 (- 0.3)	12.0 (+ 1.0)	11.8 (- 0.1)	12.1 (+ 0.3)	+ 0.9 % (p<.05)	45	+ 1.6 (46)	+ 14.8 % (46)
	Male	17.9 (n/a)	18.4 (+ 0.5)	17.7 (- 0.7)	19.1 (+ 1.4)	18.9 (- 0.2)	19.2 (+ 0.3)	+ 0.5 % n/s			
	Female	4.1 (n/a)	5.0 (+ 0.9)	4.9 (- 0.1)	5.4 (+ 0.5)	5.3 (- 0.1)	5.6 (+ 0.3)	+ 1.7 % (p<.05)			
CO	Both	17.3 (n/a)	19.2 (+ 1.9)	19.0 (- 0.2)	20.0 (+ 1.0)	21.6 (+ 1.5)	23.2 (+ 1.6)	+ 1.8 % (p<.01)	8	+ 5.9 (12)	+ 34.1 % (22)
	Male	28.6 (n/a)	30.9 (+ 2.3)	30.5 (- 0.4)	31.5 (+ 1.0)	33.4 (+ 1.9)	36.3 (+ 2.9)	+ 1.4 % (p<.01)			
	Female	7.0 (n/a)	8.2 (+ 1.3)	8.2 (+ 0.0)	9.1 (+ 0.9)	10.1 (+ 1.0)	10.4 (+ 0.3)	+ 2.6 % (p<.01)			
CT	Both	9.6 (n/a)	8.9 (- 0.7)	9.1 (+ 0.2)	10.2 (+ 1.1)	11.0 (+ 0.8)	11.5 (+ 0.5)	+ 1.6 % (p<.05)	46	+ 1.9 (43)	+ 19.2 % (34)
	Male	16.4 (n/a)	14.6 (- 1.8)	15.0 (+ 0.4)	16.6 (+ 1.6)	17.6 (+ 1.0)	17.3 (- 0.3)	+ 0.9 % n/s			
	Female	3.6 (n/a)	3.8 (+ 0.2)	3.7 (- 0.2)	4.4 (+ 0.7)	4.9 (+ 0.5)	6.2 (+ 1.3)	+ 3.5 % (p<.05)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.

**Comment [HJ]:** Insert “National Vital Statistics System”

**Comment [HJ]:** Consider sorting state abbreviations alphabetically instead of state names.



# Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, 1999 – 2016

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
DE	Both	13.6 (n/a)	13.2 (+ 1.4)	12.9 (- 0.3)	13.0 (+ 1.7)	15.2 (+ 0.6)	16.0 (+ 0.2)	+ 0.9 % (p<.01)	32	+ 0.8 (20)	+ 36.9 % (50)
	Male	20.0 (n/a)	20.3 (+ 2.5)	20.9 (- 0.4)	23.3 (+ 2.2)	22.7 (+ 2.7)	23.5 (+ 0.3)	+ 0.6 % (p<.05)			
	Female	5.3 (n/a)	5.0 (+ 0.2)	4.5 (+ 0.6)	5.9 (+ 0.2)	6.4 (+ 0.6)	6.2 (+ 0.2)	+ 3.6 % (p<.01)			
DS	Both	13.9 (n/a)	16.4 (+ 0.8)	15.4 (+ 0.7)	15.3 (+ 0.8)	15.5 (+ 2.7)	10.9 (+ 0.6)	+ 0.2 % (p<.01)	59	+ 6.0 (48)	+ 46.0 % (45)
	Male	20.7 (n/a)	25.0 (+ 0.3)	26.5 (+ 0.5)	25.5 (+ 2.9)	29.0 (+ 2.5)	30.7 (+ 1.6)	+ 0.9 % (p<.01)			
	Female	14.0 (n/a)††	2.8 (- 0.6)††	3.3 (+ 0.3)	3.6 (- 0.3)	6.6 (+ 1.0)	2.4 (+ 0.8)	+ 3.2 % (p<.05)			
KY	Both	14.3 (n/a)	15.2 (+ 0.3)	14.9 (+ 0.3)	16.2 (+ 0.3)	18.2 (+ 2.0)	10.3 (+ 0.1)	+ 0.9 % (p<.05)	29	+ 5.8 (46)	+ 30.6 % (48)
	Male	25.0 (n/a)	26.8 (+ 0.9)	28.5 (+ 0.8)	27.2 (+ 2.6)	35.6 (+ 2.6)	35.5 (+ 0.6)	+ 0.5 % (p<.01)			
	Female	6.8 (n/a)	6.8 (+ 0.5)	6.8 (+ 0.8)	6.1 (+ 0.3)	7.6 (+ 0.9)	7.8 (+ 0.6)	+ 3.2 % (p<.01)			
GA	Both	12.9 (n/a)	12.9 (+ 0.2)	12.4 (+ 0.4)	13.0 (+ 0.9)	13.7 (+ 0.8)	13.0 (+ 2.5)	+ 0.0 % (p<.05)	20	+ 2.3 (20)	+ 20.2 % (26)
	Male	22.9 (n/a)	22.3 (+ 0.6)	22.4 (+ 0.8)	23.9 (+ 0.6)	22.6 (+ 0.3)	27.3 (+ 3.6)	+ 0.5 % n/s			
	Female	5.0 (n/a)	4.8 (- 0.2)	4.2 (+ 0.2)	4.5 (+ 0.2)	6.8 (+ 0.2)	6.6 (+ 0.8)	+ 2.8 % (p<.05)			
ME	Both	12.9 (n/a)	13.6 (- 0.8)	14.4 (+ 0.3)	15.5 (+ 4.0)	18.4 (+ 3.5)	15.3 (+ 0.4)	+ 2.0 % (p<.05)	25	+ 2.0 (25)	+ 28.3 % (20)
	Male	20.0 (n/a)	22.2 (- 2.1)	24.6 (+ 1.9)	25.9 (+ 6.7)	22.5 (+ 6.6)	29.3 (+ 1.3)	+ 2.8 % (p<.05)			
	Female	5.3 (n/a)	5.0 (- 0.0)	5.2 (+ 0.5)	6.0 (+ 0.3)	6.2 (+ 0.6)	5.9 (+ 0.3)	+ 3.2 % (p<.05)			
MD	Both	10.0 (n/a)	10.2 (+ 0.0)	10.3 (- 0.2)	20.0 (+ 0.3)	20.9 (+ 0.5)	20.8 (+ 0.3)	+ 0.5 % (p<.05)	40 §§	+ 0.8 (46)§§	+ 43.5% (49)¶¶
	Male	28.6 (n/a)	32.8 (+ 0.7)	37.3 (- 0.6)	37.9 (+ 0.8)	38.2 (+ 0.2)	38.0 (+ 3.2)	+ 0.8 % (p<.05)			
	Female	3.2 (n/a)	3.8 (+ 0.4)	6.9 (+ 0.0)	3.7 (+ 2.2)	0.5 (+ 0.4)	14.8 (+ 0.3)	+ 4.3 % (p<.05)			
MA	Both	9.9 (n/a)	9.6 (+ 0.2)	9.7 (+ 0.8)	10.6 (+ 0.8)	19.2 (+ 0.6)	10.0 (+ 0.0)	+ 2.5 % (p<.05)	48	+ 2.6 (38)¶¶	+ 38.2% (40)¶¶
	Male	12.1 (n/a)	12.8 (+ 0.7)	15.2 (+ 0.6)	15.6 (+ 2.4)	15.2 (+ 0.2)	10.8 (+ 0.8)	+ 2.0 % (p<.05)			
	Female	3.3 (n/a)	2.0 (- 0.0)	3.6 (+ 0.0)	4.2 (+ 0.4)	4.6 (+ 0.0)	4.2 (+ 0.2)	+ 2.0 % (p<.05)			
WI	Both	13.0 (n/a)	12.5 (+ 0.7)	12.9 (+ 0.7)	13.9 (+ 0.6)	16.5 (+ 0.7)	15.6 (+ 0.7)	+ 1.9 % (p<.01)	26	+ 3.9 (26)	+ 32.9 % (25)
	Male	20.0 (n/a)	20.2 (+ 0.8)	24.6 (+ 0.2)	22.8 (+ 0.3)	26.9 (+ 2.0)	28.0 (+ 1.0)	+ 1.5 % (p<.01)			
	Female	4.6 (n/a)	5.0 (+ 0.4)	5.0 (+ 0.2)	5.0 (+ 0.6)	6.8 (+ 0.9)	6.6 (+ 0.2)	+ 2.8 % (p<.01)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.

### Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, 1999 – 2016

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
MN	Both	10.7 (n/a)	11.5 (+ 0.9)	12.4 (+ 0.8)	12.9 (+ 0.5)	14.2 (+ 1.3)	15.0 (+ 0.9)	+ 2.3 % (p<.01)	38	+ 4.3 (19)	+ 40.6 % ( 8)
	Male	18.3 (n/a)	19.3 (+ 1.1)	20.4 (+ 1.0)	20.9 (+ 0.6)	22.9 (+ 1.9)	23.3 (+ 0.4)	+ 1.7 % (p<.01)			
	Female	3.6 (n/a)	4.2 (+ 0.6)	4.8 (+ 0.6)	5.1 (+ 0.4)	5.8 (+ 0.6)	6.9 (+ 1.2)	+ 4.2 % (p<.01)			
MS	Both	12.9 (n/a)	14.1 (+ 1.2)	14.7 (+ 0.6)	15.5 (+ 0.8)	15.6 (+ 0.1)	15.2 (- 0.3)	+ 1.1 % (p<.05)	36	+ 2.3 (36)	+ 17.8 % (40)
	Male	22.9 (n/a)	24.6 (+ 1.7)	25.1 (+ 0.6)	26.8 (+ 1.7)	25.9 (- 0.9)	25.3 (- 0.6)	+ 0.7 % n/s			
	Female	4.3 (n/a)	5.0 (+ 0.7)	5.5 (+ 0.5)	5.5 (- 0.0)	6.4 (+ 0.9)	6.2 (- 0.2)	+ 2.4 % (p<.01)			
MO	Both	14.7 (n/a)	14.1 (- 0.6)	15.4 (+ 1.3)	16.0 (+ 0.7)	17.8 (+ 1.7)	20.0 (+ 2.3)	+ 2.2 % (p<.01)	16	+ 5.3 (15)	+ 36.4 % (17)
	Male	25.3 (n/a)	23.7 (- 1.6)	25.6 (+ 1.9)	26.6 (+ 1.0)	28.9 (+ 2.3)	32.2 (+ 3.3)	+ 1.8 % (p<.05)			
	Female	5.4 (n/a)	5.4 (+ 0.1)	6.1 (+ 0.7)	6.3 (+ 0.2)	7.4 (+ 1.1)	8.6 (+ 1.2)	+ 3.2 % (p<.01)			
MT	Both	21.1 (n/a)	22.6 (+ 1.4)	23.6 (+ 1.0)	24.7 (+ 1.1)	26.7 (+ 2.0)	29.2 (+ 2.5)	+ 2.1 % (p<.01)	1	+ 8.0 ( 2)	+ 38.0 % (11)
	Male	36.9 (n/a)	37.3 (+ 0.4)	39.8 (+ 2.5)	39.7 (- 0.1)	41.0 (+ 1.4)	45.5 (+ 4.4)	+ 1.3 % (p<.01)			
	Female	6.7 (n/a)	8.4 (+ 1.8)	8.4 (- 0.1)	10.0 (+ 1.6)	12.6 (+ 2.6)	13.1 (+ 0.5)	+ 4.6 % (p<.01)			
NE	Both	12.7 (n/a)	12.2 (- 0.5)	12.6 (+ 0.4)	11.7 (- 0.8)	13.5 (+ 1.8)	14.8 (+ 1.3)	+ 1.0 % n/s	40	+ 2.1 (42)	+ 16.2 % (43)
	Male	22.2 (n/a)	20.7 (- 1.5)	20.3 (- 0.4)	19.8 (- 0.5)	22.0 (+ 2.2)	23.9 (+ 1.9)	+ 0.6 % n/s			
	Female	3.8 (n/a)	4.2 (+ 0.4)	5.1 (+ 0.9)	4.0 (- 1.1)	5.5 (+ 1.4)	5.8 (+ 0.3)	+ 2.6 % n/s			
NV	Both	23.3 (n/a)	22.6 (- 0.6)	22.1 (- 0.5)	22.6 (+ 0.5)	21.4 (- 1.2)	23.1 (+ 1.6)	- 0.2 % n/s	9	- 0.2 (51)	- 1.0 % (51)
	Male	38.3 (n/a)	36.7 (- 1.7)	35.1 (- 1.6)	35.6 (+ 0.5)	32.5 (- 3.0)	35.4 (+ 2.8)	- 0.7 % n/s			
	Female	8.9 (n/a)	9.5 (+ 0.5)	9.6 (+ 0.1)	10.0 (+ 0.4)	10.6 (+ 0.6)	11.2 (+ 0.6)	+ 1.5 % (p<.01)			
NH	Both	13.5 (n/a)	12.5 (- 1.0)	13.3 (+ 0.8)	15.2 (+ 1.9)	15.8 (+ 0.6)	20.0 (+ 4.2)	+ 2.7 % (p<.05)	17	+ 6.5 ( 8)	+ 48.3 % ( 3)
	Male	22.5 (n/a)	21.1 (- 1.4)	21.7 (+ 0.6)	24.8 (+ 3.1)	25.4 (+ 0.6)	30.6 (+ 5.2)	+ 2.2 % (p<.05)			
	Female	5.3 (n/a)	4.8 (- 0.5)	5.9 (+ 1.0)	6.2 (+ 0.4)	6.6 (+ 0.4)	9.8 (+ 3.2)	+ 3.9 % (p<.05)			
NJ	Both	7.8 (n/a)	7.7 (- 0.1)	7.5 (- 0.2)	8.0 (+ 0.5)	8.9 (+ 0.9)	9.2 (+ 0.4)	+ 1.3 % (p<.05)	50	+ 1.5 (47)	+ 19.2 % (35)
	Male	13.0 (n/a)	13.1 (+ 0.0)	12.6 (- 0.5)	13.7 (+ 1.1)	14.5 (+ 0.8)	14.6 (+ 0.1)	+ 0.9 % (p<.05)			
	Female	3.2 (n/a)	2.9 (- 0.3)	3.0 (+ 0.0)	2.9 (- 0.1)	3.8 (+ 0.9)	4.4 (+ 0.6)	+ 2.3 % n/s			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.



### Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, 1999 – 2016

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
NM	Both	22.0 (n/a)	22.0 (- 0.1)	21.8 (- 0.2)	23.0 (+ 1.2)	24.1 (+ 1.1)	26.0 (+ 1.9)	+ 1.1 % (p<.05)	4	+ 4.0 (24)	+ 18.3 % (39)
	Male	36.8 (n/a)	37.7 (+ 0.9)	36.4 (- 1.2)	35.8 (- 0.6)	37.1 (+ 1.3)	40.7 (+ 3.6)	+ 0.4 % n/s			
	Female	8.5 (n/a)	7.4 (- 1.1)	8.2 (+ 0.7)	10.7 (+ 2.6)	11.7 (+ 0.9)	12.0 (+ 0.3)	+ 3.3 % (p<.05)			
NY	Both	7.2 (n/a)	7.1 (- 0.1)	7.7 (+ 0.6)	8.4 (+ 0.8)	9.5 (+ 1.1)	9.3 (- 0.1)	+ 2.1 % (p<.01)	49	+ 2.1 (41)	+ 28.8 % (27)
	Male	12.5 (n/a)	12.2 (- 0.3)	12.9 (+ 0.7)	13.9 (+ 1.0)	15.4 (+ 1.4)	14.5 (- 0.9)	+ 1.4 % (p<.05)			
	Female	2.7 (n/a)	2.6 (- 0.1)	3.0 (+ 0.3)	3.5 (+ 0.5)	4.2 (+ 0.7)	4.6 (+ 0.5)	+ 4.2 % (p<.01)			
NC	Both	13.6 (n/a)	13.5 (- 0.1)	13.7 (+ 0.1)	14.2 (+ 0.5)	14.5 (+ 0.4)	15.3 (+ 0.8)	+ 0.8 % (p<.01)	34	+ 1.7 (44)	+ 12.7 % (47)
	Male	22.7 (n/a)	22.7 (+ 0.0)	22.2 (- 0.6)	23.3 (+ 1.1)	23.3 (+ 0.0)	23.9 (+ 0.6)	+ 0.4 % n/s			
	Female	5.6 (n/a)	5.5 (- 0.2)	6.2 (+ 0.8)	6.0 (- 0.2)	6.7 (+ 0.7)	7.6 (+ 0.9)	+ 2.0 % (p<.05)			
ND	Both	13.3 (n/a)	14.6 (+ 1.3)	16.0 (+ 1.4)	16.6 (+ 0.6)	18.4 (+ 1.9)	20.9 (+ 2.5)	+ 2.9 % (p<.01)	14	+ 7.6 ( 5)	+ 57.6 % ( 1)
	Male	21.4 (n/a)	24.6 (+ 3.2)	28.0 (+ 3.4)	27.1 (- 0.9)	29.6 (+ 2.5)	32.7 (+ 3.0)	+ 2.5 % (p<.01)			
	Female	5.6 (n/a)	4.5 (- 1.0)	3.7 (- 0.8)	5.7 (+ 2.0)	6.7 (+ 1.0)	8.5 (+ 1.8)	+ 3.9 % n/s			
OH	Both	11.6 (n/a)	12.3 (+ 0.8)	13.1 (+ 0.8)	13.4 (+ 0.2)	14.8 (+ 1.4)	15.8 (+ 1.0)	+ 2.0 % (p<.01)	32	+ 4.2 (21)	+ 36.0 % (19)
	Male	20.4 (n/a)	20.9 (+ 0.5)	22.2 (+ 1.3)	22.1 (- 0.1)	24.2 (+ 2.1)	25.5 (+ 1.3)	+ 1.5 % (p<.01)			
	Female	4.0 (n/a)	4.7 (+ 0.7)	4.9 (+ 0.1)	5.3 (+ 0.5)	6.2 (+ 0.9)	6.7 (+ 0.6)	+ 3.4 % (p<.01)			
OK	Both	17.0 (n/a)	16.5 (- 0.6)	17.2 (+ 0.8)	18.4 (+ 1.1)	20.7 (+ 2.3)	23.5 (+ 2.8)	+ 2.3 % (p<.05)	7	+ 6.4 (10)	+ 37.6 % (12)
	Male	28.5 (n/a)	27.3 (- 1.2)	27.8 (+ 0.5)	30.3 (+ 2.5)	33.4 (+ 3.1)	37.3 (+ 3.8)	+ 2.0 % (p<.05)			
	Female	6.6 (n/a)	6.4 (- 0.2)	7.5 (+ 1.1)	7.0 (- 0.5)	8.5 (+ 1.6)	10.3 (+ 1.8)	+ 2.9 % (p<.05)			
OR	Both	16.4 (n/a)	17.7 (+ 1.3)	17.7 (- 0.0)	18.6 (+ 0.9)	19.8 (+ 1.2)	21.1 (+ 1.3)	+ 1.6 % (p<.01)	13	+ 4.6 (18)	+ 28.2 % (28)
	Male	27.4 (n/a)	29.5 (+ 2.1)	28.5 (- 0.9)	29.5 (+ 1.0)	31.4 (+ 1.8)	33.0 (+ 1.6)	+ 1.1 % (p<.01)			
	Female	6.5 (n/a)	7.1 (+ 0.6)	7.7 (+ 0.6)	8.4 (+ 0.7)	8.8 (+ 0.4)	9.8 (+ 0.9)	+ 2.7 % (p<.01)			
PA	Both	12.1 (n/a)	12.5 (+ 0.4)	12.8 (+ 0.3)	13.9 (+ 1.1)	15.0 (+ 1.1)	16.3 (+ 1.2)	+ 2.0 % (p<.01)	30	+ 4.1 (22)	+ 34.3 % (21)
	Male	21.0 (n/a)	21.3 (+ 0.3)	21.9 (+ 0.6)	23.1 (+ 1.2)	24.7 (+ 1.7)	26.1 (+ 1.3)	+ 1.5 % (p<.01)			
	Female	4.2 (n/a)	4.6 (+ 0.3)	4.6 (+ 0.0)	5.4 (+ 0.9)	6.0 (+ 0.6)	7.1 (+ 1.1)	+ 3.5 % (p<.01)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.

# Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, 1999 – 2016

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
RI	Both	9.4 (n/a)	9.0 (- 0.3)	9.0 (- 0.0)	12.8 (+ 3.8)	11.9 (- 0.9)	12.6 (+ 0.7)	+ 2.6 % (p<.05)	43	+ 3.2 (30 ¶¶)	+ 34.1 % (23 ¶¶)
	Male	15.4 (n/a)	15.2 (- 0.2)	14.8 (- 0.3)	21.2 (+ 6.4)	19.2 (- 2.0)	19.6 (+ 0.4)	+ 2.2 % n/s			
	Female	4.0 (n/a)	3.3 (- 0.7)	3.8 (+ 0.4)	5.1 (+ 1.3)	5.1 (+ 0.0)	6.1 (+ 1.0)	+ 3.7 % (p<.05)			
SC	Both	12.8 (n/a)	13.0 (+ 0.2)	13.7 (+ 0.7)	14.9 (+ 1.2)	16.0 (+ 1.1)	17.7 (+ 1.7)	+ 2.3 % (p<.01)	23	+ 4.9 (17)	+ 38.3 % (10)
	Male	21.3 (n/a)	22.5 (+ 1.2)	22.3 (- 0.1)	24.6 (+ 2.2)	26.1 (+ 1.5)	28.0 (+ 1.9)	+ 1.8 % (p<.01)			
	Female	5.4 (n/a)	4.7 (- 0.7)	6.0 (+ 1.3)	6.2 (+ 0.2)	7.0 (+ 0.8)	8.4 (+ 1.4)	+ 3.4 % (p<.05)			
SD	Both	15.7 (n/a)	15.8 (+ 0.1)	17.1 (+ 1.3)	19.3 (+ 2.2)	19.7 (+ 0.4)	22.6 (+ 2.9)	+ 2.5 % (p<.01)	10	+ 7.0 ( 7)	+ 44.5 % ( 6)
	Male	27.6 (n/a)	26.3 (- 1.3)	27.9 (+ 1.6)	30.1 (+ 2.2)	32.0 (+ 1.9)	33.6 (+ 1.6)	+ 1.6 % (p<.01)			
	Female	4.2 (n/a)	5.8 (+ 1.6)	6.4 (+ 0.6)	8.3 (+ 2.0)	7.3 (- 1.0)	11.3 (+ 4.0)	+ 5.8 % (p<.01)			
TN	Both	14.6 (n/a)	15.2 (+ 0.6)	16.1 (+ 0.8)	17.2 (+ 1.1)	17.2 (+ 0.0)	18.2 (+ 1.0)	+ 1.4 % (p<.01)	22	+ 3.5 (28)	+ 24.2 % (31)
	Male	25.1 (n/a)	25.4 (+ 0.3)	26.8 (+ 1.3)	28.0 (+ 1.2)	28.6 (+ 0.6)	29.8 (+ 1.2)	+ 1.2 % (p<.01)			
	Female	5.4 (n/a)	6.3 (+ 0.9)	6.7 (+ 0.4)	7.5 (+ 0.8)	6.9 (- 0.6)	7.6 (+ 0.7)	+ 1.9 % (p<.05)			
TX	Both	12.2 (n/a)	12.7 (+ 0.6)	12.3 (- 0.4)	13.2 (+ 0.9)	13.6 (+ 0.3)	14.5 (+ 0.9)	+ 1.1 % (p<.01)	41	+ 2.3 (37)	+ 18.9 % (36)
	Male	20.4 (n/a)	20.9 (+ 0.5)	20.4 (- 0.6)	22.0 (+ 1.6)	22.2 (+ 0.3)	23.1 (+ 0.9)	+ 0.9 % (p<.05)			
	Female	4.8 (n/a)	5.4 (+ 0.6)	5.0 (- 0.4)	5.2 (+ 0.2)	5.6 (+ 0.4)	6.4 (+ 0.8)	+ 1.6 % (p<.05)			
UT	Both	17.2 (n/a)	19.0 (+ 1.8)	18.2 (- 0.7)	20.2 (+ 2.0)	24.0 (+ 3.8)	25.2 (+ 1.2)	+ 2.7 % (p<.01)	5	+ 8.0 ( 3 ¶¶)	+ 46.5 % ( 4 ¶¶)
	Male	28.2 (n/a)	31.1 (+ 2.9)	29.4 (- 1.7)	32.1 (+ 2.7)	37.8 (+ 5.7)	38.0 (+ 0.2)	+ 2.1 % (p<.05)			
	Female	6.8 (n/a)	7.4 (+ 0.6)	7.5 (+ 0.1)	8.5 (+ 1.0)	10.6 (+ 2.1)	12.6 (+ 2.0)	+ 4.4 % (p<.01)			
VT	Both	13.2 (n/a)	16.2 (+ 3.0)	14.9 (- 1.3)	16.6 (+ 1.7)	18.7 (+ 2.1)	19.7 (+ 1.0)	+ 2.4 % (p<.01)	18	+ 6.4 ( 9)	+ 48.6 % ( 2)
	Male	23.6 (n/a)	28.3 (+ 4.6)	24.3 (- 4.0)	27.3 (+ 3.0)	31.0 (+ 3.7)	32.5 (+ 1.5)	+ 1.9 % (p<.05)			
	Female	4.3 (n/a)	5.2 (+ 0.9)	6.4 (+ 1.3)	6.6 (+ 0.2)	7.3 (+ 0.7)	7.6 (+ 0.3)	+ 3.8 % (p<.01)			
VA	Both	12.8 (n/a)	12.7 (- 0.1)	12.9 (+ 0.3)	13.6 (+ 0.7)	14.6 (+ 0.9)	15.0 (+ 0.5)	+ 1.2 % (p<.01)	37	+ 2.2 (39)	+ 17.4 % (41)
	Male	21.6 (n/a)	21.3 (- 0.2)	21.0 (- 0.4)	22.5 (+ 1.5)	23.6 (+ 1.2)	23.9 (+ 0.2)	+ 0.9 % (p<.05)			
	Female	5.3 (n/a)	5.2 (- 0.1)	5.9 (+ 0.7)	5.6 (- 0.3)	6.4 (+ 0.8)	6.9 (+ 0.5)	+ 1.8 % (p<.05)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.



### Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, 1999 – 2016

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
WA	Both	14.8 (n/a)	15.4 (+ 0.5)	14.8 (- 0.6)	15.7 (+ 0.9)	16.6 (+ 0.9)	17.6 (+ 1.0)	+ 1.1 % (p<.05)	24	+ 2.8 (33)	+ 18.8 % (37)
	Male	24.7 (n/a)	25.2 (+ 0.5)	24.1 (- 1.1)	25.1 (+ 1.0)	26.0 (+ 0.9)	27.1 (+ 1.1)	+ 0.6 % n/s			
	Female	5.9 (n/a)	6.4 (+ 0.6)	6.2 (- 0.2)	6.9 (+ 0.7)	7.7 (+ 0.8)	8.5 (+ 0.8)	+ 2.5 % (p<.01)			
WV	Both	15.6 (n/a)	17.2 (+ 1.6)	16.7 (- 0.5)	16.0 (- 0.7)	19.2 (+ 3.2)	21.4 (+ 2.2)	+ 1.8 % n/s	11	+ 5.8 (13)	+ 37.1 % (14)
	Male	27.2 (n/a)	30.1 (+ 2.9)	28.6 (- 1.5)	27.6 (- 1.0)	31.5 (+ 3.9)	33.5 (+ 2.0)	+ 1.1 % n/s			
	Female	5.3 (n/a)	5.5 (+ 0.1)	5.8 (+ 0.3)	5.3 (- 0.5)	7.6 (+ 2.3)	9.8 (+ 2.2)	+ 3.7 % n/s			
WI	Both	13.1 (n/a)	13.5 (+ 0.4)	14.0 (+ 0.5)	15.0 (+ 1.0)	15.3 (+ 0.3)	16.5 (+ 1.2)	+ 1.5 % (p<.01)	28	+ 3.4 (29)	+ 25.8 % (30)
	Male	21.7 (n/a)	22.2 (+ 0.5)	22.7 (+ 0.5)	24.0 (+ 1.2)	24.4 (+ 0.4)	25.7 (+ 1.3)	+ 1.1 % (p<.01)			
	Female	5.1 (n/a)	5.3 (+ 0.2)	5.6 (+ 0.4)	6.4 (+ 0.7)	6.5 (+ 0.1)	7.5 (+ 1.0)	+ 2.5 % (p<.01)			
WY	Both	20.7 (n/a)	23.4 (+ 2.7)	22.5 (- 0.9)	25.4 (+ 2.8)	28.9 (+ 3.5)	28.8 (- 0.1)	+ 2.3 % (p<.01)	3	+ 8.1 ( 1)	+ 39.0 % ( 9)
	Male	34.8 (n/a)	39.3 (+ 4.5)	36.3 (- 3.0)	41.5 (+ 5.2)	47.1 (+ 5.6)	44.6 (- 2.4)	+ 1.8 % (p<.05)			
	Female	7.7 (n/a)	8.2 (+ 0.6)	9.2 (+ 0.9)	9.4 (+ 0.2)	10.7 (+ 1.4)	12.6 (+ 1.9)	+ 3.2 % (p<.01)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

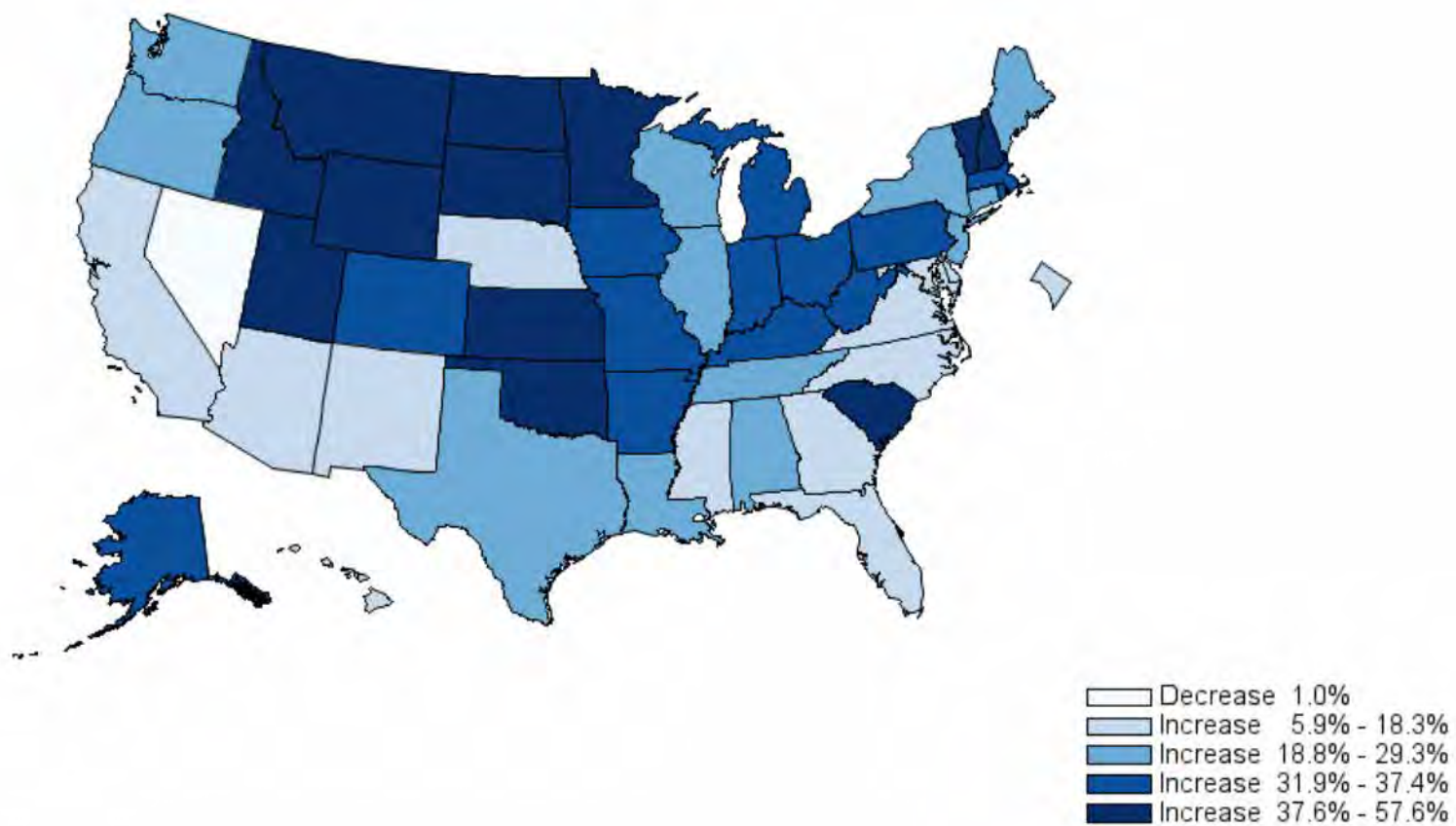
†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.

Figure 1

**Percentage Changes in Annual Suicide Rates (per 100,000, Age-Adjusted)**  
2014-2016 Compared Against 1999-2001





**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank)
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
U.S.	Both	12.3 (n/a)	12.7 (+ 0.4)	12.9 (+ 0.2)	13.8 (+ 0.9)	14.5 (+ 0.8)	15.4 (+ 0.9)	+ 1.5 % (p<.01)	n/a	+ 3.1 (n/a)	+ 25.4 % (n/a)
	Male	20.9 (n/a)	21.2 (+ 0.4)	21.3 (+ 0.0)	22.5 (+1.3)	23.5 (+ 1.0)	24.5 (+ 1.0)	+ 1.1 % (p<.01)			
	Female	4.7 (n/a)	5.0 (+ 0.3)	5.3 (+ 0.2)	5.7 (+ 0.4)	6.2 (+ 0.5)	6.9 (+ 0.7)	+ 2.6 % (p<.01)			
AL	Both	14.3 (n/a)	13.4 (- 0.9)	14.1 (+ 0.6)	15.6 (+ 1.6)	16.4 (+ 0.7)	17.5 (+ 1.1)	+ 1.6 % (p<.05)	25	+ 3.1 (31)	+ 21.9 % (33)
	Male	25.1 (n/a)	23.4 (- 1.7)	24.4 (+ 1.0)	26.4 (+ 2.0)	27.6 (+ 1.1)	29.1 (+ 1.5)	+ 1.3 % (p<.05)			
	Female	5.1 (n/a)	4.8 (- 0.3)	5.0 (+ 0.2)	6.1 (+ 1.1)	6.4 (+ 0.3)	7.0 (+ 0.7)	+ 2.6 % (p<.01)			
AK	Both	21.0 (n/a)	24.8 (+ 3.8)	24.2 (- 0.6)	26.0 (+ 1.7)	25.4 (- 0.5)	28.8 (+ 3.4)	+ 1.7 % (p<.05)	2	+ 7.8 ( 4)	+ 37.4 % (13)
	Male	33.2 (n/a)	38.1 (+ 4.9)	38.9 (+ 0.8)	40.1 (+ 1.2)	40.1 (- 0.1)	42.9 (+ 2.8)	+ 1.4 % (p<.01)			
	Female	8.6 (n/a)	11.4 (+ 2.9)	9.8 (- 1.6)	11.1 (+ 1.2)	9.9 (- 1.2)	13.2 (+ 3.4)	+ 1.7 % n/s			
AZ	Both	17.8 (n/a)	18.5 (+ 0.7)	19.1 (+ 0.5)	19.1 (- 0.0)	20.4 (+ 1.3)	20.9 (+ 0.5)	+ 1.0 % (p<.01)	15	+ 3.1 (32)	+ 17.3 % (42)
	Male	29.3 (n/a)	30.2 (+ 1.0)	30.6 (+ 0.4)	30.2 (- 0.5)	32.0 (+ 1.9)	32.4 (+ 0.4)	+ 0.6 % (p<.05)			
	Female	7.1 (n/a)	7.5 (+ 0.4)	8.2 (+ 0.7)	8.6 (+ 0.5)	9.2 (+ 0.6)	9.9 (+ 0.6)	+ 2.2 % (p<.01)			
AR	Both	15.5 (n/a)	15.8 (+ 0.3)	16.2 (+ 0.5)	17.6 (+ 1.4)	19.2 (+ 1.6)	21.2 (+ 2.0)	+ 2.2 % (p<.01)	12	+ 5.7 (14)	+ 36.8 % (15)
	Male	26.7 (n/a)	26.7 (+ 0.0)	27.2 (+ 0.5)	28.2 (+ 1.0)	31.7 (+ 3.5)	33.5 (+ 1.9)	+ 1.6 % (p<.05)			
	Female	5.6 (n/a)	5.9 (+ 0.3)	6.2 (+ 0.4)	7.9 (+ 1.7)	7.5 (- 0.4)	9.6 (+ 2.1)	+ 3.6 % (p<.01)			
CA	Both	10.6 (n/a)	11.3 (+ 0.7)	11.0 (- 0.3)	12.0 (+ 1.0)	11.8 (- 0.1)	12.1 (+ 0.3)	+ 0.9 % (p<.05)	45	+ 1.6 (46)	+ 14.8 % (46)
	Male	17.9 (n/a)	18.4 (+ 0.5)	17.7 (- 0.7)	19.1 (+ 1.4)	18.9 (- 0.2)	19.2 (+ 0.3)	+ 0.5 % n/s			
	Female	4.1 (n/a)	5.0 (+ 0.9)	4.9 (- 0.1)	5.4 (+ 0.5)	5.3 (- 0.1)	5.6 (+ 0.3)	+ 1.7 % (p<.05)			
CO	Both	17.3 (n/a)	19.2 (+ 1.9)	19.0 (- 0.2)	20.0 (+ 1.0)	21.6 (+ 1.5)	23.2 (+ 1.6)	+ 1.8 % (p<.01)	8	+ 5.9 (12)	+ 34.1 % (22)
	Male	28.6 (n/a)	30.9 (+ 2.3)	30.5 (- 0.4)	31.5 (+ 1.0)	33.4 (+ 1.9)	36.3 (+ 2.9)	+ 1.4 % (p<.01)			
	Female	7.0 (n/a)	8.2 (+ 1.3)	8.2 (+ 0.0)	9.1 (+ 0.9)	10.1 (+ 1.0)	10.4 (+ 0.3)	+ 2.6 % (p<.01)			
CT	Both	9.6 (n/a)	8.9 (- 0.7)	9.1 (+ 0.2)	10.2 (+ 1.1)	11.0 (+ 0.8)	11.5 (+ 0.5)	+ 1.6 % (p<.05)	46	+ 1.9 (43)	+ 19.2 % (34)
	Male	16.4 (n/a)	14.6 (- 1.8)	15.0 (+ 0.4)	16.6 (+ 1.6)	17.6 (+ 1.0)	17.3 (- 0.3)	+ 0.9 % n/s			
	Female	3.6 (n/a)	3.8 (+ 0.2)	3.7 (- 0.2)	4.4 (+ 0.7)	4.9 (+ 0.5)	6.2 (+ 1.3)	+ 3.5 % (p<.05)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.

Comment [HJ]: Insert "National Vital Statistics System"

Comment [HJ]: Consider sorting state abbreviations alphabetically instead of state names.

# Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, 1999 – 2016

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
DE	Both	13.6 (n/a)	13.2 (+ 1.4)	12.9 (- 0.3)	13.0 (+ 1.7)	15.2 (+ 0.6)	16.0 (+ 0.2)	+ 0.9 % (p<.01)	32	+ 0.8 (20)	+ 36.9 % (50)
	Male	20.0 (n/a)	20.3 (+ 2.5)	20.9 (- 0.4)	23.3 (+ 2.2)	22.7 (+ 2.7)	23.5 (+ 0.3)	+ 0.6 % (p<.05)			
	Female	5.3 (n/a)	5.0 (+ 0.2)	4.5 (+ 0.6)	5.9 (+ 0.2)	6.4 (+ 0.6)	6.2 (+ 0.2)	+ 3.6 % (p<.01)			
DS	Both	13.9 (n/a)	16.4 (+ 0.8)	15.4 (+ 0.7)	15.3 (+ 0.8)	15.5 (+ 2.7)	10.9 (+ 0.6)	+ 0.2 % (p<.01)	59	+ 6.0 (48)	+ 46.0 % (45)
	Male	20.7 (n/a)	25.0 (+ 0.3)	26.5 (+ 0.5)	25.5 (+ 2.9)	29.0 (+ 2.5)	30.7 (+ 1.6)	+ 0.9 % (p<.01)			
	Female	14.0 (n/a)††	2.8 (- 0.6)††	3.3 (+ 0.3)	2.8 (- 0.3)	6.6 (+ 1.0)	2.4 (+ 0.8)	+ 3.2 % (p<.05)			
KY	Both	14.3 (n/a)	15.2 (+ 0.3)	14.9 (+ 0.3)	16.2 (+ 0.3)	18.2 (+ 2.0)	10.3 (+ 0.1)	+ 0.9 % (p<.05)	29	+ 5.8 (46)	+ 30.6 % (48)
	Male	25.0 (n/a)	26.8 (+ 0.9)	28.5 (+ 0.8)	27.2 (+ 2.6)	35.6 (+ 2.6)	35.5 (+ 0.6)	+ 0.5 % (p<.01)			
	Female	6.8 (n/a)	6.8 (+ 0.5)	6.8 (+ 0.8)	6.1 (+ 0.3)	7.6 (+ 0.9)	7.8 (+ 0.6)	+ 3.2 % (p<.01)			
GA	Both	12.9 (n/a)	12.9 (+ 0.2)	12.4 (+ 0.4)	13.0 (+ 0.9)	13.7 (+ 0.8)	13.0 (+ 2.5)	+ 0.0 % (p<.05)	20	+ 2.3 (20)	+ 20.2 % (26)
	Male	22.9 (n/a)	22.3 (+ 0.6)	22.4 (+ 0.8)	23.9 (+ 0.6)	23.6 (+ 0.3)	27.3 (+ 3.6)	+ 0.5 % n/s			
	Female	5.0 (n/a)	4.8 (- 0.2)	4.2 (+ 0.2)	4.5 (+ 0.2)	6.8 (+ 0.2)	6.6 (+ 0.8)	+ 2.8 % (p<.05)			
ME	Both	12.9 (n/a)	13.6 (- 0.8)	14.4 (+ 0.3)	15.5 (+ 4.0)	18.4 (+ 3.5)	15.3 (+ 0.4)	+ 2.0 % (p<.05)	25	+ 2.0 (25)	+ 28.3 % (20)
	Male	20.0 (n/a)	22.2 (- 2.1)	24.6 (+ 1.9)	25.9 (+ 6.7)	32.5 (+ 6.6)	29.3 (+ 1.3)	+ 2.8 % (p<.05)			
	Female	5.3 (n/a)	5.0 (- 0.0)	5.2 (+ 0.5)	6.0 (+ 0.3)	6.2 (+ 0.6)	5.9 (+ 0.3)	+ 3.2 % (p<.05)			
MD	Both	10.0 (n/a)	10.2 (+ 0.0)	10.3 (- 0.2)	20.0 (+ 0.3)	20.9 (+ 0.5)	20.8 (+ 0.3)	+ 0.5 % (p<.05)	40 §§	+ 0.8 (46)§§	+ 43.5% (49)¶¶
	Male	28.6 (n/a)	32.8 (+ 0.7)	37.3 (- 0.6)	37.9 (+ 0.8)	38.2 (+ 0.2)	38.0 (+ 3.2)	+ 0.8 % (p<.05)			
	Female	3.2 (n/a)	3.8 (+ 0.4)	6.9 (+ 0.0)	3.7 (+ 2.2)	0.5 (+ 0.4)	14.8 (+ 0.3)	+ 4.3 % (p<.05)			
MA	Both	9.0 (n/a)	9.6 (+ 0.2)	9.7 (+ 0.8)	10.6 (+ 0.8)	19.2 (+ 0.6)	10.0 (+ 0.0)	+ 2.5 % (p<.05)	48	+ 2.6 (38)¶¶	+ 38.2% (40)¶¶
	Male	12.1 (n/a)	12.8 (+ 0.7)	15.2 (+ 0.6)	15.6 (+ 2.4)	15.2 (+ 0.2)	10.8 (+ 0.8)	+ 2.0 % (p<.05)			
	Female	3.3 (n/a)	2.0 (- 0.0)	3.0 (+ 0.0)	4.2 (+ 0.4)	4.6 (+ 0.0)	4.2 (+ 0.2)	+ 2.0 % (p<.05)			
WI	Both	13.0 (n/a)	12.5 (+ 0.7)	12.0 (+ 0.7)	13.9 (+ 0.6)	16.5 (+ 0.7)	13.6 (+ 0.7)	+ 1.9 % (p<.01)	36	+ 3.9 (28)	+ 32.9 % (25)
	Male	20.0 (n/a)	20.2 (+ 0.8)	24.6 (+ 0.2)	22.8 (+ 0.3)	26.9 (+ 2.0)	28.0 (+ 1.0)	+ 1.5 % (p<.01)			
	Female	4.6 (n/a)	5.0 (+ 0.4)	5.0 (+ 0.2)	5.0 (+ 0.6)	6.8 (+ 0.9)	6.6 (+ 0.2)	+ 2.8 % (p<.01)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.



### Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, 1999 – 2016

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
MN	Both	10.7 (n/a)	11.5 (+ 0.9)	12.4 (+ 0.8)	12.9 (+ 0.5)	14.2 (+ 1.3)	15.0 (+ 0.9)	+ 2.3 % (p<.01)	38	+ 4.3 (19)	+ 40.6 % ( 8)
	Male	18.3 (n/a)	19.3 (+ 1.1)	20.4 (+ 1.0)	20.9 (+ 0.6)	22.9 (+ 1.9)	23.3 (+ 0.4)	+ 1.7 % (p<.01)			
	Female	3.6 (n/a)	4.2 (+ 0.6)	4.8 (+ 0.6)	5.1 (+ 0.4)	5.8 (+ 0.6)	6.9 (+ 1.2)	+ 4.2 % (p<.01)			
MS	Both	12.9 (n/a)	14.1 (+ 1.2)	14.7 (+ 0.6)	15.5 (+ 0.8)	15.6 (+ 0.1)	15.2 (- 0.3)	+ 1.1 % (p<.05)	36	+ 2.3 (36)	+ 17.8 % (40)
	Male	22.9 (n/a)	24.6 (+ 1.7)	25.1 (+ 0.6)	26.8 (+ 1.7)	25.9 (- 0.9)	25.3 (- 0.6)	+ 0.7 % n/s			
	Female	4.3 (n/a)	5.0 (+ 0.7)	5.5 (+ 0.5)	5.5 (- 0.0)	6.4 (+ 0.9)	6.2 (- 0.2)	+ 2.4 % (p<.01)			
MO	Both	14.7 (n/a)	14.1 (- 0.6)	15.4 (+ 1.3)	16.0 (+ 0.7)	17.8 (+ 1.7)	20.0 (+ 2.3)	+ 2.2 % (p<.01)	16	+ 5.3 (15)	+ 36.4 % (17)
	Male	25.3 (n/a)	23.7 (- 1.6)	25.6 (+ 1.9)	26.6 (+ 1.0)	28.9 (+ 2.3)	32.2 (+ 3.3)	+ 1.8 % (p<.05)			
	Female	5.4 (n/a)	5.4 (+ 0.1)	6.1 (+ 0.7)	6.3 (+ 0.2)	7.4 (+ 1.1)	8.6 (+ 1.2)	+ 3.2 % (p<.01)			
MT	Both	21.1 (n/a)	22.6 (+ 1.4)	23.6 (+ 1.0)	24.7 (+ 1.1)	26.7 (+ 2.0)	29.2 (+ 2.5)	+ 2.1 % (p<.01)	1	+ 8.0 ( 2)	+ 38.0 % (11)
	Male	36.9 (n/a)	37.3 (+ 0.4)	39.8 (+ 2.5)	39.7 (- 0.1)	41.0 (+ 1.4)	45.5 (+ 4.4)	+ 1.3 % (p<.01)			
	Female	6.7 (n/a)	8.4 (+ 1.8)	8.4 (- 0.1)	10.0 (+ 1.6)	12.6 (+ 2.6)	13.1 (+ 0.5)	+ 4.6 % (p<.01)			
NE	Both	12.7 (n/a)	12.2 (- 0.5)	12.6 (+ 0.4)	11.7 (- 0.8)	13.5 (+ 1.8)	14.8 (+ 1.3)	+ 1.0 % n/s	40	+ 2.1 (42)	+ 16.2 % (43)
	Male	22.2 (n/a)	20.7 (- 1.5)	20.3 (- 0.4)	19.8 (- 0.5)	22.0 (+ 2.2)	23.9 (+ 1.9)	+ 0.6 % n/s			
	Female	3.8 (n/a)	4.2 (+ 0.4)	5.1 (+ 0.9)	4.0 (- 1.1)	5.5 (+ 1.4)	5.8 (+ 0.3)	+ 2.6 % n/s			
NV	Both	23.3 (n/a)	22.6 (- 0.6)	22.1 (- 0.5)	22.6 (+ 0.5)	21.4 (- 1.2)	23.1 (+ 1.6)	- 0.2 % n/s	9	- 0.2 (51)	- 1.0 % (51)
	Male	38.3 (n/a)	36.7 (- 1.7)	35.1 (- 1.6)	35.6 (+ 0.5)	32.5 (- 3.0)	35.4 (+ 2.8)	- 0.7 % n/s			
	Female	8.9 (n/a)	9.5 (+ 0.5)	9.6 (+ 0.1)	10.0 (+ 0.4)	10.6 (+ 0.6)	11.2 (+ 0.6)	+ 1.5 % (p<.01)			
NH	Both	13.5 (n/a)	12.5 (- 1.0)	13.3 (+ 0.8)	15.2 (+ 1.9)	15.8 (+ 0.6)	20.0 (+ 4.2)	+ 2.7 % (p<.05)	17	+ 6.5 ( 8)	+ 48.3 % ( 3)
	Male	22.5 (n/a)	21.1 (- 1.4)	21.7 (+ 0.6)	24.8 (+ 3.1)	25.4 (+ 0.6)	30.6 (+ 5.2)	+ 2.2 % (p<.05)			
	Female	5.3 (n/a)	4.8 (- 0.5)	5.9 (+ 1.0)	6.2 (+ 0.4)	6.6 (+ 0.4)	9.8 (+ 3.2)	+ 3.9 % (p<.05)			
NJ	Both	7.8 (n/a)	7.7 (- 0.1)	7.5 (- 0.2)	8.0 (+ 0.5)	8.9 (+ 0.9)	9.2 (+ 0.4)	+ 1.3 % (p<.05)	50	+ 1.5 (47)	+ 19.2 % (35)
	Male	13.0 (n/a)	13.1 (+ 0.0)	12.6 (- 0.5)	13.7 (+ 1.1)	14.5 (+ 0.8)	14.6 (+ 0.1)	+ 0.9 % (p<.05)			
	Female	3.2 (n/a)	2.9 (- 0.3)	3.0 (+ 0.0)	2.9 (- 0.1)	3.8 (+ 0.9)	4.4 (+ 0.6)	+ 2.3 % n/s			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.

### Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, 1999 – 2016

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
NM	Both	22.0 (n/a)	22.0 (- 0.1)	21.8 (- 0.2)	23.0 (+ 1.2)	24.1 (+ 1.1)	26.0 (+ 1.9)	+ 1.1 % (p<.05)	4	+ 4.0 (24)	+ 18.3 % (39)
	Male	36.8 (n/a)	37.7 (+ 0.9)	36.4 (- 1.2)	35.8 (- 0.6)	37.1 (+ 1.3)	40.7 (+ 3.6)	+ 0.4 % n/s			
	Female	8.5 (n/a)	7.4 (- 1.1)	8.2 (+ 0.7)	10.7 (+ 2.6)	11.7 (+ 0.9)	12.0 (+ 0.3)	+ 3.3 % (p<.05)			
NY	Both	7.2 (n/a)	7.1 (- 0.1)	7.7 (+ 0.6)	8.4 (+ 0.8)	9.5 (+ 1.1)	9.3 (- 0.1)	+ 2.1 % (p<.01)	49	+ 2.1 (41)	+ 28.8 % (27)
	Male	12.5 (n/a)	12.2 (- 0.3)	12.9 (+ 0.7)	13.9 (+ 1.0)	15.4 (+ 1.4)	14.5 (- 0.9)	+ 1.4 % (p<.05)			
	Female	2.7 (n/a)	2.6 (- 0.1)	3.0 (+ 0.3)	3.5 (+ 0.5)	4.2 (+ 0.7)	4.6 (+ 0.5)	+ 4.2 % (p<.01)			
NC	Both	13.6 (n/a)	13.5 (- 0.1)	13.7 (+ 0.1)	14.2 (+ 0.5)	14.5 (+ 0.4)	15.3 (+ 0.8)	+ 0.8 % (p<.01)	34	+ 1.7 (44)	+ 12.7 % (47)
	Male	22.7 (n/a)	22.7 (+ 0.0)	22.2 (- 0.6)	23.3 (+ 1.1)	23.3 (+ 0.0)	23.9 (+ 0.6)	+ 0.4 % n/s			
	Female	5.6 (n/a)	5.5 (- 0.2)	6.2 (+ 0.8)	6.0 (- 0.2)	6.7 (+ 0.7)	7.6 (+ 0.9)	+ 2.0 % (p<.05)			
ND	Both	13.3 (n/a)	14.6 (+ 1.3)	16.0 (+ 1.4)	16.6 (+ 0.6)	18.4 (+ 1.9)	20.9 (+ 2.5)	+ 2.9 % (p<.01)	14	+ 7.6 ( 5)	+ 57.6 % ( 1)
	Male	21.4 (n/a)	24.6 (+ 3.2)	28.0 (+ 3.4)	27.1 (- 0.9)	29.6 (+ 2.5)	32.7 (+ 3.0)	+ 2.5 % (p<.01)			
	Female	5.6 (n/a)	4.5 (- 1.0)	3.7 (- 0.8)	5.7 (+ 2.0)	6.7 (+ 1.0)	8.5 (+ 1.8)	+ 3.9 % n/s			
OH	Both	11.6 (n/a)	12.3 (+ 0.8)	13.1 (+ 0.8)	13.4 (+ 0.2)	14.8 (+ 1.4)	15.8 (+ 1.0)	+ 2.0 % (p<.01)	32	+ 4.2 (21)	+ 36.0 % (19)
	Male	20.4 (n/a)	20.9 (+ 0.5)	22.2 (+ 1.3)	22.1 (- 0.1)	24.2 (+ 2.1)	25.5 (+ 1.3)	+ 1.5 % (p<.01)			
	Female	4.0 (n/a)	4.7 (+ 0.7)	4.9 (+ 0.1)	5.3 (+ 0.5)	6.2 (+ 0.9)	6.7 (+ 0.6)	+ 3.4 % (p<.01)			
OK	Both	17.0 (n/a)	16.5 (- 0.6)	17.2 (+ 0.8)	18.4 (+ 1.1)	20.7 (+ 2.3)	23.5 (+ 2.8)	+ 2.3 % (p<.05)	7	+ 6.4 (10)	+ 37.6 % (12)
	Male	28.5 (n/a)	27.3 (- 1.2)	27.8 (+ 0.5)	30.3 (+ 2.5)	33.4 (+ 3.1)	37.3 (+ 3.8)	+ 2.0 % (p<.05)			
	Female	6.6 (n/a)	6.4 (- 0.2)	7.5 (+ 1.1)	7.0 (- 0.5)	8.5 (+ 1.6)	10.3 (+ 1.8)	+ 2.9 % (p<.05)			
OR	Both	16.4 (n/a)	17.7 (+ 1.3)	17.7 (- 0.0)	18.6 (+ 0.9)	19.8 (+ 1.2)	21.1 (+ 1.3)	+ 1.6 % (p<.01)	13	+ 4.6 (18)	+ 28.2 % (28)
	Male	27.4 (n/a)	29.5 (+ 2.1)	28.5 (- 0.9)	29.5 (+ 1.0)	31.4 (+ 1.8)	33.0 (+ 1.6)	+ 1.1 % (p<.01)			
	Female	6.5 (n/a)	7.1 (+ 0.6)	7.7 (+ 0.6)	8.4 (+ 0.7)	8.8 (+ 0.4)	9.8 (+ 0.9)	+ 2.7 % (p<.01)			
PA	Both	12.1 (n/a)	12.5 (+ 0.4)	12.8 (+ 0.3)	13.9 (+ 1.1)	15.0 (+ 1.1)	16.3 (+ 1.2)	+ 2.0 % (p<.01)	30	+ 4.1 (22)	+ 34.3 % (21)
	Male	21.0 (n/a)	21.3 (+ 0.3)	21.9 (+ 0.6)	23.1 (+ 1.2)	24.7 (+ 1.7)	26.1 (+ 1.3)	+ 1.5 % (p<.01)			
	Female	4.2 (n/a)	4.6 (+ 0.3)	4.6 (+ 0.0)	5.4 (+ 0.9)	6.0 (+ 0.6)	7.1 (+ 1.1)	+ 3.5 % (p<.01)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.



### Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, 1999 – 2016

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
RI	Both	9.4 (n/a)	9.0 (- 0.3)	9.0 (- 0.0)	12.8 (+ 3.8)	11.9 (- 0.9)	12.6 (+ 0.7)	+ 2.6 % (p<.05)	43	+ 3.2 (30 ¶¶)	+ 34.1 % (23 ¶¶)
	Male	15.4 (n/a)	15.2 (- 0.2)	14.8 (- 0.3)	21.2 (+ 6.4)	19.2 (- 2.0)	19.6 (+ 0.4)	+ 2.2 % n/s			
	Female	4.0 (n/a)	3.3 (- 0.7)	3.8 (+ 0.4)	5.1 (+ 1.3)	5.1 (+ 0.0)	6.1 (+ 1.0)	+ 3.7 % (p<.05)			
SC	Both	12.8 (n/a)	13.0 (+ 0.2)	13.7 (+ 0.7)	14.9 (+ 1.2)	16.0 (+ 1.1)	17.7 (+ 1.7)	+ 2.3 % (p<.01)	23	+ 4.9 (17)	+ 38.3 % (10)
	Male	21.3 (n/a)	22.5 (+ 1.2)	22.3 (- 0.1)	24.6 (+ 2.2)	26.1 (+ 1.5)	28.0 (+ 1.9)	+ 1.8 % (p<.01)			
	Female	5.4 (n/a)	4.7 (- 0.7)	6.0 (+ 1.3)	6.2 (+ 0.2)	7.0 (+ 0.8)	8.4 (+ 1.4)	+ 3.4 % (p<.05)			
SD	Both	15.7 (n/a)	15.8 (+ 0.1)	17.1 (+ 1.3)	19.3 (+ 2.2)	19.7 (+ 0.4)	22.6 (+ 2.9)	+ 2.5 % (p<.01)	10	+ 7.0 ( 7)	+ 44.5 % ( 6)
	Male	27.6 (n/a)	26.3 (- 1.3)	27.9 (+ 1.6)	30.1 (+ 2.2)	32.0 (+ 1.9)	33.6 (+ 1.6)	+ 1.6 % (p<.01)			
	Female	4.2 (n/a)	5.8 (+ 1.6)	6.4 (+ 0.6)	8.3 (+ 2.0)	7.3 (- 1.0)	11.3 (+ 4.0)	+ 5.8 % (p<.01)			
TN	Both	14.6 (n/a)	15.2 (+ 0.6)	16.1 (+ 0.8)	17.2 (+ 1.1)	17.2 (+ 0.0)	18.2 (+ 1.0)	+ 1.4 % (p<.01)	22	+ 3.5 (28)	+ 24.2 % (31)
	Male	25.1 (n/a)	25.4 (+ 0.3)	26.8 (+ 1.3)	28.0 (+ 1.2)	28.6 (+ 0.6)	29.8 (+ 1.2)	+ 1.2 % (p<.01)			
	Female	5.4 (n/a)	6.3 (+ 0.9)	6.7 (+ 0.4)	7.5 (+ 0.8)	6.9 (- 0.6)	7.6 (+ 0.7)	+ 1.9 % (p<.05)			
TX	Both	12.2 (n/a)	12.7 (+ 0.6)	12.3 (- 0.4)	13.2 (+ 0.9)	13.6 (+ 0.3)	14.5 (+ 0.9)	+ 1.1 % (p<.01)	41	+ 2.3 (37)	+ 18.9 % (36)
	Male	20.4 (n/a)	20.9 (+ 0.5)	20.4 (- 0.6)	22.0 (+ 1.6)	22.2 (+ 0.3)	23.1 (+ 0.9)	+ 0.9 % (p<.05)			
	Female	4.8 (n/a)	5.4 (+ 0.6)	5.0 (- 0.4)	5.2 (+ 0.2)	5.6 (+ 0.4)	6.4 (+ 0.8)	+ 1.6 % (p<.05)			
UT	Both	17.2 (n/a)	19.0 (+ 1.8)	18.2 (- 0.7)	20.2 (+ 2.0)	24.0 (+ 3.8)	25.2 (+ 1.2)	+ 2.7 % (p<.01)	5	+ 8.0 ( 3 ¶¶)	+ 46.5 % ( 4 ¶¶)
	Male	28.2 (n/a)	31.1 (+ 2.9)	29.4 (- 1.7)	32.1 (+ 2.7)	37.8 (+ 5.7)	38.0 (+ 0.2)	+ 2.1 % (p<.05)			
	Female	6.8 (n/a)	7.4 (+ 0.6)	7.5 (+ 0.1)	8.5 (+ 1.0)	10.6 (+ 2.1)	12.6 (+ 2.0)	+ 4.4 % (p<.01)			
VT	Both	13.2 (n/a)	16.2 (+ 3.0)	14.9 (- 1.3)	16.6 (+ 1.7)	18.7 (+ 2.1)	19.7 (+ 1.0)	+ 2.4 % (p<.01)	18	+ 6.4 ( 9)	+ 48.6 % ( 2)
	Male	23.6 (n/a)	28.3 (+ 4.6)	24.3 (- 4.0)	27.3 (+ 3.0)	31.0 (+ 3.7)	32.5 (+ 1.5)	+ 1.9 % (p<.05)			
	Female	4.3 (n/a)	5.2 (+ 0.9)	6.4 (+ 1.3)	6.6 (+ 0.2)	7.3 (+ 0.7)	7.6 (+ 0.3)	+ 3.8 % (p<.01)			
VA	Both	12.8 (n/a)	12.7 (- 0.1)	12.9 (+ 0.3)	13.6 (+ 0.7)	14.6 (+ 0.9)	15.0 (+ 0.5)	+ 1.2 % (p<.01)	37	+ 2.2 (39)	+ 17.4 % (41)
	Male	21.6 (n/a)	21.3 (- 0.2)	21.0 (- 0.4)	22.5 (+ 1.5)	23.6 (+ 1.2)	23.9 (+ 0.2)	+ 0.9 % (p<.05)			
	Female	5.3 (n/a)	5.2 (- 0.1)	5.9 (+ 0.7)	5.6 (- 0.3)	6.4 (+ 0.8)	6.9 (+ 0.5)	+ 1.8 % (p<.05)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.

### Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, 1999 – 2016

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
WA	Both	14.8 (n/a)	15.4 (+ 0.5)	14.8 (- 0.6)	15.7 (+ 0.9)	16.6 (+ 0.9)	17.6 (+ 1.0)	+ 1.1 % (p<.05)	24	+ 2.8 (33)	+ 18.8 % (37)
	Male	24.7 (n/a)	25.2 (+ 0.5)	24.1 (- 1.1)	25.1 (+ 1.0)	26.0 (+ 0.9)	27.1 (+ 1.1)	+ 0.6 % n/s			
	Female	5.9 (n/a)	6.4 (+ 0.6)	6.2 (- 0.2)	6.9 (+ 0.7)	7.7 (+ 0.8)	8.5 (+ 0.8)	+ 2.5 % (p<.01)			
WV	Both	15.6 (n/a)	17.2 (+ 1.6)	16.7 (- 0.5)	16.0 (- 0.7)	19.2 (+ 3.2)	21.4 (+ 2.2)	+ 1.8 % n/s	11	+ 5.8 (13)	+ 37.1 % (14)
	Male	27.2 (n/a)	30.1 (+ 2.9)	28.6 (- 1.5)	27.6 (- 1.0)	31.5 (+ 3.9)	33.5 (+ 2.0)	+ 1.1 % n/s			
	Female	5.3 (n/a)	5.5 (+ 0.1)	5.8 (+ 0.3)	5.3 (- 0.5)	7.6 (+ 2.3)	9.8 (+ 2.2)	+ 3.7 % n/s			
WI	Both	13.1 (n/a)	13.5 (+ 0.4)	14.0 (+ 0.5)	15.0 (+ 1.0)	15.3 (+ 0.3)	16.5 (+ 1.2)	+ 1.5 % (p<.01)	28	+ 3.4 (29)	+ 25.8 % (30)
	Male	21.7 (n/a)	22.2 (+ 0.5)	22.7 (+ 0.5)	24.0 (+ 1.2)	24.4 (+ 0.4)	25.7 (+ 1.3)	+ 1.1 % (p<.01)			
	Female	5.1 (n/a)	5.3 (+ 0.2)	5.6 (+ 0.4)	6.4 (+ 0.7)	6.5 (+ 0.1)	7.5 (+ 1.0)	+ 2.5 % (p<.01)			
WY	Both	20.7 (n/a)	23.4 (+ 2.7)	22.5 (- 0.9)	25.4 (+ 2.8)	28.9 (+ 3.5)	28.8 (- 0.1)	+ 2.3 % (p<.01)	3	+ 8.1 ( 1)	+ 39.0 % ( 9)
	Male	34.8 (n/a)	39.3 (+ 4.5)	36.3 (- 3.0)	41.5 (+ 5.2)	47.1 (+ 5.6)	44.6 (- 2.4)	+ 1.8 % (p<.05)			
	Female	7.7 (n/a)	8.2 (+ 0.6)	9.2 (+ 0.9)	9.4 (+ 0.2)	10.7 (+ 1.4)	12.6 (+ 1.9)	+ 3.2 % (p<.01)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

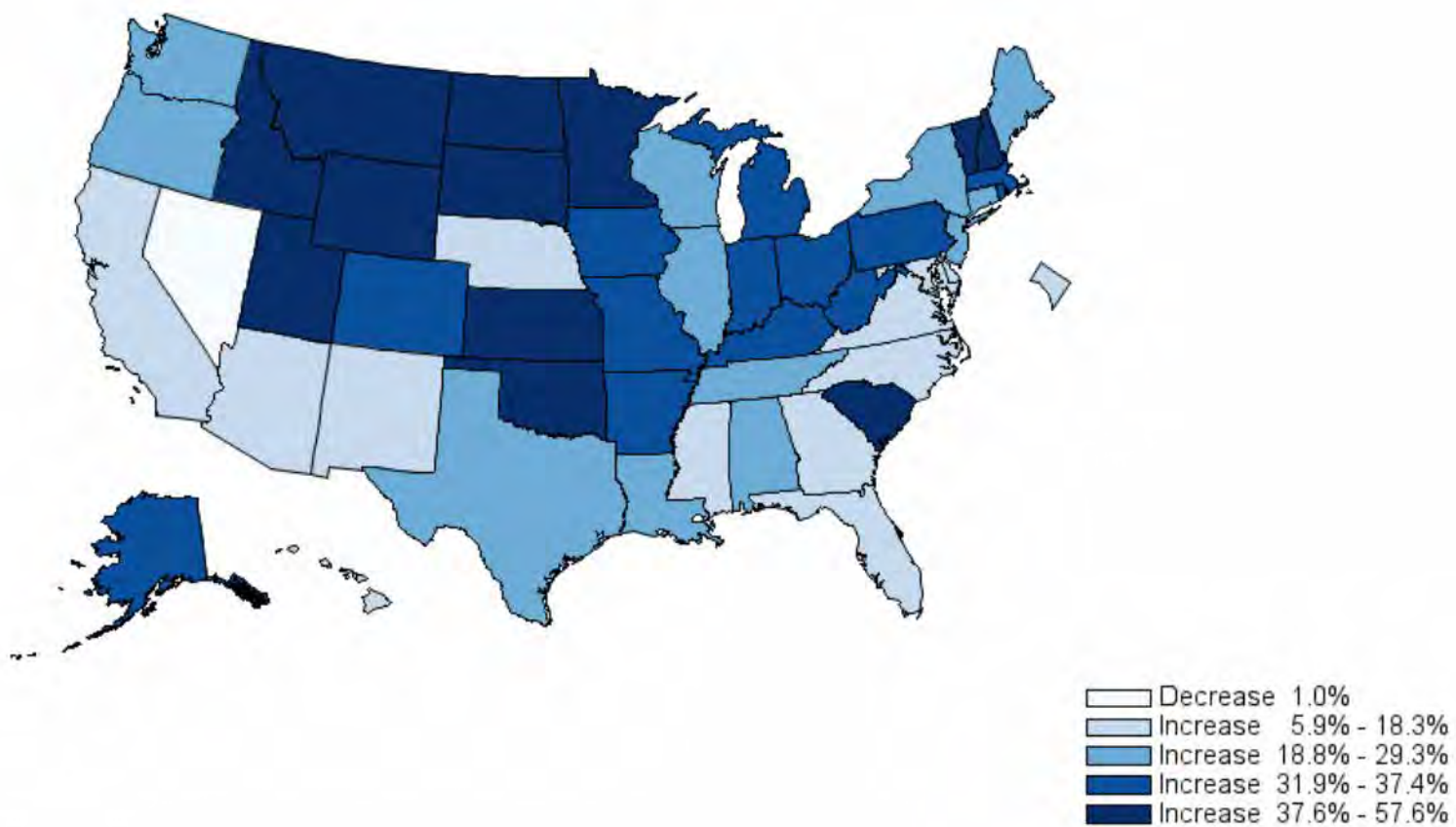
§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.



Figure 1

**Percentage Changes in Annual Suicide Rates (per 100,000, Age-Adjusted)**  
2014-2016 Compared Against 1999-2001



**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
U.S.	Both	12.3 (n/a)	12.7 (+ 0.4)	12.9 (+ 0.2)	13.8 (+ 0.9)	14.5 (+ 0.8)	15.4 (+ 0.9)	+ 1.5 % (p<.01)	n/a	+ 3.1 (n/a)	+ 25.4 % (n/a)
	Male	20.9 (n/a)	21.2 (+ 0.4)	21.3 (+ 0.0)	22.5 (+1.3)	23.5 (+ 1.0)	24.5 (+ 1.0)	+ 1.1 % (p<.01)			
	Female	4.7 (n/a)	5.0 (+ 0.3)	5.3 (+ 0.2)	5.7 (+ 0.4)	6.2 (+ 0.5)	6.9 (+ 0.7)	+ 2.6 % (p<.01)			
AL	Both	14.3 (n/a)	13.4 (- 0.9)	14.1 (+ 0.6)	15.6 (+ 1.6)	16.4 (+ 0.7)	17.5 (+ 1.1)	+ 1.6 % (p<.05)	25	+ 3.1 (31)	+ 21.9 % (33)
	Male	25.1 (n/a)	23.4 (- 1.7)	24.4 (+ 1.0)	26.4 (+ 2.0)	27.6 (+ 1.1)	29.1 (+ 1.5)	+ 1.3 % (p<.05)			
	Female	5.1 (n/a)	4.8 (- 0.3)	5.0 (+ 0.2)	6.1 (+ 1.1)	6.4 (+ 0.3)	7.0 (+ 0.7)	+ 2.6 % (p<.01)			
AK	Both	21.0 (n/a)	24.8 (+ 3.8)	24.2 (- 0.6)	26.0 (+ 1.7)	25.4 (- 0.5)	28.8 (+ 3.4)	+ 1.7 % (p<.05)	2	+ 7.8 ( 4)	+ 37.4 % (13)
	Male	33.2 (n/a)	38.1 (+ 4.9)	38.9 (+ 0.8)	40.1 (+ 1.2)	40.1 (- 0.1)	42.9 (+ 2.8)	+ 1.4 % (p<.01)			
	Female	8.6 (n/a)	11.4 (+ 2.9)	9.8 (- 1.6)	11.1 (+ 1.2)	9.9 (- 1.2)	13.2 (+ 3.4)	+ 1.7 % n/s			
AZ	Both	17.8 (n/a)	18.5 (+ 0.7)	19.1 (+ 0.5)	19.1 (- 0.0)	20.4 (+ 1.3)	20.9 (+ 0.5)	+ 1.0 % (p<.01)	15	+ 3.1 (32)	+ 17.3 % (42)
	Male	29.3 (n/a)	30.2 (+ 1.0)	30.6 (+ 0.4)	30.2 (- 0.5)	32.0 (+ 1.9)	32.4 (+ 0.4)	+ 0.6 % (p<.05)			
	Female	7.1 (n/a)	7.5 (+ 0.4)	8.2 (+ 0.7)	8.6 (+ 0.5)	9.2 (+ 0.6)	9.9 (+ 0.6)	+ 2.2 % (p<.01)			
AR	Both	15.5 (n/a)	15.8 (+ 0.3)	16.2 (+ 0.5)	17.6 (+ 1.4)	19.2 (+ 1.6)	21.2 (+ 2.0)	+ 2.2 % (p<.01)	12	+ 5.7 (14)	+ 36.8 % (15)
	Male	26.7 (n/a)	26.7 (+ 0.0)	27.2 (+ 0.5)	28.2 (+ 1.0)	31.7 (+ 3.5)	33.5 (+ 1.9)	+ 1.6 % (p<.05)			
	Female	5.6 (n/a)	5.9 (+ 0.3)	6.2 (+ 0.4)	7.9 (+ 1.7)	7.5 (- 0.4)	9.6 (+ 2.1)	+ 3.6 % (p<.01)			
CA	Both	10.6 (n/a)	11.3 (+ 0.7)	11.0 (- 0.3)	12.0 (+ 1.0)	11.8 (- 0.1)	12.1 (+ 0.3)	+ 0.9 % (p<.05)	45	+ 1.6 (46)	+ 14.8 % (46)
	Male	17.9 (n/a)	18.4 (+ 0.5)	17.7 (- 0.7)	19.1 (+ 1.4)	18.9 (- 0.2)	19.2 (+ 0.3)	+ 0.5 % n/s			
	Female	4.1 (n/a)	5.0 (+ 0.9)	4.9 (- 0.1)	5.4 (+ 0.5)	5.3 (- 0.1)	5.6 (+ 0.3)	+ 1.7 % (p<.05)			
CO	Both	17.3 (n/a)	19.2 (+ 1.9)	19.0 (- 0.2)	20.0 (+ 1.0)	21.6 (+ 1.5)	23.2 (+ 1.6)	+ 1.8 % (p<.01)	8	+ 5.9 (12)	+ 34.1 % (22)
	Male	28.6 (n/a)	30.9 (+ 2.3)	30.5 (- 0.4)	31.5 (+ 1.0)	33.4 (+ 1.9)	36.3 (+ 2.9)	+ 1.4 % (p<.01)			
	Female	7.0 (n/a)	8.2 (+ 1.3)	8.2 (+ 0.0)	9.1 (+ 0.9)	10.1 (+ 1.0)	10.4 (+ 0.3)	+ 2.6 % (p<.01)			
CT	Both	9.6 (n/a)	8.9 (- 0.7)	9.1 (+ 0.2)	10.2 (+ 1.1)	11.0 (+ 0.8)	11.5 (+ 0.5)	+ 1.6 % (p<.05)	46	+ 1.9 (43)	+ 19.2 % (34)
	Male	16.4 (n/a)	14.6 (- 1.8)	15.0 (+ 0.4)	16.6 (+ 1.6)	17.6 (+ 1.0)	17.3 (- 0.3)	+ 0.9 % n/s			
	Female	3.6 (n/a)	3.8 (+ 0.2)	3.7 (- 0.2)	4.4 (+ 0.7)	4.9 (+ 0.5)	6.2 (+ 1.3)	+ 3.5 % (p<.05)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.



# Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, 1999 – 2016

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
DE	Both	13.6 (n/a)	13.2 (+ 1.4)	12.9 (- 0.3)	13.0 (+ 1.7)	15.2 (+ 0.6)	16.0 (+ 0.2)	+ 0.9 % (p<.01)	32	+ 0.8 (20)	+ 36.2 % (50)
	Male	20.0 (n/a)	20.3 (+ 2.5)	20.9 (- 0.4)	23.3 (+ 2.2)	22.7 (+ 2.7)	23.5 (+ 0.3)	+ 0.6 % (p<.05)			
	Female	5.3 (n/a)	5.0 (+ 0.2)	4.5 (+ 0.6)	5.9 (+ 0.2)	6.4 (+ 0.6)	6.2 (+ 0.2)	+ 3.6 % (p<.01)			
DS	Both	13.9 (n/a)	16.4 (+ 0.8)	15.4 (+ 0.7)	15.3 (+ 0.8)	15.5 (+ 2.7)	10.9 (+ 0.6)	+ 0.2 % (p<.01)	59	+ 6.0 (48)	+ 46.0 % (45)
	Male	20.7 (n/a)	25.0 (+ 0.3)	26.5 (+ 0.5)	25.5 (+ 2.9)	29.0 (+ 2.5)	30.7 (+ 1.6)	+ 0.9 % (p<.01)			
	Female	14.0 (n/a)††	2.8 (- 0.6)††	3.3 (+ 0.3)	2.8 (- 0.3)	6.6 (+ 1.0)	2.4 (+ 0.8)	+ 3.2 % (p<.05)			
KY	Both	14.3 (n/a)	15.2 (+ 0.3)	14.9 (+ 0.3)	16.2 (+ 0.3)	18.2 (+ 2.0)	10.3 (+ 0.1)	+ 0.9 % (p<.05)	29	+ 5.8 (46)	+ 30.6 % (48)
	Male	25.0 (n/a)	26.8 (+ 0.9)	28.5 (+ 0.8)	27.2 (+ 2.6)	35.6 (+ 2.6)	35.5 (+ 0.6)	+ 0.5 % (p<.01)			
	Female	6.8 (n/a)	6.8 (+ 0.5)	6.8 (+ 0.8)	6.1 (+ 0.3)	7.6 (+ 0.9)	7.8 (+ 0.6)	+ 3.2 % (p<.01)			
GA	Both	12.9 (n/a)	12.9 (+ 0.2)	12.4 (+ 0.4)	13.0 (+ 0.9)	13.7 (+ 0.8)	13.0 (+ 2.5)	+ 0.0 % (p<.05)	20	+ 2.3 (20)	+ 20.2 % (26)
	Male	22.9 (n/a)	22.3 (+ 0.6)	22.4 (+ 0.8)	23.9 (+ 0.6)	23.6 (+ 0.3)	27.3 (+ 3.6)	+ 0.5 % n/s			
	Female	5.0 (n/a)	4.8 (- 0.2)	4.2 (+ 0.2)	4.5 (+ 0.2)	6.8 (+ 0.2)	6.6 (+ 0.8)	+ 2.8 % (p<.05)			
ME	Both	12.9 (n/a)	13.6 (- 0.8)	14.4 (+ 0.3)	15.5 (+ 4.0)	18.4 (+ 3.5)	18.3 (+ 0.4)	+ 2.0 % (p<.05)	25	+ 2.0 (25)	+ 28.3 % (20)
	Male	20.0 (n/a)	22.2 (- 2.1)	24.6 (+ 1.9)	25.9 (+ 6.7)	32.5 (+ 6.5)	29.3 (+ 1.3)	+ 2.8 % (p<.05)			
	Female	5.3 (n/a)	5.0 (- 0.0)	5.2 (+ 0.5)	6.0 (+ 0.3)	6.2 (+ 0.6)	5.9 (+ 0.3)	+ 3.2 % (p<.05)			
MD	Both	10.0 (n/a)	10.2 (+ 0.0)	10.3 (- 0.2)	20.0 (+ 0.3)	20.9 (+ 0.5)	20.8 (+ 0.3)	+ 0.5 % (p<.05)	40 §§	+ 0.8 (46)§§	+ 43.5% (49)¶¶
	Male	28.6 (n/a)	32.8 (+ 0.7)	37.3 (- 0.6)	37.9 (+ 0.8)	38.2 (+ 0.2)	38.0 (+ 3.2)	+ 0.8 % (p<.05)			
	Female	3.2 (n/a)	3.8 (+ 0.4)	6.9 (+ 0.0)	3.7 (+ 2.2)	9.5 (+ 0.4)	14.8 (+ 0.3)	+ 4.3 % (p<.05)			
MA	Both	9.9 (n/a)	9.6 (+ 0.2)	9.7 (+ 0.8)	10.6 (+ 0.8)	19.2 (+ 0.6)	10.0 (+ 0.0)	+ 2.5 % (p<.05)	48	+ 2.6 (38)¶¶	+ 38.2% (40)¶¶
	Male	12.1 (n/a)	12.8 (+ 0.7)	15.2 (+ 0.6)	15.6 (+ 2.4)	15.2 (+ 0.2)	10.8 (+ 0.8)	+ 2.0 % (p<.05)			
	Female	3.3 (n/a)	2.0 (- 0.0)	3.0 (+ 0.0)	4.2 (+ 0.4)	4.6 (+ 0.0)	4.2 (+ 0.2)	+ 2.0 % (p<.05)			
WI	Both	13.0 (n/a)	12.5 (+ 0.7)	12.9 (+ 0.7)	13.9 (+ 0.6)	16.5 (+ 0.7)	13.6 (+ 0.7)	+ 1.9 % (p<.01)	36	+ 3.9 (28)	+ 32.9 % (25)
	Male	20.0 (n/a)	20.2 (+ 0.8)	24.6 (+ 0.2)	22.8 (+ 0.3)	26.9 (+ 2.0)	28.0 (+ 1.0)	+ 1.5 % (p<.01)			
	Female	4.6 (n/a)	5.0 (+ 0.4)	5.0 (+ 0.2)	5.0 (+ 0.6)	6.8 (+ 0.9)	6.6 (+ 0.2)	+ 2.8 % (p<.01)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.

### Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, 1999 – 2016

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
MN	Both	10.7 (n/a)	11.5 (+ 0.9)	12.4 (+ 0.8)	12.9 (+ 0.5)	14.2 (+ 1.3)	15.0 (+ 0.9)	+ 2.3 % (p<.01)	38	+ 4.3 (19)	+ 40.6 % ( 8)
	Male	18.3 (n/a)	19.3 (+ 1.1)	20.4 (+ 1.0)	20.9 (+ 0.6)	22.9 (+ 1.9)	23.3 (+ 0.4)	+ 1.7 % (p<.01)			
	Female	3.6 (n/a)	4.2 (+ 0.6)	4.8 (+ 0.6)	5.1 (+ 0.4)	5.8 (+ 0.6)	6.9 (+ 1.2)	+ 4.2 % (p<.01)			
MS	Both	12.9 (n/a)	14.1 (+ 1.2)	14.7 (+ 0.6)	15.5 (+ 0.8)	15.6 (+ 0.1)	15.2 (- 0.3)	+ 1.1 % (p<.05)	36	+ 2.3 (36)	+ 17.8 % (40)
	Male	22.9 (n/a)	24.6 (+ 1.7)	25.1 (+ 0.6)	26.8 (+ 1.7)	25.9 (- 0.9)	25.3 (- 0.6)	+ 0.7 % n/s			
	Female	4.3 (n/a)	5.0 (+ 0.7)	5.5 (+ 0.5)	5.5 (- 0.0)	6.4 (+ 0.9)	6.2 (- 0.2)	+ 2.4 % (p<.01)			
MO	Both	14.7 (n/a)	14.1 (- 0.6)	15.4 (+ 1.3)	16.0 (+ 0.7)	17.8 (+ 1.7)	20.0 (+ 2.3)	+ 2.2 % (p<.01)	16	+ 5.3 (15)	+ 36.4 % (17)
	Male	25.3 (n/a)	23.7 (- 1.6)	25.6 (+ 1.9)	26.6 (+ 1.0)	28.9 (+ 2.3)	32.2 (+ 3.3)	+ 1.8 % (p<.05)			
	Female	5.4 (n/a)	5.4 (+ 0.1)	6.1 (+ 0.7)	6.3 (+ 0.2)	7.4 (+ 1.1)	8.6 (+ 1.2)	+ 3.2 % (p<.01)			
MT	Both	21.1 (n/a)	22.6 (+ 1.4)	23.6 (+ 1.0)	24.7 (+ 1.1)	26.7 (+ 2.0)	29.2 (+ 2.5)	+ 2.1 % (p<.01)	1	+ 8.0 ( 2)	+ 38.0 % (11)
	Male	36.9 (n/a)	37.3 (+ 0.4)	39.8 (+ 2.5)	39.7 (- 0.1)	41.0 (+ 1.4)	45.5 (+ 4.4)	+ 1.3 % (p<.01)			
	Female	6.7 (n/a)	8.4 (+ 1.8)	8.4 (- 0.1)	10.0 (+ 1.6)	12.6 (+ 2.6)	13.1 (+ 0.5)	+ 4.6 % (p<.01)			
NE	Both	12.7 (n/a)	12.2 (- 0.5)	12.6 (+ 0.4)	11.7 (- 0.8)	13.5 (+ 1.8)	14.8 (+ 1.3)	+ 1.0 % n/s	40	+ 2.1 (42)	+ 16.2 % (43)
	Male	22.2 (n/a)	20.7 (- 1.5)	20.3 (- 0.4)	19.8 (- 0.5)	22.0 (+ 2.2)	23.9 (+ 1.9)	+ 0.6 % n/s			
	Female	3.8 (n/a)	4.2 (+ 0.4)	5.1 (+ 0.9)	4.0 (- 1.1)	5.5 (+ 1.4)	5.8 (+ 0.3)	+ 2.6 % n/s			
NV	Both	23.3 (n/a)	22.6 (- 0.6)	22.1 (- 0.5)	22.6 (+ 0.5)	21.4 (- 1.2)	23.1 (+ 1.6)	- 0.2 % n/s	9	- 0.2 (51)	- 1.0 % (51)
	Male	38.3 (n/a)	36.7 (- 1.7)	35.1 (- 1.6)	35.6 (+ 0.5)	32.5 (- 3.0)	35.4 (+ 2.8)	- 0.7 % n/s			
	Female	8.9 (n/a)	9.5 (+ 0.5)	9.6 (+ 0.1)	10.0 (+ 0.4)	10.6 (+ 0.6)	11.2 (+ 0.6)	+ 1.5 % (p<.01)			
NH	Both	13.5 (n/a)	12.5 (- 1.0)	13.3 (+ 0.8)	15.2 (+ 1.9)	15.8 (+ 0.6)	20.0 (+ 4.2)	+ 2.7 % (p<.05)	17	+ 6.5 ( 8)	+ 48.3 % ( 3)
	Male	22.5 (n/a)	21.1 (- 1.4)	21.7 (+ 0.6)	24.8 (+ 3.1)	25.4 (+ 0.6)	30.6 (+ 5.2)	+ 2.2 % (p<.05)			
	Female	5.3 (n/a)	4.8 (- 0.5)	5.9 (+ 1.0)	6.2 (+ 0.4)	6.6 (+ 0.4)	9.8 (+ 3.2)	+ 3.9 % (p<.05)			
NJ	Both	7.8 (n/a)	7.7 (- 0.1)	7.5 (- 0.2)	8.0 (+ 0.5)	8.9 (+ 0.9)	9.2 (+ 0.4)	+ 1.3 % (p<.05)	50	+ 1.5 (47)	+ 19.2 % (35)
	Male	13.0 (n/a)	13.1 (+ 0.0)	12.6 (- 0.5)	13.7 (+ 1.1)	14.5 (+ 0.8)	14.6 (+ 0.1)	+ 0.9 % (p<.05)			
	Female	3.2 (n/a)	2.9 (- 0.3)	3.0 (+ 0.0)	2.9 (- 0.1)	3.8 (+ 0.9)	4.4 (+ 0.6)	+ 2.3 % n/s			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.



### Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, 1999 – 2016

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
NM	Both	22.0 (n/a)	22.0 (- 0.1)	21.8 (- 0.2)	23.0 (+ 1.2)	24.1 (+ 1.1)	26.0 (+ 1.9)	+ 1.1 % (p<.05)	4	+ 4.0 (24)	+ 18.3 % (39)
	Male	36.8 (n/a)	37.7 (+ 0.9)	36.4 (- 1.2)	35.8 (- 0.6)	37.1 (+ 1.3)	40.7 (+ 3.6)	+ 0.4 % n/s			
	Female	8.5 (n/a)	7.4 (- 1.1)	8.2 (+ 0.7)	10.7 (+ 2.6)	11.7 (+ 0.9)	12.0 (+ 0.3)	+ 3.3 % (p<.05)			
NY	Both	7.2 (n/a)	7.1 (- 0.1)	7.7 (+ 0.6)	8.4 (+ 0.8)	9.5 (+ 1.1)	9.3 (- 0.1)	+ 2.1 % (p<.01)	49	+ 2.1 (41)	+ 28.8 % (27)
	Male	12.5 (n/a)	12.2 (- 0.3)	12.9 (+ 0.7)	13.9 (+ 1.0)	15.4 (+ 1.4)	14.5 (- 0.9)	+ 1.4 % (p<.05)			
	Female	2.7 (n/a)	2.6 (- 0.1)	3.0 (+ 0.3)	3.5 (+ 0.5)	4.2 (+ 0.7)	4.6 (+ 0.5)	+ 4.2 % (p<.01)			
NC	Both	13.6 (n/a)	13.5 (- 0.1)	13.7 (+ 0.1)	14.2 (+ 0.5)	14.5 (+ 0.4)	15.3 (+ 0.8)	+ 0.8 % (p<.01)	34	+ 1.7 (44)	+ 12.7 % (47)
	Male	22.7 (n/a)	22.7 (+ 0.0)	22.2 (- 0.6)	23.3 (+ 1.1)	23.3 (+ 0.0)	23.9 (+ 0.6)	+ 0.4 % n/s			
	Female	5.6 (n/a)	5.5 (- 0.2)	6.2 (+ 0.8)	6.0 (- 0.2)	6.7 (+ 0.7)	7.6 (+ 0.9)	+ 2.0 % (p<.05)			
ND	Both	13.3 (n/a)	14.6 (+ 1.3)	16.0 (+ 1.4)	16.6 (+ 0.6)	18.4 (+ 1.9)	20.9 (+ 2.5)	+ 2.9 % (p<.01)	14	+ 7.6 ( 5)	+ 57.6 % ( 1)
	Male	21.4 (n/a)	24.6 (+ 3.2)	28.0 (+ 3.4)	27.1 (- 0.9)	29.6 (+ 2.5)	32.7 (+ 3.0)	+ 2.5 % (p<.01)			
	Female	5.6 (n/a)	4.5 (- 1.0)	3.7 (- 0.8)	5.7 (+ 2.0)	6.7 (+ 1.0)	8.5 (+ 1.8)	+ 3.9 % n/s			
OH	Both	11.6 (n/a)	12.3 (+ 0.8)	13.1 (+ 0.8)	13.4 (+ 0.2)	14.8 (+ 1.4)	15.8 (+ 1.0)	+ 2.0 % (p<.01)	32	+ 4.2 (21)	+ 36.0 % (19)
	Male	20.4 (n/a)	20.9 (+ 0.5)	22.2 (+ 1.3)	22.1 (- 0.1)	24.2 (+ 2.1)	25.5 (+ 1.3)	+ 1.5 % (p<.01)			
	Female	4.0 (n/a)	4.7 (+ 0.7)	4.9 (+ 0.1)	5.3 (+ 0.5)	6.2 (+ 0.9)	6.7 (+ 0.6)	+ 3.4 % (p<.01)			
OK	Both	17.0 (n/a)	16.5 (- 0.6)	17.2 (+ 0.8)	18.4 (+ 1.1)	20.7 (+ 2.3)	23.5 (+ 2.8)	+ 2.3 % (p<.05)	7	+ 6.4 (10)	+ 37.6 % (12)
	Male	28.5 (n/a)	27.3 (- 1.2)	27.8 (+ 0.5)	30.3 (+ 2.5)	33.4 (+ 3.1)	37.3 (+ 3.8)	+ 2.0 % (p<.05)			
	Female	6.6 (n/a)	6.4 (- 0.2)	7.5 (+ 1.1)	7.0 (- 0.5)	8.5 (+ 1.6)	10.3 (+ 1.8)	+ 2.9 % (p<.05)			
OR	Both	16.4 (n/a)	17.7 (+ 1.3)	17.7 (- 0.0)	18.6 (+ 0.9)	19.8 (+ 1.2)	21.1 (+ 1.3)	+ 1.6 % (p<.01)	13	+ 4.6 (18)	+ 28.2 % (28)
	Male	27.4 (n/a)	29.5 (+ 2.1)	28.5 (- 0.9)	29.5 (+ 1.0)	31.4 (+ 1.8)	33.0 (+ 1.6)	+ 1.1 % (p<.01)			
	Female	6.5 (n/a)	7.1 (+ 0.6)	7.7 (+ 0.6)	8.4 (+ 0.7)	8.8 (+ 0.4)	9.8 (+ 0.9)	+ 2.7 % (p<.01)			
PA	Both	12.1 (n/a)	12.5 (+ 0.4)	12.8 (+ 0.3)	13.9 (+ 1.1)	15.0 (+ 1.1)	16.3 (+ 1.2)	+ 2.0 % (p<.01)	30	+ 4.1 (22)	+ 34.3 % (21)
	Male	21.0 (n/a)	21.3 (+ 0.3)	21.9 (+ 0.6)	23.1 (+ 1.2)	24.7 (+ 1.7)	26.1 (+ 1.3)	+ 1.5 % (p<.01)			
	Female	4.2 (n/a)	4.6 (+ 0.3)	4.6 (+ 0.0)	5.4 (+ 0.9)	6.0 (+ 0.6)	7.1 (+ 1.1)	+ 3.5 % (p<.01)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.

# Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, 1999 – 2016

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
RI	Both	9.4 (n/a)	9.0 (- 0.3)	9.0 (- 0.0)	12.8 (+ 3.8)	11.9 (- 0.9)	12.6 (+ 0.7)	+ 2.6 % (p<.05)	43	+ 3.2 (30 ¶¶)	+ 34.1 % (23 ¶¶)
	Male	15.4 (n/a)	15.2 (- 0.2)	14.8 (- 0.3)	21.2 (+ 6.4)	19.2 (- 2.0)	19.6 (+ 0.4)	+ 2.2 % n/s			
	Female	4.0 (n/a)	3.3 (- 0.7)	3.8 (+ 0.4)	5.1 (+ 1.3)	5.1 (+ 0.0)	6.1 (+ 1.0)	+ 3.7 % (p<.05)			
SC	Both	12.8 (n/a)	13.0 (+ 0.2)	13.7 (+ 0.7)	14.9 (+ 1.2)	16.0 (+ 1.1)	17.7 (+ 1.7)	+ 2.3 % (p<.01)	23	+ 4.9 (17)	+ 38.3 % (10)
	Male	21.3 (n/a)	22.5 (+ 1.2)	22.3 (- 0.1)	24.6 (+ 2.2)	26.1 (+ 1.5)	28.0 (+ 1.9)	+ 1.8 % (p<.01)			
	Female	5.4 (n/a)	4.7 (- 0.7)	6.0 (+ 1.3)	6.2 (+ 0.2)	7.0 (+ 0.8)	8.4 (+ 1.4)	+ 3.4 % (p<.05)			
SD	Both	15.7 (n/a)	15.8 (+ 0.1)	17.1 (+ 1.3)	19.3 (+ 2.2)	19.7 (+ 0.4)	22.6 (+ 2.9)	+ 2.5 % (p<.01)	10	+ 7.0 ( 7)	+ 44.5 % ( 6)
	Male	27.6 (n/a)	26.3 (- 1.3)	27.9 (+ 1.6)	30.1 (+ 2.2)	32.0 (+ 1.9)	33.6 (+ 1.6)	+ 1.6 % (p<.01)			
	Female	4.2 (n/a)	5.8 (+ 1.6)	6.4 (+ 0.6)	8.3 (+ 2.0)	7.3 (- 1.0)	11.3 (+ 4.0)	+ 5.8 % (p<.01)			
TN	Both	14.6 (n/a)	15.2 (+ 0.6)	16.1 (+ 0.8)	17.2 (+ 1.1)	17.2 (+ 0.0)	18.2 (+ 1.0)	+ 1.4 % (p<.01)	22	+ 3.5 (28)	+ 24.2 % (31)
	Male	25.1 (n/a)	25.4 (+ 0.3)	26.8 (+ 1.3)	28.0 (+ 1.2)	28.6 (+ 0.6)	29.8 (+ 1.2)	+ 1.2 % (p<.01)			
	Female	5.4 (n/a)	6.3 (+ 0.9)	6.7 (+ 0.4)	7.5 (+ 0.8)	6.9 (- 0.6)	7.6 (+ 0.7)	+ 1.9 % (p<.05)			
TX	Both	12.2 (n/a)	12.7 (+ 0.6)	12.3 (- 0.4)	13.2 (+ 0.9)	13.6 (+ 0.3)	14.5 (+ 0.9)	+ 1.1 % (p<.01)	41	+ 2.3 (37)	+ 18.9 % (36)
	Male	20.4 (n/a)	20.9 (+ 0.5)	20.4 (- 0.6)	22.0 (+ 1.6)	22.2 (+ 0.3)	23.1 (+ 0.9)	+ 0.9 % (p<.05)			
	Female	4.8 (n/a)	5.4 (+ 0.6)	5.0 (- 0.4)	5.2 (+ 0.2)	5.6 (+ 0.4)	6.4 (+ 0.8)	+ 1.6 % (p<.05)			
UT	Both	17.2 (n/a)	19.0 (+ 1.8)	18.2 (- 0.7)	20.2 (+ 2.0)	24.0 (+ 3.8)	25.2 (+ 1.2)	+ 2.7 % (p<.01)	5	+ 8.0 ( 3 ¶¶)	+ 46.5 % ( 4 ¶¶)
	Male	28.2 (n/a)	31.1 (+ 2.9)	29.4 (- 1.7)	32.1 (+ 2.7)	37.8 (+ 5.7)	38.0 (+ 0.2)	+ 2.1 % (p<.05)			
	Female	6.8 (n/a)	7.4 (+ 0.6)	7.5 (+ 0.1)	8.5 (+ 1.0)	10.6 (+ 2.1)	12.6 (+ 2.0)	+ 4.4 % (p<.01)			
VT	Both	13.2 (n/a)	16.2 (+ 3.0)	14.9 (- 1.3)	16.6 (+ 1.7)	18.7 (+ 2.1)	19.7 (+ 1.0)	+ 2.4 % (p<.01)	18	+ 6.4 ( 9)	+ 48.6 % ( 2)
	Male	23.6 (n/a)	28.3 (+ 4.6)	24.3 (- 4.0)	27.3 (+ 3.0)	31.0 (+ 3.7)	32.5 (+ 1.5)	+ 1.9 % (p<.05)			
	Female	4.3 (n/a)	5.2 (+ 0.9)	6.4 (+ 1.3)	6.6 (+ 0.2)	7.3 (+ 0.7)	7.6 (+ 0.3)	+ 3.8 % (p<.01)			
VA	Both	12.8 (n/a)	12.7 (- 0.1)	12.9 (+ 0.3)	13.6 (+ 0.7)	14.6 (+ 0.9)	15.0 (+ 0.5)	+ 1.2 % (p<.01)	37	+ 2.2 (39)	+ 17.4 % (41)
	Male	21.6 (n/a)	21.3 (- 0.2)	21.0 (- 0.4)	22.5 (+ 1.5)	23.6 (+ 1.2)	23.9 (+ 0.2)	+ 0.9 % (p<.05)			
	Female	5.3 (n/a)	5.2 (- 0.1)	5.9 (+ 0.7)	5.6 (- 0.3)	6.4 (+ 0.8)	6.9 (+ 0.5)	+ 1.8 % (p<.05)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.



### Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, 1999 – 2016

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
WA	Both	14.8 (n/a)	15.4 (+ 0.5)	14.8 (- 0.6)	15.7 (+ 0.9)	16.6 (+ 0.9)	17.6 (+ 1.0)	+ 1.1 % (p<.05)	24	+ 2.8 (33)	+ 18.8 % (37)
	Male	24.7 (n/a)	25.2 (+ 0.5)	24.1 (- 1.1)	25.1 (+ 1.0)	26.0 (+ 0.9)	27.1 (+ 1.1)	+ 0.6 % n/s			
	Female	5.9 (n/a)	6.4 (+ 0.6)	6.2 (- 0.2)	6.9 (+ 0.7)	7.7 (+ 0.8)	8.5 (+ 0.8)	+ 2.5 % (p<.01)			
WV	Both	15.6 (n/a)	17.2 (+ 1.6)	16.7 (- 0.5)	16.0 (- 0.7)	19.2 (+ 3.2)	21.4 (+ 2.2)	+ 1.8 % n/s	11	+ 5.8 (13)	+ 37.1 % (14)
	Male	27.2 (n/a)	30.1 (+ 2.9)	28.6 (- 1.5)	27.6 (- 1.0)	31.5 (+ 3.9)	33.5 (+ 2.0)	+ 1.1 % n/s			
	Female	5.3 (n/a)	5.5 (+ 0.1)	5.8 (+ 0.3)	5.3 (- 0.5)	7.6 (+ 2.3)	9.8 (+ 2.2)	+ 3.7 % n/s			
WI	Both	13.1 (n/a)	13.5 (+ 0.4)	14.0 (+ 0.5)	15.0 (+ 1.0)	15.3 (+ 0.3)	16.5 (+ 1.2)	+ 1.5 % (p<.01)	28	+ 3.4 (29)	+ 25.8 % (30)
	Male	21.7 (n/a)	22.2 (+ 0.5)	22.7 (+ 0.5)	24.0 (+ 1.2)	24.4 (+ 0.4)	25.7 (+ 1.3)	+ 1.1 % (p<.01)			
	Female	5.1 (n/a)	5.3 (+ 0.2)	5.6 (+ 0.4)	6.4 (+ 0.7)	6.5 (+ 0.1)	7.5 (+ 1.0)	+ 2.5 % (p<.01)			
WY	Both	20.7 (n/a)	23.4 (+ 2.7)	22.5 (- 0.9)	25.4 (+ 2.8)	28.9 (+ 3.5)	28.8 (- 0.1)	+ 2.3 % (p<.01)	3	+ 8.1 ( 1)	+ 39.0 % ( 9)
	Male	34.8 (n/a)	39.3 (+ 4.5)	36.3 (- 3.0)	41.5 (+ 5.2)	47.1 (+ 5.6)	44.6 (- 2.4)	+ 1.8 % (p<.05)			
	Female	7.7 (n/a)	8.2 (+ 0.6)	9.2 (+ 0.9)	9.4 (+ 0.2)	10.7 (+ 1.4)	12.6 (+ 1.9)	+ 3.2 % (p<.01)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

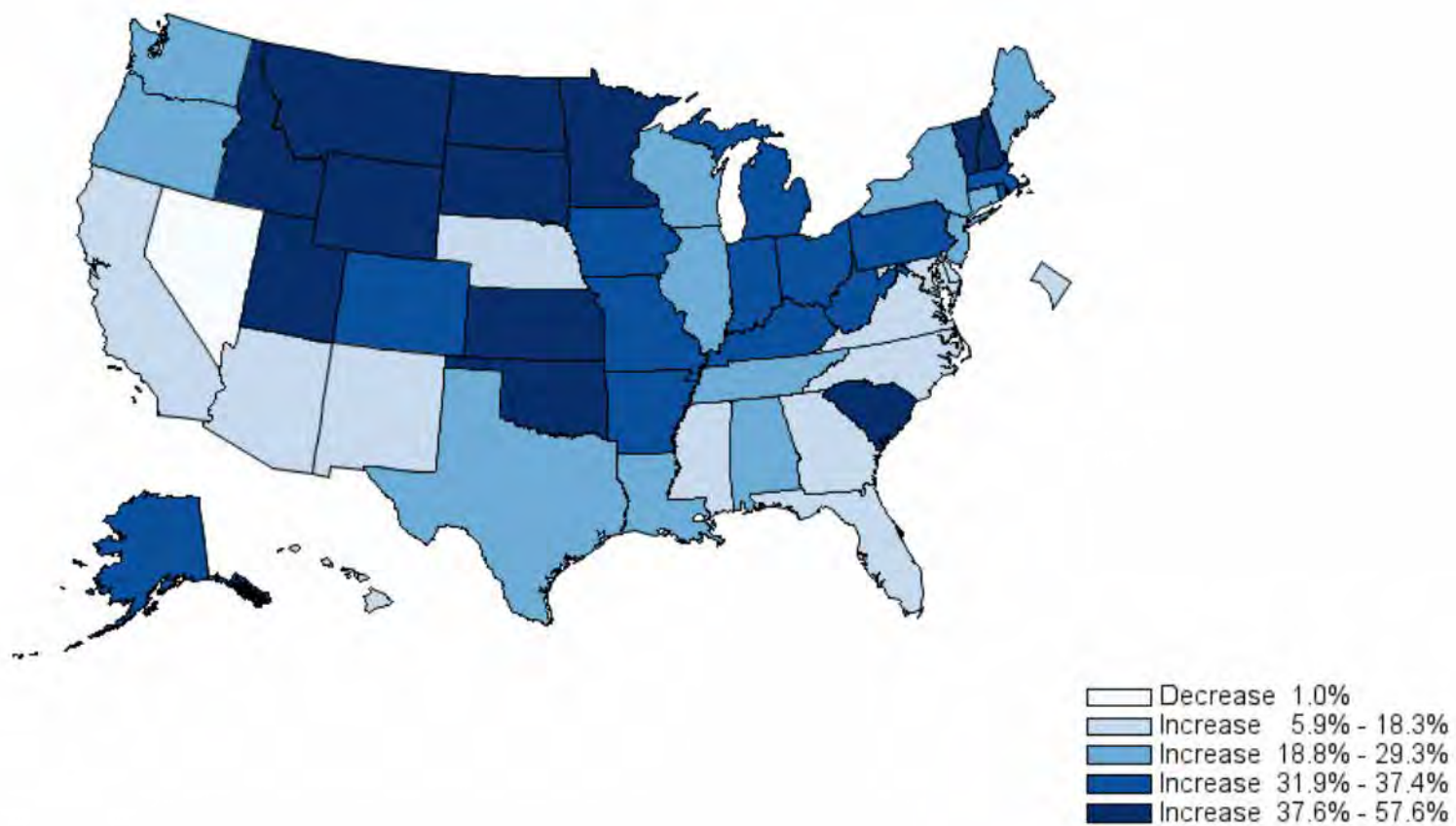
\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.

**Percentage Changes in Annual Suicide Rates (per 100,000, Age-Adjusted)**  
2014-2016 Compared Against 1999-2001





**Short Title:** Vital Signs: Contributing Circumstances to Suicide and Increasing Trends in State Suicide Rates

Deborah M. Stone, ScD;<sup>1</sup> Thomas R. Simon PhD;<sup>1</sup> Katherine A. Fowler, PhD;<sup>1</sup> Scott R. Kegler, PhD;<sup>2</sup> Keming Yuan, MS;<sup>1</sup> Kristin M. Holland, PhD;<sup>1</sup> Asha Z. Ivey-Stephenson, PhD;<sup>1</sup> Alex E. Crosby, MD<sup>1</sup>

**Background:** Suicide rates in the United States have risen nearly 30% since 1999. Mental health problems (MHP) are just one factor contributing to suicide. Examining state-level trends in, and the multiple contributing circumstances to, suicide can inform comprehensive state suicide prevention planning.

**Methods:** Trends in age-adjusted suicide rates among people aged  $\geq 10$  years, by state and sex, across six consecutive three-year periods (1999-2016), were assessed using data from the National Vital Statistics System for 50 states and Washington, D.C. Data from the National Violent Death Reporting System, covering 27 states in 2015, were used to examine contributing circumstances among decedents with and without known mental health problems (MHP).

**Results:** From 1999-2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases of more than 30%. Rates increased significantly among males and females in 34 and 43 states, respectively. In 2015, more than half (54%) of decedents in 27 states did not have a known MHP. Among people with circumstance information, several circumstances, including relationship problems/loss (45.1% vs 39.6%), life stressors (54.2% vs 49.7%), and recent/impending crises (32.9% vs 26.0%) were significantly more likely among those without a known MHP than decedents with MHP, but were common across groups.

**Conclusions:** Suicide rates increased significantly across most states from 1999-2016. Various circumstances contributed to suicides among people with and without known MHP.

**Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach to prevent suicide risk before it occurs, identify and support people at risk, prevent reattempts, and help friends/family after a suicide occurs.

## INTRODUCTION

### BACKGROUND AND PURPOSE

In 2016, nearly 45,000 suicides (15.6/100,000 [age-adjusted]) occurred in the United States (U.S.), among people  $\geq 10$  years old (1). Between 1999 and 2015, suicide rates increased across sexes, racial/ethnic groups, and urbanization levels (2, 3). Suicide is the 10<sup>th</sup> leading cause of death and is one of just three leading causes that are *increasing* (1, 4). Additionally, rates of Emergency Department visits for nonfatal self-harm, a key risk factor for suicide, increased nearly 45% between 2001 and 2015 (1). Together, suicides and self-harm injuries cost the nation more than \$69 billion in direct medical and work loss costs (1).

The *National Strategy for Suicide Prevention (NSSP)* (5) calls for a public health approach to suicide prevention with efforts spanning across multiple levels (i.e., individual, family/relationship, community, and societal). Such an approach underscores that suicide is rarely caused by any single factor, but rather, is multi-determined. Despite the NSSP guidance, suicide prevention efforts are largely clinically-oriented, focused on treating mental health problems (MHP) and preventing re-attempts (6). Apart from MHP and prior attempts, other contributing circumstances to suicide include social and economic problems, access to lethal means (e.g., substances, firearms, bridges) among people at risk, and poor coping and problem-solving skills (5). Expanded awareness of these additional circumstances contributing to suicide risk and action to address them, can help reach the nation's goal of reducing suicide rates 20% by 2025 (7). To assist states in achieving this goal, this study analyzes

state-specific trends in suicide rates, assesses the multiple contributing factors to suicide, and provides recommendations for multi-level comprehensive suicide prevention.

## METHODS

Suicide rates were analyzed for people aged  $\geq 10$  years only, as determining suicidal intent in younger children can be difficult (8). Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases 10<sup>th</sup> Revision*, underlying-cause-of death codes X60-X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods spanning 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Characteristics and circumstances of suicide decedents  $\geq 10$  years old, with and without known MHP, were compared in the 27 states with complete data participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines MHP as disorders and syndromes listed in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (9), with the exception of alcohol and other substance dependence, which are captured separately in NVDRS. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known MHP were compared using Chi-square tests. Logistic regression analyses estimated adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and race/ethnicity.

## RESULTS (665)

The most recent overall suicide rates (representing 2014-2016) varied four-fold, from 6.9 (D.C.) to 29.2 (Montana) per 100,000 persons per year (Table 1). Across the study period, rates increased in all states, except Nevada (which had a consistently high rate throughout), with absolute increases ranging from +0.8 (Delaware) to +8.1 (Wyoming) per 100,000. Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with increases of more than 30% observed in 25 states (Table 1, Figure 1).

Modeled suicide rate trends indicated significant increases for 44 states, for males (34 states) and females (43 states), as well as for the U.S. overall (Table 1). Nationally, the model-estimated AAPC for the overall suicide rate was +1.5%. By sex, estimated national rate trends further indicated significant increases for males (AAPC +1.1%) and females (AAPC +2.6%).

Suicide decedents without known MHP (N=11,039) were compared to those with MHP (N=9,407) in 27 states. While all decedents were predominately male (Table 2; 76.8%) and non-Hispanic white (83.6%), those without known MHP, relative to those with MHP, were more likely male (83.6% vs. 68.8%; odds ratio (OR)=2.3, 95% CI = 2.2-2.5) and racial/ethnic minorities (OR range: 1.2-2.0). Suicide decedents without known MHP also had significantly greater odds of perpetrating homicide-suicide (adjusted odds ratio aOR = 2.9, 95% CI = 2.2-3.8). Among adult decedents, 20.1% and 15.3% of people without and with MHP, respectively, ever served, or were currently serving, in the U.S. military.

While firearms were the most common method of suicide used overall (48.5%) and for both groups, decedents without known MHP were more likely to die by firearm (55.3% vs. 40.6%) and less likely to die by



84 hanging/strangulation/suffocation (26.9% vs 31.3%) or poisoning (10.4% vs 19.8%) than those with known MHP.  
85 These differences remained significant in the adjusted models.

86 Decedents without known MHP were less likely to receive toxicology testing. Among those with toxicology  
87 results, decedents without known MHP were less likely to test positive for any substance overall (aOR=0.8, 95%  
88 CI=0.7-0.8) but more likely to test positive for alcohol (aOR=1.2, 95% CI=1.1-1.3).

89 All suicide decedents with MHP (N=9,407) and approximately 85% without known MHP (N=9,357) had available  
90 circumstances information (Table 3). People without known MHP were less likely to have any substance abuse  
91 problems (aOR=0.7, 95% CI=0.7-0.8). While two-thirds of those with known MHP had a history of mental health  
92 or substance abuse treatment (67.2%), just over half (54.0%) were in current treatment.

93 Decedents without, versus those with, known MHP, had significantly greater likelihood of any relationship  
94 problem/loss (45.1% vs. 39.6%), specifically intimate partner problems (30.2% vs. 24.1%), arguments/conflicts  
95 (17.5% vs. 13.6%), and recently perpetrating interpersonal violence (3.0% vs. 1.4%). They also were more likely  
96 to have experienced any life stressors (54.2% vs 49.7%), such as criminal-legal problems (10.7% vs. 6.2%), or  
97 eviction/loss of home (4.3% vs. 3.4%) and were more likely to have had a crisis within the preceding or  
98 upcoming two weeks (32.9% vs. 26.0%). All of these differences remained significant in the adjusted models.  
99 Among all people with crises, intimate partner problems were the most common types and did not differ by  
100 group. Similarly, among people without versus with MHP, physical health problems (23.2% and 21.4%) and  
101 job/financial problems (15.6% and 16.8%) were commonly experienced and did not differ by group.

102 Decedents without known MHP had significantly lower odds of recent release from any institution (aOR=0.5,  
103 95% CI=0.4-0.5), but among those who were recently released (5.1%), they were significantly more likely to be  
104 released from a correctional facility (25.7% vs. 8.7%) or hospital (43.7% vs. 33.0%) than those with a known  
105 MHP. Among decedents with known MHP who were recently released from an institution (10.2%), 46.7% of this  
106 group were released from psychiatric facilities.

107 Decedents without known MHP, compared to those with MHP, were significantly less likely to have a history of  
108 suicidal ideation (23.0% vs. 40.8%) and prior suicide attempts (10.3% vs. 29.4%). More than one in five people in  
109 both groups disclosed suicide intent (22.4% vs. 24.5%).

## 110 Conclusions and Comments

111 From 1999-2016, 44 states saw significant increases in suicide rates and 25 states experienced substantial  
112 increases in suicide rates of more than 30%. Rates increased significantly among males, in 34 states, and  
113 females, in 43 states. This finding is consistent with prior research showing a decreasing gender gap in male-  
114 female suicide rates between 1999-2014 (3). Additional research into the specific causes of these trends is  
115 necessary. Fortunately, data from the 27 states participating in NVDRS provides important insight into suicide  
116 circumstances and can help states identify prevention priorities.

117 Suicidologists regularly state that suicide is not caused by a single factor; (5) however, suicide prevention  
118 research and practice is heavily oriented towards downstream treatment of MHP and prevention of reattempts.  
119 Additional focus on non-mental health factors, further upstream, is essential to a public health approach (10), as  
120 the current study found that more than half of suicide decedents in NVDRS did *not* have a known MHP. This  
121 group suffered more from relationship problems and other life stressors such as criminal-legal matters,  
122 eviction/loss of home, and recent or impending crises.

123 Similarly, people with MHP also experienced other life stressors such as job/financial, relationship, and/or  
124 physical health problems. These findings point to the need to both prevent the conditions associated with

Comment [HDE(): I would add in the %  
for opioids as it is timely and relevant

Comment [HDE(): I thought they were  
also 2x likely to be released from other  
facility which included drug rehab?



mental health problems in the first place, and to support people with known MHP to decrease their risk of poor outcomes (11). Two-thirds of this group had a history of any mental health and/or substance abuse treatment, with over half in treatment when they died. This suggests the need for additional safety supports, including broader implementation of affordable and effective treatment modalities such as doctor-patient collaborative care models and proven cognitive-behavioral therapies. Additionally, greater access to behavioral health providers in underserved areas is needed, as is expansion of healthcare systems needed that integrates physical and behavioral health with a priority on suicide prevention and patient safety, especially through care transitions (12).

Comprehensive statewide suicide prevention activities are needed to address the full range of factors contributing to suicide. Prevention strategies include: strengthening economic supports (e.g., housing stabilization policies, household financial support); teaching coping and problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in life; promoting social connectedness to increase a sense of belongingness and access to informational, tangible, emotional, and social support; and identifying and better supporting people at risk (e.g., Veterans, people with physical/mental health problems) (12). Other strategies include creating protective environments (e.g., reducing access to lethal means among people at risk, creating organizational and workplace policies to promote help-seeking, easing transitions into and out of work for people with MHP and other life challenges), supporting family and friends after a suicide, and assuring safe reporting by the media in order to prevent suicide contagion (12). Some states, such as Colorado, are planning to implement such a comprehensive approach to suicide prevention (10).

These findings have at least three limitations. In the state-level analysis, rankings for four states (MD, MA, RI, UT) might have been impacted by large proportions of injury deaths of undetermined intent (potentially biasing reported suicide rates downward), or decreased percentages of such deaths over time (potentially biasing estimated rate trends upward). Second, NVDRS is not yet nationally representative; the 27 states included represent 49.6% of the population (<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml>).

Third, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the extent of informant knowledge can impact data completeness and accuracy. Studies including more in-depth interviews with next-of-kin often see greater attributions to mental disorders (13), however many methodological variations across studies exist (14). It is likely that some people without known MHP in the current study were experiencing mental health challenges that were unknown, and hence underreported by key informants. However, any lack of awareness of decedent MHP suggests the importance of addressing the broad range of contributing circumstances.

Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are available. States and communities can use data from NVDRS and resources such as CDC's *Preventing Suicide: a Technical Package of Policies, Programs, and Practices* (12) to better understand their suicide problem, prioritize evidence-based comprehensive suicide prevention, and save lives.

## Acknowledgments

The authors acknowledge Robert Anderson, Holly Hedegaard, and Margaret Warner from the Division of Vital Statistics, National Center for Health Statistics, CDC, for their statistical consultation.

**Conflict of Interest** No conflicts of interest were reported.



168 **Corresponding author:** Deborah M. Stone, [dstone3@cdc.gov](mailto:dstone3@cdc.gov), 770-488-3942

169 **Author Affiliations:**

170 <sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis,  
171 Research, and Practice Integration, National Center for Injury Prevention and Control, CDC

172 **References:**

- 173 1. Centers for Disease Control and Prevention. Web-based Injury Statistics Query and Reporting System  
174 (WISQARS). Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018. In.
- 175 2. Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide Trends Among and  
176 Within Urbanization Levels by Sex, Race/Ethnicity, Age Group, and Mechanism of Death - United States,  
177 2001-2015. *MMWR Surveill Summ* 2017;66(18):1-16.
- 178 3. Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999-2014. In: US Department  
179 of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health  
180 Statistics Hyattsville, MD; 2016.
- 181 4. Kochanek K, Murphy S, Xu J, Arias E. Mortality in the United States, 2016. *NCHS Data Brief*, no 293.  
182 National Center for Health Statistics 2017.
- 183 5. Office of the Surgeon General, National Action Alliance for Suicide Prevention. 2012 National strategy for  
184 suicide prevention: Goals and objectives for action: a report of the US Surgeon General and of the National  
185 Action Alliance for Suicide Prevention. 2012.
- 186 6. Zalsman G, Hawton K, Wasserman D, van Heeringen K, Arensman E, Sarchiapone M, et al. Suicide  
187 prevention strategies revisited: 10-year systematic review. *The Lancet Psychiatry* 2016;3(7):646-659.
- 188 7. Torguson K, O'Brien A. Leading Suicide Prevention Efforts Unite to Address Rising National Suicide Rate. In.  
189 Washington, D.C.; 2017.
- 190 8. Crepeau-Hobson F. The Psychological Autopsy and Determination of Child Suicides: A Survey of Medical  
191 Examiners. *Archives of Suicide Research* 2010;14(1):24-34.
- 192 9. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5®):  
193 American Psychiatric Pub; 2013.
- 194 10. Caine ED, Reed J, Hindman J, Quinlan K. Comprehensive, integrated approaches to suicide prevention:  
195 practical guidance. *Injury prevention* 2017;injuryprev-2017-042366.
- 196 11. World Health Organization. Risks to mental health: An overview of vulnerabilities and risk factors. Geneva:  
197 WHO 2012.
- 198 12. Stone DM, Holland KM, Bartholow BN, Crosby AE, Davis SP, Wilkins N. Preventing suicide: A technical  
199 package of policies, programs, and practice. 2017.
- 200 13. Milner A, Svetcic J, De Leo D. Suicide in the absence of mental disorder? A review of psychological autopsy  
201 studies across countries. *Int J Soc Psychiatry* 2013;59(6):545-54.
- 202 14. Pouliot L, De Leo D. Critical issues in psychological autopsy studies. *Suicide Life Threat Behav*  
203 2006;36(5):491-510.

204 **Attachments:**

205 Stone\_Suicide Vital Signs MMWR 3.27.18 (table 1.fig 1)

206 Stone\_Suicide Vital Signs MMWR 4.5.18 (Tables 2&3)

207 **Word Count:** 1868/1800



1 **Short Title:** Vital Signs: Contributing Circumstances to Suicide and Increasing Trends in State Suicide Rates

2 Deborah M. Stone, ScD;<sup>1</sup> Thomas R. Simon PhD;<sup>1</sup> Katherine A. Fowler, PhD;<sup>1</sup> Scott R. Kegler, PhD;<sup>2</sup> Keming Yuan,  
3 MS;<sup>1</sup> Kristin M. Holland, PhD;<sup>1</sup> Asha Z. Ivey-Stephenson, PhD;<sup>1</sup> Alex E. Crosby, MD<sup>1</sup>

4 **Background:** Suicide rates in the United States have risen nearly 30% since 1999. ~~Mental health problems (MHP)~~  
5 ~~are just one factor contributing to suicide.~~ Examining state-level trends in ~~suicide~~ and ~~other the multiple~~  
6 contributing circumstances ~~to, suicide~~ can inform comprehensive state suicide prevention planning.

7 **Methods:** Trends in age-adjusted suicide rates among people aged ≥10 years, by state and sex, across six  
8 consecutive three-year periods (1999-2016), were assessed using data from the National Vital Statistics System  
9 for 50 states and Washington, D.C. Data from the National Violent Death Reporting System (NVDRS), covering  
10 27 states in 2015, were used to examine contributing circumstances among decedents with and without known  
11 ~~MHP~~ mental health problems (MHP).

12 **Results:** From 1999-2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases  
13 of more than 30%. Rates increased significantly among males and females in 34 and 43 states, respectively.  
14 ~~Among decedents in NVDRS decedents in 27 states, 54.0% half (54.0%) of decedents did not have a known~~  
15 ~~MHP. Among decedents-people~~ with circumstance information, several circumstances, including relationship  
16 problems/loss (45.1% vs 39.6%), life stressors (54.2% vs 49.7%), **health problems (23.2 vs 21.4%)** and  
17 recent/impending crises (32.9% vs 26.0%), were significantly more likely among those without a known MHP  
18 than decedents with MHP, but were common across groups.

19 **Conclusions:** Suicide rates increased significantly across most states from 1999-2016. Various circumstances  
20 contributed to suicides among people with and without known MHP.

21 **Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach  
22 to prevent suicide risk before it occurs, identify and support people at risk, prevent reattempts, and help  
23 friends/family after a suicide occurs.

24 **INTRODUCTION**

25 **BACKGROUND AND PURPOSE**

26 In 2016, nearly 45,000 suicides (15.6/100,000 [age-adjusted]) occurred in the United States (U.S.), among people  
27 ≥10 years old (1). Between 1999 and 2015, suicide rates increased across ~~both~~ sexes, racial/ethnic groups, and  
28 urbanization levels (2, 3). Suicide is the 10<sup>th</sup> leading cause of death and is one of just three leading causes that  
29 are *increasing* (1, 4). Additionally, rates of Emergency Department visits for nonfatal self-harm, a key risk factor  
30 for suicide, increased nearly 45% between 2001 and 2015 (1). Together, suicides and self-harm injuries cost the  
31 nation more than \$69 billion in direct medical and work loss costs (1).

32 The *National Strategy for Suicide Prevention* (NSSP) (5) calls for a public health approach to suicide prevention  
33 with efforts spanning across multiple levels (i.e., individual, family/relationship, community, and societal). Such  
34 an approach underscores that suicide is rarely caused by any single factor, but rather, is multi-determined.

35 Despite the NSSP guidance, suicide prevention efforts largely focus on ~~identifying and treating individuals~~  
36 ~~with clinically-oriented interventions-mental health focused on mental health~~ problems (MHP) ~~or and providing~~  
37 ~~follow-up care to people who have attempted preventing re-attempts suicide~~ (6). ~~Apart from these risks,~~ Other  
38 contributing circumstances include social ~~isolation, relationship problems, and~~ economic problems, access to  
39 lethal means (e.g., substances, firearms, bridges) among people at risk, ~~and~~ poor coping and problem-solving  
40 skills ~~and prior suicide attempts~~ (5). Expanded awareness of these additional circumstances ~~that contributing~~

**Comment [FC]:** I think some sort of clarification is needed to distinguish from previous two sentences since what is reported here are not data on full examined time period or all 50 states. Tracked an idea but there are likely other ways to clarify.

**Comment [zat9]:** Updated



to suicide risk ~~apart from MHP~~, and action to address them, can help reach the nation's goal of reducing suicide rates 20% by 2025 (7). To assist states in achieving this goal, this study analyzes state-specific trends in suicide rates, assesses the multiple contributing factors to suicide, and provides recommendations for multi-level comprehensive suicide prevention.

## METHODS

Suicide rates were analyzed for people aged  $\geq 10$  years only, as attributions of suicidal intent in younger children are variable (8). Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases 10<sup>th</sup> Revision*, underlying-cause-of death codes X60-X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods spanning 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Characteristics and circumstances of suicide decedents  $\geq 10$  years, with and without known MHP, were compared in the 27 states with complete data participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines MHP as disorders and syndromes listed in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (9), with the exception of alcohol and other substance dependence, which are captured separately in NVDRS. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known MHP were compared using Chi-square tests. Logistic regression analyses estimated adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and race/ethnicity.

## RESULTS

The most recent overall suicide rates (representing 2014-2016) varied four-fold, from 6.9 (D.C.) to 29.2 (Montana) per 100,000 persons per year (Table 1). Across the study period, rates increased in all states, except Nevada (which had a consistently high rate throughout), with absolute increases ranging from +0.8 (Delaware) to +8.1 (Wyoming) per 100,000. Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with increases of more than 30% observed in 25 states (Table 1, Figure 1).

Modeled suicide rate trends indicated significant increases for 44 states, for males (34 states) and females (43 states), as well as for the U.S. overall (Table 1). Nationally, the model-estimated AAPC for the overall suicide rate was +1.5%. By sex, estimated national rate trends further indicated significant increases for males (AAPC +1.1%) and females (AAPC +2.6%).

Suicide decedents without known MHP (N=11,039) were compared to those with MHP (N=9,407) in 27 states. While all decedents were predominately male (Table 2; 76.8%) and non-Hispanic white (83.6%), those without known MHP, relative to those with MHP, were more likely male (83.6% vs. 68.8%; odds ratio (OR)=2.3, 95% CI = 2.2-2.5) and racial/ethnic minorities (OR range: 1.2-2.0). Suicide decedents without known MHP also had significantly greater odds of perpetrating homicide-suicide (adjusted odds ratio aOR = 2.9, 95% CI = 2.2-3.8). Among adult decedents, 20.1% and 15.3% of people without and with MHP, respectively, ever served, or were currently serving, in the U.S. military.

**Comment [FC]:** Suggest pulling out the references to tables 2 and 3 since table 1 hasn't been mentioned yet and helps saves on word count. If you want to keep them in, suggest adding "table 1" somewhere into the above paragraph.

**Comment [za19]:** Took the ref to tables out.

**Comment [FC]:** Given attention to this particular at-risk population in the results, made me wonder if some mention of needs of this group should be in the discussion. There are other higher risk groups described below. A consideration could be in the discussion about prevention needs of underserved areas (bottom of page 3) some phrasing could be added about the need for services for higher risk groups, such as those who have served in the military and those who have difficulties, such as MPH, intimate partner problems, have physical health problems, and have financial and legal difficulties. Or on page 4 where "identifying and better supporting people at risk" is stated an e.g. could be added.

**Comment [za19]:** Did not end up adding this as it seemed odd to call out this one population.



85 While firearms were the most common method of suicide overall (48.5%) and for both groups, decedents  
86 without known MHP were more likely to die by firearm (55.3% vs. 40.6%) and less likely to die by  
87 hanging/strangulation/suffocation (26.9% vs 31.3%) or poisoning (10.4% vs 19.8%) than those with known MHP.  
88 These differences remained significant in the adjusted models.

89 Decedents without known MHP were less likely to receive toxicology testing. Among those with toxicology  
90 results, decedents without known MHP were less likely to test positive for any substance overall (aOR=0.8, 95%  
91 CI=0.7-0.8) but more likely to test positive for alcohol (aOR=1.2, 95% CI=1.1-1.3).

92 All suicide decedents with MHP (N=9,407) and approximately 85% without known MHP (N=9,357) had available  
93 circumstances information (Table 3). People without known MHP were less likely to have any substance abuse  
94 problems (aOR=0.7, 95% CI=0.7-0.8) or job/financial problems (aOR=0.9, 95% CI (0.8-1.0)). While two-thirds of  
95 those with known MHP had a history of mental health or substance abuse treatment (67.2%), just over half  
96 (54.0%) were in current treatment.

97 Decedents without known MHP versus those with known MHP had significantly greater likelihood of any  
98 relationship problem/loss (45.1% vs. 39.6%), specifically intimate partner problems (30.2% vs. 24.1%),  
99 arguments/conflicts (17.5% vs. 13.6%), and recently perpetrating interpersonal violence (3.0% vs. 1.4%). They  
100 were also more likely to have experienced any life stressors (54.2% vs 49.7%), such as criminal-legal problems  
101 (10.7% vs. 6.2%) or eviction/loss of home (4.3% vs. 3.4%), or health problems (23.2% and 21.4%) and they were  
102 more likely to have had a crisis within the preceding or upcoming two weeks (32.9% vs. 26.0%). All of these  
103 differences remained significant in the adjusted models. Among those with crises, intimate partner and physical  
104 health problems were the most common types for both groups and did not differ between them.

105 Decedents without known MHP had significantly lower odds of recent release from any institution (aOR=0.5,  
106 95% CI=0.4-0.5), but among those who were recently released (5.1%), they were significantly more likely to be  
107 released from a correctional facility (25.7% vs. 8.7%) or hospital (43.7% vs. 33.0%) than those with a known  
108 MHP. Among decedents with known MHP who were recently released from an institution (10.2%), 46.7% of this  
109 group were released from psychiatric facilities.

110 Decedents without known MHP, compared to those with MHP, were significantly less likely to have a history of  
111 suicidal ideation (23.0% vs. 40.8%) and prior suicide attempts (10.3% vs. 29.4%). More than one in five people  
112 in both groups disclosed suicide intent (22.4% vs. 24.5%).

### 113 Conclusions and Comments

114 From 1999-2016, 44 states saw significant ~~suicide rate increases~~ increases in suicide rates and 25 states  
115 experienced rate increases of more than 30%. Rates increased significantly ~~for among~~ males, (in 34 states); and  
116 ~~for~~ females; (in 43 states). This finding is consistent with prior research showing a decreasing gender gap in  
117 male-female suicide rates between 1999-2014 (3). ~~Overall, half of the states experienced substantial increases in~~  
118 ~~suicide rates of more than 30%~~. Additional research into the specific causes of these trends is necessary.  
119 Fortunately, data from the 27 states participating in NVDRS ~~can shed light on~~ provides important insight into the  
120 suicide circumstances and circumstances that contributed to recent suicides, and can help states identify  
121 prevention priorities, help guide prevention activities.

122 ~~Researchers and practitioners~~ Suicidologists regularly state that ‘suicide ‘is not caused by a single factor;’ (5)  
123 however, suicide prevention research and practice ~~prevention practices often focus on~~ is heavily weighted  
124 towards identifying and treating MHP clinically-oriented activities focused on MHP (6). In contrast, ~~t~~ The current  
125 study found that more than half of suicide decedents in NVDRS did *not* have a known MHP. This group

Comment [FC]: It appears non-MHP is being compared to non-MHP. Tracked what I think the edit is but please double check.

Comment [za19]: You are correct. Should be with in the second instances, not without.



126 ~~experienced suffered more~~ relationship problems/issues and ~~other~~ life stressors such as criminal-legal-matters,  
127 ~~housing eviction/loss of home, and health problems. They also experienced more and~~ recent/~~or~~ impending crises  
128 ~~(which may indicate suicides —This is particularly noteworthy in light of findings that suggest that took place~~  
129 ~~many suicides and attempts occur w/with~~ minimal deliberation (10)). ~~Similarly,~~

130 Among people with MHP ~~struggled more with~~ job/financial problems and substance abuse and also commonly  
131 ~~experienced arguments/conflicts, intimate partner,~~ health problems, and other life stressors. These findings all  
132 align with a large literature suggesting vulnerability to such socio-economic and health problems among people  
133 with mental health disorders (11).

134 These results suggest that broader prevention outside of clinical settings is necessary. This can include:  
135 educating the public to know the warning signs of suicide and how to respond, especially if someone discloses  
136 suicide intent; strengthening economic supports (e.g., through housing stabilization policies, household financial  
137 support); creating protective environments (e.g., reducing access to lethal means among people at risk,  
138 implementing workplace policies conducive to help-seeking and encouraging overall well-being, and zoning to  
139 reduce alcohol-outlet density); teaching coping and problem-solving skills early in life to foster lifelong healthy  
140 relationships; and promoting social connectedness to increase one's sense of belonging and access to resources.

141 To address findings that ~~t~~-two-thirds of people with MHP had a history of ~~any treatment mental health and/or~~  
142 ~~substance abuse treatment and over half 54% were in current treatment when they died, states and~~  
143 ~~communities can~~. This suggests that additional supports for this population are needed to keep them safe. This  
144 includes broader implementation of affordable and effective evidence-based treatment modalities (e.g., such as  
145 doctor-patient collaborative care, ~~models and cognitive-behavioral therapy), provide~~ ~~Additionally, greater~~  
146 access to behavioral health providers (especially in underserved areas) ~~is needed, as and encourage greater is~~  
147 ~~expansion of healthcare systems to integration of~~ physical and behavioral health that better support suicide  
148 ~~prevention and patient safety within healthcare systems, especially through care transitions~~ (12).

149 ~~Study findings indicate that people with known MHP also experienced other life stressors such as job/financial,~~  
150 ~~relationship, and/or physical health problems. These findings point to the need to both prevent the conditions~~  
151 ~~associated with mental health problems in the first place, and to support people with known MHP to decrease~~  
152 ~~their risk of poor social, health, and economic outcomes~~ (11).

153 Finally, Together, these results underscore the importance of comprehensive statewide suicide prevention  
154 activities that address multiple factors associated with suicide. Prevention strategies may include: strengthening  
155 economic supports (e.g., housing stabilization policies, household financial support); teaching coping and  
156 problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in  
157 life; promoting social connectedness to increase a sense of belongingness and access to informational,  
158 emotional, and social support; and identifying and better supporting people at risk. Other strategies include it is  
159 essential to address risk associated with suicide loss itself. ~~creating protective environments (e.g., reducing~~  
160 ~~access to lethal means among people at risk, creating organizational and workplace policies to promote help-~~  
161 ~~seeking, easing transitions into and out of work for people with MHP and other life challenges), Caring for~~  
162 ~~friends/family after a suicide has taken place and supporting family and friends after a suicide, and assuring~~  
163 ~~safe media reporting and messaging in the aftermath of a suicide can reporting by the media in order to prevent~~  
164 ~~suicide contagion (12) and keep people safe. Such a comprehensive approach to suicide prevention to support~~  
165 ~~all people with or without mental health problems is essential and~~ some states, such as Colorado, are  
166 ~~underway planning to implement such a comprehensive a strategy approach to suicide prevention~~ (13).

Comment [FC]: True point but it suggests at least to me there is limited prevention opportunity. Given 22% disclosed suicide intent, perhaps there needs to be more stated here. Idea: suicides can occur with minimal deliberation but many individuals disclose suicidal intent or demonstrate other risk factors that help in identifying at-risk individual who need immediate access to supportive services.

Comment [za19]: updated

Comment [FC]: Wonder if it might be good to move this point down into the paragraph about comprehensive strategies or its own paragraph since it is applicable to those with known and not known MPH. If moved out of this paragraph specific to MPH, and framed more broadly about what all persons need, then attention to a couple of vulnerable populations per earlier comment could be added to this idea.

Comment [za19]: Prefer to keep this as is because we want to want to 'advocate' for better treatment and services for people with MHP.

Comment [FC]: I like the evolution I have seen of the results and discussion to emphasize the difficulties of those without known MHP. I do think it's important as done for the discussion to talk specifically about those with known MPH. But, the two MPH group paragraphs in the discussion seem to tip the balance more toward the MPH group. I suggest weaving into the previous paragraph that



167 These findings have at least three limitations. In the state-level analysis, rankings for four states (MD, MA, RI,  
168 UT) might have been impacted by large proportions of injury deaths of undetermined intent (potentially biasing  
169 reported suicide rates downward), or decreased percentages of such deaths over time (potentially biasing  
170 estimated rate trends upward). Second, NVDRS is not yet nationally representative; the 27 states included  
171 represent 49.6% of the population  
172 (<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml>).

173 Third, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the  
174 extent of informant knowledge can impact data completeness and accuracy. Studies including more in-depth  
175 interviews with next-of-kin often see greater attributions to mental disorders (14), however many  
176 methodological variations across studies exist (15). It is likely that some people without known MHP in the  
177 current study were experiencing mental health challenges that were unknown, and hence underreported by key  
178 informants. However, any lack of awareness of decedent MHP suggests the importance of addressing the broad  
179 range of contributing circumstances.

180 Suicide is a growing public health problem ~~with . Effective approaches to prevent the many associated suicide~~  
181 ~~risk factors are available.~~ States and communities can ~~use use data from~~ NVDRS ~~data to better understand their~~  
182 ~~suicide problem~~ and ~~can use~~ resources such as CDC's *Preventing Suicide: a Technical Package of Policies,*  
183 *Programs, and Practices* (12) to ~~better understand their suicide problem and prioritize implement~~ evidence-  
184 based comprehensive suicide prevention ~~to save lives.~~

#### 185 **Acknowledgments**

186 The authors acknowledge Robert Anderson, Holly Hedegaard, and Margaret Warner from the Division of Vital  
187 Statistics, National Center for Health Statistics, CDC, for their statistical consultation.

188  
189 **Conflict of Interest** No conflicts of interest were reported.

190  
191 **Corresponding author:** Deborah M. Stone, [dstone3@cdc.gov](mailto:dstone3@cdc.gov), 770-488-3942

#### 192 193 **Author Affiliations:**

194 <sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis,  
195 Research, and Practice Integration, National Center for Injury Prevention and Control, CDC

#### 196 **References:**

- 197 1. Centers for Disease Control and Prevention. Web-based Injury Statistics Query and Reporting System  
198 (WISQARS). Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018. In.
- 199 2. Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide Trends Among and  
200 Within Urbanization Levels by Sex, Race/Ethnicity, Age Group, and Mechanism of Death - United States, 2001-  
201 2015. *MMWR Surveill Summ* 2017;66(18):1-16.
- 202 3. Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999-2014. In: US  
203 Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for  
204 Health Statistics Hyattsville, MD; 2016.
- 205 4. Kochanek K, Murphy S, Xu J, Arias E. Mortality in the United States, 2016. NCHS Data Brief, no 293.  
206 National Center for Health Statistics 2017.
- 207 5. Office of the Surgeon General, National Action Alliance for Suicide Prevention. 2012 National strategy  
208 for suicide prevention: goals and objectives for action: a report of the US Surgeon General and of the National  
209 Action Alliance for Suicide Prevention. 2012.



- 210 6. Zalsman G, Hawton K, Wasserman D, van Heeringen K, Arensman E, Sarchiapone M, et al. Suicide  
211 prevention strategies revisited: 10-year systematic review. *The Lancet Psychiatry* 2016;3(7):646-659.
- 212 7. Torguson K, O'Brien A. Leading Suicide Prevention Efforts Unite to Address Rising National Suicide Rate.  
213 In. Washington, D.C.; 2017.
- 214 8. Crepeau-Hobson F. The Psychological Autopsy and Determination of Child Suicides: A Survey of Medical  
215 Examiners. *Archives of Suicide Research* 2010;14(1):24-34.
- 216 9. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5®):  
217 American Psychiatric Pub; 2013.
- 218 10. Simon TR, Swann AC, Powell KE, Potter LB, Kresnow Mj, O'Carroll PW. Characteristics of impulsive  
219 suicide attempts and attempters. *Suicide and Life-Threatening Behavior* 2002;32(s1):49-59.
- 220 11. World Health Organization. Risks to mental health: An overview of vulnerabilities and risk factors.  
221 Geneva: WHO 2012.
- 222 12. Stone DM, Holland KM, Bartholow BN, Crosby AE, Davis SP, Wilkins N. Preventing suicide: A technical  
223 package of policies, programs, and practice. 2017.
- 224 13. Caine ED, Reed J, Hindman J, Quinlan K. Comprehensive, integrated approaches to suicide prevention:  
225 practical guidance. *Injury prevention* 2017;injuryprev-2017-042366.
- 226 14. Milner A, Sveticic J, De Leo D. Suicide in the absence of mental disorder? A review of psychological  
227 autopsy studies across countries. *Int J Soc Psychiatry* 2013;59(6):545-54.
- 228 15. Pouliot L, De Leo D. Critical issues in psychological autopsy studies. *Suicide Life Threat Behav*  
229 2006;36(5):491-510.

230 **Attachments:**

231 Stone\_Suicide Vital Signs MMWR 3.27.18 (table 1.fig 1)

232 Stone\_Suicide Vital Signs MMWR 3.27.18 (Tables 2&3)

233 **Word Count:** ~~182258~~/1800

1 **Short Title:** Vital Signs: ~~Contributing Circumstances to Suicide and Identifying~~ Increasing Trends in State Suicide  
2 Rates ~~and Exploring Suicide's Multiple Contributing Circumstances~~

3 Deborah M. Stone, ScD;<sup>1</sup> Thomas R. Simon PhD;<sup>1</sup> Katherine A. Fowler, PhD;<sup>1</sup> Scott R. Kegler, PhD;<sup>2</sup> Keming Yuan,  
4 MS;<sup>1</sup> Kristin M. Holland, PhD;<sup>1</sup> Asha Z. Ivey-Stephenson, PhD;<sup>1</sup> Alex E. Crosby, MD<sup>1</sup>

5 **Background:** Suicide rates in the United States have risen nearly 30% since 1999. ~~Mental health problems (MHP)~~  
6 ~~are just one factor contributing to suicide.~~ Examining state-level trends in ~~suicide~~ and ~~other the multiple~~  
7 contributing circumstances ~~to, suicide~~ can inform comprehensive state suicide prevention planning.

8 **Methods:** Trends in age-adjusted suicide rates among people aged ≥10 years, by state and sex, across six  
9 consecutive three-year periods (1999-2016), were assessed using data from the National Vital Statistics System  
10 for 50 states and Washington, D.C. Data from the National Violent Death Reporting System (NVDRS), covering  
11 27 states in 2015, were used to examine contributing circumstances among decedents with and without known  
12 ~~MHP~~mental health problems (MHP).

13 **Results:** From 1999-2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases  
14 of more than 30%. Rates increased significantly among males and females in 34 and 43 states, respectively.  
15 ~~Among decedents in NVDRS, 54.0% half (54.0%) of decedents did not have a known MHP.~~ Among decedents  
16 with circumstance information, several circumstances, including relationship problems/loss (45.1% vs 39.6%),  
17 life stressors (54.2% vs 49.7%) and recent/impending crises (32.9% vs 26.0%), were significantly more likely  
18 among those without a known MHP than decedents with MHP, but were common across groups.

19 **Conclusions:** Suicide rates increased significantly across most states from 1999-2016. Various circumstances  
20 contributed to suicides among people with and without known MHP.

21 **Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach  
22 to prevent suicide risk before it occurs, identify and support people at risk, prevent reattempts, and help  
23 friends/family after a suicide occurs.

## 24 INTRODUCTION

### 25 BACKGROUND AND PURPOSE

26 In 2016, nearly 45,000 suicides (15.6/100,000 [age-adjusted]) occurred in the United States (U.S.), among people  
27 ≥10 years old (1). Between 1999 and 2015, suicide rates increased across ~~both~~ sexes, racial/ethnic groups, and  
28 urbanization levels (2, 3). Suicide is the 10<sup>th</sup> leading cause of death and is one of just three leading causes that  
29 are *increasing* (1, 4). Additionally, rates of Emergency Department visits for nonfatal self-harm, a key risk factor  
30 for suicide, increased nearly 45% between 2001 and 2015 (1). Together, suicides and self-harm injuries cost the  
31 nation more than \$69 billion in direct medical and work loss costs (1).

32 The *National Strategy for Suicide Prevention*(NSSP) (5) calls for a public health approach to suicide prevention  
33 with efforts spanning across multiple levels (i.e., individual, family/relationship, community, and societal). Such  
34 an approach underscores that suicide is rarely caused by any single factor, but rather, is multi-determined.

35 Despite the NSSP guidance, suicide prevention efforts largely focus on ~~identifying and treating individuals~~  
36 ~~with clinically-oriented interventions mental health focused on people with mental health~~ problems (MHP) or  
37 ~~providing follow-up care to people who have attempted~~ people who have attempted suicide (6). Other  
38 contributing circumstances include social ~~isolation, relationship problems, and~~ economic problems, access to  
39 lethal means (e.g., substances, firearms, bridges) among people at risk, ~~and~~ poor coping and problem-solving  
40 skills ~~and prior suicide attempts~~ (5). Expanded awareness of these additional circumstances ~~that contributing~~

Comment [FC]: I think some sort of clarification is needed to distinguish from previous two sentences since what is reported here are not data on full examined time period or all 50 states. Tracked an idea but there are likely other ways to clarify.

Comment [zaf9]: Updated



to suicide risk ~~apart from MHP~~, and action to address them, can help reach the nation's goal of reducing suicide rates 20% by 2025 (7). To assist states in achieving this goal, this study analyzes state-specific trends in suicide rates, assesses the multiple contributing factors to suicide, and provides recommendations for multi-level comprehensive suicide prevention.

## METHODS

Suicide rates were analyzed for people aged  $\geq 10$  years only, as attributions of suicidal intent in younger children are variable (8). Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases 10<sup>th</sup> Revision*, underlying-cause-of death codes X60-X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods spanning 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Characteristics and circumstances of suicide decedents  $\geq 10$  years, with and without known MHP, were compared in the 27 states with complete data participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines MHP as disorders and syndromes listed in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (9), with the exception of alcohol and other substance dependence, which are captured separately in NVDRS. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known MHP were compared using Chi-square tests. Logistic regression analyses estimated adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and race/ethnicity.

## RESULTS

The most recent overall suicide rates (representing 2014-2016) varied four-fold, from 6.9 (D.C.) to 29.2 (Montana) per 100,000 persons per year (Table 1). Across the study period, rates increased in all states, except Nevada (which had a consistently high rate throughout), with absolute increases ranging from +0.8 (Delaware) to +8.1 (Wyoming) per 100,000. Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with increases of more than 30% observed in 25 states (Table 1, Figure 1).

Modeled suicide rate trends indicated significant increases for 44 states, for males (34 states) and females (43 states), as well as for the U.S. overall (Table 1). Nationally, the model-estimated AAPC for the overall suicide rate was +1.5%. By sex, estimated national rate trends further indicated significant increases for males (AAPC +1.1%) and females (AAPC +2.6%).

Suicide decedents without known MHP (N=11,039) were compared to those with MHP (N=9,407) in 27 states. While all decedents were predominately male (Table 2; 76.8%) and non-Hispanic white (83.6%), those without known MHP, relative to those with MHP, were more likely male (83.6% vs. 68.8%; odds ratio (OR)=2.3, 95% CI = 2.2-2.5) and racial/ethnic minorities (OR range: 1.2-2.0). Suicide decedents without known MHP also had significantly greater odds of perpetrating homicide-suicide (adjusted odds ratio aOR = 2.9, 95% CI = 2.2-3.8). Among adult decedents, 20.1% and 15.3% of people without and with MHP, respectively, ever served, or were currently serving, in the U.S. military.

**Comment [FC]:** Suggest pulling out the references to tables 2 and 3 since table 1 hasn't been mentioned yet and helps saves on word count. If you want to keep them in, suggest adding "table 1" somewhere into the above paragraph.

**Comment [za19]:** Took the ref to tables out.

**Comment [FC]:** Given attention to this particular at-risk population in the results, made me wonder if some mention of needs of this group should be in the discussion. There are other higher risk groups described below. A consideration could be in the discussion about prevention needs of underserved areas (bottom of page 3) some phrasing could be added about the need for services for higher risk groups, such as those who have served in the military and those who have difficulties, such as MPH, intimate partner problems, have physical health problems, and have financial and legal difficulties. Or on page 4 where "identifying and better supporting people at risk" is stated an e.g. could be added.

**Comment [za19]:** Did not end up adding this as it seemed odd to call out this one population.



85 While firearms were the most common method of suicide overall (48.5%) and for both groups, decedents  
86 without known MHP were more likely to die by firearm (55.3% vs. 40.6%) and less likely to die by  
87 hanging/strangulation/suffocation (26.9% vs 31.3%) or poisoning (10.4% vs 19.8%) than those with known MHP.  
88 These differences remained significant in the adjusted models.

89 Decedents without known MHP were less likely to receive toxicology testing. Among those with toxicology  
90 results, decedents without known MHP were less likely to test positive for any substance overall (aOR=0.8, 95%  
91 CI=0.7-0.8) but more likely to test positive for alcohol (aOR=1.2, 95% CI=1.1-1.3).

92 All suicide decedents with MHP (N=9,407) and approximately 85% without known MHP (N=9,357) had available  
93 circumstances information (Table 3). People without known MHP were less likely to have any substance abuse  
94 problems (aOR=0.7, 95% CI=0.7-0.8). While two-thirds of those with known MHP had a history of mental health  
95 or substance abuse treatment (67.2%), just over half (54.0%) were in current treatment.

96 Decedents without known MHP versus those with known MHP had significantly greater likelihood of any  
97 relationship problem/loss (45.1% vs. 39.6%), specifically intimate partner problems (30.2% vs. 24.1%),  
98 arguments/conflicts (17.5% vs. 13.6%), and recently perpetrating interpersonal violence (3.0% vs. 1.4%). They  
99 were also more likely to have experienced any life stressors (54.2% vs 49.7%), such as criminal-legal problems  
100 (10.7% vs. 6.2%) or eviction/loss of home (4.3% vs. 3.4%), and they were more likely to have had a crisis within  
101 the preceding or upcoming two weeks (32.9% vs. 26.0%). All of these differences remained significant in the  
102 adjusted models. Among those with crises, intimate partner and physical health problems were the most  
103 common types for both groups and did not differ between them.

104 Decedents without known MHP had significantly lower odds of recent release from any institution (aOR=0.5,  
105 95% CI=0.4-0.5), but among those who were recently released (5.1%), they were significantly more likely to be  
106 released from a correctional facility (25.7% vs. 8.7%) or hospital (43.7% vs. 33.0%) than those with a known  
107 MHP. Among decedents with known MHP who were recently released from an institution (10.2%), 46.7% of this  
108 group were released from psychiatric facilities.

109 Decedents without known MHP, compared to those with MHP, were significantly less likely to have a history of  
110 suicidal ideation (23.0% vs. 40.8%) and prior suicide attempts (10.3% vs. 29.4%). More than 1 in five people in  
111 both groups disclosed suicide intent (22.4% vs. 24.5%).

## 112 Conclusions and Comments

113 From 1999-2016, 44 states saw significant ~~suicide rate increases~~ increases in suicide rates and 25 states  
114 experienced rate increases of more than 30%. Rates increased significantly ~~for among~~ for males, (in 34 states), and  
115 ~~for~~ for females; (in 43 states). This finding is consistent with prior research showing a decreasing gender gap in  
116 male-female suicide rates between 1999-2014 (3). ~~Overall, half of the states experienced substantial increases in~~  
117 ~~suicide rates of more than 30%~~. Additional research into the specific causes of these trends is necessary.  
118 ~~Fortunately in the meantime, data from the 27 states participating in NVDRS NVDRS can shed light on provides~~  
119 ~~insight into the suicide circumstances and circumstances that contributed to recent suicides, and can help~~  
120 ~~states identify prevention priorities. help guide prevention activities.~~

121 ~~Researchers and practitioners~~ Suicidologists regularly state that ‘suicide ‘is not caused by a single factor;’ (5)  
122 however, suicide prevention research and practice ~~prevention practices often focus on is~~ heavily weighted  
123 towards identifying and treating MHP ~~clinically-oriented activities~~ (6). ~~In contrast, t~~ The current study found that  
124 more than half of suicide decedents in NVDRS did not have a known MHP. This group suffered more from  
125 relationship problems ~~issues~~ and other life stressors such as criminal-legal ~~matters~~, housing ~~eviction/loss of~~

**Comment [FC]:** It appears non-MHP is being compared to non-MHP. Tracked what I think the edit is but please double check.

**Comment [za19]:** You are correct. Should be with in the second instances, not without.



126 home, and health problems. They also experienced more and recent/or impending crises which may point to  
 127 suicides. This is particularly noteworthy in light of findings that suggest that took place many suicides and  
 128 attempts occur with minimal deliberation (10). In addition to educating about how to respond to signs or  
 129 disclosures of suicide risk, broader prevention to address non-clinical risks is critical and can include  
 130 strengthening economic supports (e.g., through housing stabilization policies, household financial support);  
 131 teaching coping and problem-solving skills early in life to bolster healthy relationships over the life course; and  
 132 promoting social connectedness to increase one's sense of belonging.

133 The above strategies are also applicable to Among people with MHP who, in the current study struggled more  
 134 with job/financial problems, bereavement issues, and family crises, and who commonly experienced  
 135 arguments/conflicts, intimate partner, and health problems. These findings support a body of literature  
 136 indicating increased vulnerability among people with MHP to socio-economic and health problems (11). In the  
 137 clinical realm, two-thirds of people with MHP had a history of any treatment mental health and/or substance  
 138 abuse treatment and over half 54% were in current treatment when they died. This suggests the need for that  
 139 additional supports for this population are needed to keep them safe. This includes broader broader  
 140 implementation of affordable and effective evidence-based treatment modalities (e.g., such as doctor-patient  
 141 collaborative care, models and cognitive-behavioral therapy). Additionally, greater access to behavioral health  
 142 providers (especially in underserved areas) is needed, as and expanded is expansion of healthcare systems to  
 143 integration of physical and behavioral health that better support suicide prevention and patient safety within  
 144 healthcare systems, especially through care transitions (12).

145 Study findings indicate that people with known MHP also experienced other life stressors such as job/financial,  
 146 relationship, and/or physical health problems. These findings point to the need to both prevent the conditions  
 147 associated with mental health problems in the first place, and to support people with known MHP to decrease  
 148 their risk of poor social, health, and economic outcomes (11).

149 In addition to the abovementioned strategies, other components of a comprehensive approach Together, these  
 150 results underscore the importance of comprehensive statewide suicide prevention activities that address  
 151 multiple factors associated with suicide. Prevention strategies may include: strengthening economic supports  
 152 (e.g., housing stabilization policies, household financial support); teaching coping and problem-solving skills to  
 153 manage everyday stressors and prevent future relationship problems, especially early in life; promoting social  
 154 connectedness to increase a sense of belongingness and access to informational, emotional, and social support;  
 155 and identifying and better supporting people at risk. Other strategies include: creating protective environments  
 156 by s (e.g., reducing access to lethal means (e.g., medications, firearms) among people at risk, creating  
 157 organizational and workplace policies to encouraging promote employee help-seeking and connectedness;  
 158 easing transitions into and out of work for people with MHP and other life challenges), and zoning to reduce  
 159 alcohol-outlet density; better identifying people at risk; supporting friends/family after a suicide has taken place  
 160 and supporting family and friends after a suicide, and assuring safe reporting by the media in order to prevent  
 161 suicide contagion (12). Some states, such as Colorado, are planning to implement such a comprehensive  
 162 approach to suicide prevention (13).

163 These findings have at least three limitations. In the state-level analysis, rankings for four states (MD, MA, RI,  
 164 UT) might have been impacted by large proportions of injury deaths of undetermined intent (potentially biasing  
 165 reported suicide rates downward), or decreased percentages of such deaths over time (potentially biasing  
 166 estimated rate trends upward). Second, NVDRS is not yet nationally representative; the 27 states included  
 167 represent 49.6% of the population  
 168 (<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml>).

**Comment [FC]:** True point but it suggests at least to me there is limited prevention opportunity. Given 22% disclosed suicide intent, perhaps there needs to be more stated here. Idea: suicides can occur with minimal deliberation but many individuals disclose suicidal intent or demonstrate other risk factors that help in identifying at-risk individual who need immediate access to supportive services.

**Comment [za19]:** updated

**Comment [FC]:** Wonder if it might be good to move this point down into the paragraph about comprehensive strategies or its own paragraph since it is applicable to those with known and not known MPH. If moved out of this paragraph specific to MPH, and framed more broadly about what all persons need, then attention to a couple of vulnerable populations per earlier comment could be added to this idea.

**Comment [za19]:** Prefer to keep this as is because we want to want to 'advocate' for better treatment and services for people with MHP.

**Comment [FC]:** I like the evolution I have seen of the results and discussion to emphasize the difficulties of those without known MHP. I do think it's important as done for the discussion to talk specifically about those with known MPH. But, the two MPH group paragraphs in the discussion seem to tip the balance more toward the MPH group. I suggest weaving into the previous paragraph that



Third, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the extent of informant knowledge can impact data completeness and accuracy. Studies including more in-depth interviews with next-of-kin often see greater attributions to mental disorders (14), however many methodological variations across studies exist (15). It is likely that some people without known MHP in the current study were experiencing mental health challenges that were unknown, and hence underreported by key informants. However, any lack of awareness of decedent MHP suggests the importance of addressing the broad range of contributing circumstances.

Suicide is a growing public health problem ~~with - Effective approaches to prevent the many associated suicide risk factors are available.~~ States and communities can ~~use use data from NVDRS data to better understand their suicide problem~~ and ~~can use~~ resources such as CDC's *Preventing Suicide: a Technical Package of Policies, Programs, and Practices* (12) to ~~better understand their suicide problem and prioritize implement~~ evidence-based comprehensive suicide prevention ~~to save lives.~~

#### Acknowledgments

The authors acknowledge Robert Anderson, Holly Hedegaard, and Margaret Warner from the Division of Vital Statistics, National Center for Health Statistics, CDC, for their statistical consultation.

**Conflict of Interest** No conflicts of interest were reported.

**Corresponding author:** Deborah M. Stone, [dstone3@cdc.gov](mailto:dstone3@cdc.gov), 770-488-3942

#### Author Affiliations:

<sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis, Research, and Practice Integration, National Center for Injury Prevention and Control, CDC

#### References:

- Centers for Disease Control and Prevention. Web-based Injury Statistics Query and Reporting System (WISQARS). Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018. In.
- Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide Trends Among and Within Urbanization Levels by Sex, Race/Ethnicity, Age Group, and Mechanism of Death - United States, 2001-2015. *MMWR Surveill Summ* 2017;66(18):1-16.
- Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999-2014. In: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics Hyattsville, MD; 2016.
- Kochanek K, Murphy S, Xu J, Arias E. Mortality in the United States, 2016. *NCHS Data Brief*, no 293. National Center for Health Statistics 2017.
- Office of the Surgeon General, National Action Alliance for Suicide Prevention. 2012 National strategy for suicide prevention: goals and objectives for action: a report of the US Surgeon General and of the National Action Alliance for Suicide Prevention. 2012.
- Zalsman G, Hawton K, Wasserman D, van Heeringen K, Arensman E, Sarchiapone M, et al. Suicide prevention strategies revisited: 10-year systematic review. *The Lancet Psychiatry* 2016;3(7):646-659.
- Torguson K, O'Brien A. Leading Suicide Prevention Efforts Unite to Address Rising National Suicide Rate. In. Washington, D.C.; 2017.
- Crepeau-Hobson F. The Psychological Autopsy and Determination of Child Suicides: A Survey of Medical Examiners. *Archives of Suicide Research* 2010;14(1):24-34.
- American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5®): American Psychiatric Pub; 2013.



- 214 10. Simon TR, Swann AC, Powell KE, Potter LB, Kresnow Mj, O'Carroll PW. Characteristics of impulsive  
215 suicide attempts and attempters. *Suicide and Life-Threatening Behavior* 2002;32(s1):49-59.
- 216 11. World Health Organization. *Risks to mental health: An overview of vulnerabilities and risk factors.*  
217 Geneva: WHO 2012.
- 218 12. Stone DM, Holland KM, Bartholow BN, Crosby AE, Davis SP, Wilkins N. *Preventing suicide: A technical*  
219 *package of policies, programs, and practice.* 2017.
- 220 13. Caine ED, Reed J, Hindman J, Quinlan K. Comprehensive, integrated approaches to suicide prevention:  
221 practical guidance. *Injury prevention* 2017;injuryprev-2017-042366.
- 222 14. Milner A, Svetlicic J, De Leo D. Suicide in the absence of mental disorder? A review of psychological  
223 autopsy studies across countries. *Int J Soc Psychiatry* 2013;59(6):545-54.
- 224 15. Pouliot L, De Leo D. Critical issues in psychological autopsy studies. *Suicide Life Threat Behav*  
225 2006;36(5):491-510.

226 **Attachments:**

227 Stone\_Suicide Vital Signs MMWR 3.27.18 (table 1.fig 1)

228 Stone\_Suicide Vital Signs MMWR 3.27.18 (Tables 2&3)

229 **Word Count:** ~~1858~~1799/1800

1 **Short Title:** Vital Signs: Contributing Circumstances to Suicide and Increasing Trends in State Suicide Rates

2 Deborah M. Stone, ScD;<sup>1</sup> Thomas R. Simon PhD;<sup>1</sup> Katherine A. Fowler, PhD;<sup>1</sup> Scott R. Kegler, PhD;<sup>2</sup> Keming Yuan,  
3 MS;<sup>1</sup> Kristin M. Holland, PhD;<sup>1</sup> Asha Z. Ivey-Stephenson, PhD;<sup>1</sup> Alex E. Crosby, MD<sup>1</sup>

4 **Background:** Suicide rates in the United States have risen nearly 30% since 1999. Mental health problems (MHP)  
5 are just one factor contributing to suicide. Examining state-level trends in suicide and other contributing  
6 circumstances can inform comprehensive state suicide prevention planning.

7 **Methods:** Trends in age-adjusted suicide rates among people aged  $\geq 10$  years, by state and sex, across six  
8 consecutive three-year periods (1999-2016), were assessed using data from the National Vital Statistics System  
9 for 50 states and Washington, D.C. Data from the National Violent Death Reporting System, covering 27 states  
10 in 2015, were used to examine contributing circumstances among decedents with and without known MHP.

11 **Results:** From 1999-2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases  
12 of more than 30%. Rates increased significantly among males and females in 34 and 43 states, respectively.  
13 Among decedents in 2015 in 27 states, Over half (54.0%) of decedents did not have a known MHP. Among  
14 decedents with circumstance information, several circumstances, including relationship problems/loss (45.1% vs  
15 39.6%), life stressors (54.2% vs 49.7%) and recent/impending crises (32.9% vs 26.0%), were significantly more  
16 likely among those without a known MHP than decedents with MHP, but were common across groups.

17 **Conclusions:** Suicide rates increased significantly across most states from 1999-2016. Various circumstances  
18 contributed to suicides among people with and without known MHP.

19 **Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach  
20 to prevent suicide risk before it occurs, identify and support people at risk, prevent reattempts, and help  
21 friends/family after a suicide occurs.

22 **INTRODUCTION**

23 **BACKGROUND AND PURPOSE**

24 In 2016, nearly 45,000 suicides (15.6/100,000 [age-adjusted]) occurred in the United States (U.S.), among people  
25  $\geq 10$  years old (1). Between 1999 and 2015, suicide rates increased across sexes, racial/ethnic groups, and  
26 urbanization levels (2, 3). Suicide is the 10<sup>th</sup> leading cause of death and is one of just three leading causes that  
27 are *increasing* (1, 4). Additionally, rates of Emergency Department visits for nonfatal self-harm, a key risk factor  
28 for suicide, increased nearly 45% between 2001 and 2015 (1). Together, suicides and self-harm injuries cost the  
29 nation more than \$69 billion in direct medical and work loss costs (1).

30 The *National Strategy for Suicide Prevention* (NSSP) (5) calls for a public health approach to suicide prevention  
31 with efforts spanning across multiple levels (i.e., individual, family/relationship, community, and societal). Such  
32 an approach underscores that suicide is rarely caused by any single factor, but rather, is multi-determined.  
33 Despite the NSSP guidance, suicide prevention efforts largely focus on identifying and treating individuals with  
34 mental health problems (MHP) or providing follow-up care to people who have attempted suicide (6). Other  
35 contributing circumstances include social and economic problems, access to lethal means (e.g., substances,  
36 firearms, bridges) among people at risk, poor coping and problem-solving skills, and prior suicide attempts (5).  
37 Expanded awareness of the additional circumstances that contribute to suicide risk apart from MHP, and action  
38 to address them, can help reach the nation's goal of reducing suicide rates 20% by 2025 (7). To assist states in  
39 achieving this goal, this study analyzes state-specific trends in suicide rates, assesses the multiple contributing  
40 factors, and provides recommendations for multi-level comprehensive suicide prevention.

**Comment [FC]:** I think some sort of clarification is needed to distinguish from previous two sentences since what is reported here are not data on full examined time period or all 50 states. Tracked an idea but there are likely other ways to clarify.



41 **METHODS**

42 Suicide rates were analyzed for people aged  $\geq 10$  years only, as attributions of suicidal intent in younger children  
 43 are variable (8). Age-specific suicide counts were tabulated based on National Vital Statistics System coded death  
 44 certificate records (*International Classification of Diseases 10<sup>th</sup> Revision*, underlying-cause-of death codes X60-  
 45 X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for  
 46 Health Statistics bridged-race population data releases.

47  
 48 National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods  
 49 spanning 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed  
 50 per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data  
 51 aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends  
 52 are reported in terms of average annual percentage changes (AAPCs).

53  
 54 Characteristics (Table 2) and circumstances (Table 3) of suicide decedents  $\geq 10$  years, with and without known  
 55 MHP, were compared in the 27 states with complete data participating in CDC's National Violent Death  
 56 Reporting System (NVDRS) in 2015. NVDRS defines MHP as disorders and syndromes listed in the Diagnostic and  
 57 Statistical Manual of Mental Disorders, Fifth Edition (9), with the exception of alcohol and other substance  
 58 dependence, which are captured separately in NVDRS. NVDRS aggregates data from three primary data sources:  
 59 death certificates, coroner/medical examiner reports (including toxicology), and law enforcement  
 60 reports. Decedents with and without known MHP were compared using Chi-square tests. Logistic regression  
 61 analyses estimated adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and  
 62 race/ethnicity.

63 **RESULTS**

64 The most recent overall suicide rates (representing 2014-2016) varied four-fold, from 6.9 (D.C.) to 29.2  
 65 (Montana) per 100,000 persons per year (Table 1). Across the study period, rates increased in all states, except  
 66 Nevada (which had a consistently high rate throughout), with absolute increases ranging from +0.8 (Delaware)  
 67 to +8.1 (Wyoming) per 100,000. Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North  
 68 Dakota), with increases of more than 30% observed in 25 states (Table 1, Figure 1).

69  
 70 Modeled suicide rate trends indicated significant increases for 44 states, for males (34 states) and females (43  
 71 states), as well as for the U.S. overall (Table 1). Nationally, the model-estimated AAPC for the overall suicide  
 72 rate was +1.5%. By sex, estimated national rate trends further indicated significant increases for males (AAPC  
 73 +1.1%) and females (AAPC +2.6%).

74  
 75 Suicide decedents without known MHP (N=11,039) were compared to those with MHP (N=9,407) in 27 states.  
 76 While all decedents were predominately male (Table 2; 76.8%) and non-Hispanic white (83.6%), those without  
 77 known MHP, relative to those with MHP, were more likely male (83.6% vs. 68.8%; odds ratio (OR)=2.3, 95% CI =  
 78 2.2-2.5) and racial/ethnic minorities (OR range: 1.2-2.0). Suicide decedents without known MHP also had  
 79 significantly greater odds of perpetrating homicide-suicide (adjusted odds ratio aOR = 2.9, 95% CI = 2.2-3.8).  
 80 Among adult decedents, 20.1% and 15.3% of people without and with MHP, respectively, ever served, or were  
 81 currently serving, in the U.S. military.

82 While firearms were the most common method of suicide overall (48.5%) and for both groups, decedents  
 83 without known MHP were more likely to die by firearm (55.3% vs. 40.6%) and less likely to die by  
 84 hanging/strangulation/suffocation (26.9% vs 31.3%) or poisoning (10.4% vs 19.8%) than those without known  
 85 MHP. These differences remained significant in the adjusted models.

**Comment [FC]:** Suggest pulling out the references to tables 2 and 3 since table 1 hasn't been mentioned yet and helps saves on word count. If you want to keep them in, suggest adding "table 1" somewhere into the above paragraph.

**Comment [FC]:** Given attention to this particular at-risk population in the results, made me wonder if some mention of needs of this group should be in the discussion. There are other higher risk groups described below. A consideration could be in the discussion about prevention needs of underserved areas (bottom of page 3) some phrasing could be added about the need for services for higher risk groups, such as those who have served in the military and those who have difficulties, such as MPH, intimate partner problems, have physical health problems, and have financial and legal difficulties. Or on page 4 where "identifying and better supporting people at risk" is stated an e.g. could be added.

**Comment [FC]:** It appears non-MHP is being compared to non-MHP. Tracked what I think the edit is but please double check.



86 Decedents without known MHP were less likely to receive toxicology testing. Among those with toxicology  
87 results, decedents without known MHP were less likely to test positive for any substance overall (aOR=0.8, 95%  
88 CI=0.7-0.8) but more likely to test positive for alcohol (aOR=1.2, 95% CI=1.1-1.3).

89 All suicide decedents with MHP (N=9,407) and approximately 85% without known MHP (N=9,357) had available  
90 circumstances information (Table 3). People without known MHP were less likely to have any substance abuse  
91 problems (aOR=0.7, 95% CI=0.7-0.8). While two-thirds of those with known MHP had a history of mental health  
92 or substance abuse treatment (67.2%), just over half (54.0%) were in current treatment.

93 Decedents without known MHP versus those with known MHP had significantly greater likelihood of any  
94 relationship problem/loss (45.1% vs. 39.6%), specifically intimate partner problems (30.2% vs. 24.1%),  
95 arguments/conflicts (17.5% vs. 13.6%), and recently perpetrating interpersonal violence (3.0% vs. 1.4%). They  
96 were also more likely to have experienced any life stressors (54.2% vs 49.7%), such as criminal-legal problems  
97 (10.7% vs. 6.2%) or eviction/loss of home (4.3% vs. 3.4%), and they were more likely to have had a crisis within  
98 the preceding or upcoming two weeks (32.9% vs. 26.0%). All of these differences remained significant in the  
99 adjusted models. Among those with crises, intimate partner and physical health problems were the most  
100 common types for both groups and did not differ between them.

101 Decedents without known MHP had significantly lower odds of recent release from any institution (aOR=0.5,  
102 95% CI=0.4-0.5), but among those who were recently released (5.1%), they were significantly more likely to be  
103 released from a correctional facility (25.7% vs. 8.7%) or hospital (43.7% vs. 33.0%) than those with a known  
104 MHP. Among decedents with known MHP who were recently released from an institution (10.2%), 46.7% of this  
105 group were released from psychiatric facilities.

106 Decedents without known MHP, compared to those with MHP, were significantly less likely to have a history of  
107 suicidal ideation (23.0% vs. 40.8%) and prior suicide attempts (10.3% vs. 29.4%). More than 1 in five people in  
108 both groups disclosed suicide intent (22.4% vs. 24.5%).

## 109 Conclusions and Comments

110 From 1999-2016, 44 states saw significant suicide rate increases. Rates increased significantly for males, in 34  
111 states, and for females, in 43 states. This finding is consistent with prior research showing a decreasing gender  
112 gap in male-female suicide rates between 1999-2014 (3). Overall, half of the states experienced substantial  
113 increases in suicide rates of more than 30%. Additional research into the specific causes of these trends is  
114 necessary. Fortunately, data from the 27 states participating in NVDRS can shed light on the circumstances that  
115 contributed to recent suicides, and can help guide prevention activities.

116 Researchers and practitioners regularly state that 'suicide is not caused by a single factor;' however, research  
117 and prevention practices often focus on identifying and treating MHP (6). The current study found that more  
118 than half of suicide decedents in NVDRS did *not* have a known MHP. This group suffered more relationship  
119 problems and life stressors such as criminal-legal matters, eviction/loss of home, and recent or impending crises.  
120 This is particularly noteworthy in light of findings that suggest many suicides and attempts occur with minimal  
121 deliberation (10).

122 Among people with MHP, two-thirds had a history of mental health and/or substance abuse treatment and over  
123 half were in current treatment. This suggests that additional supports for this population are needed to keep  
124 them safe. This includes broader implementation of affordable and effective treatment modalities such as  
125 doctor-patient collaborative care models and cognitive-behavioral therapy. Additionally, greater access to  
126 behavioral health providers in underserved areas is needed, as is expansion of healthcare systems to integrate

**Comment [FC]:** True point but it suggests at least to me there is limited prevention opportunity. Given 22% disclosed suicide intent, perhaps there needs to be more stated here. Idea: suicides can occur with minimal deliberation but many individuals disclose suicidal intent or demonstrate other risk factors that help in identifying at-risk individual who need immediate access to supportive services.

**Comment [FC]:** Wonder if it might be good to move this point down into the paragraph about comprehensive strategies or its own paragraph since it is applicable to those with known and not known MPH. If moved out of this paragraph specific to MPH, and framed more broadly about what all persons need, then attention to a couple of vulnerable populations per earlier comment could be added to this idea.



127 physical and behavioral health that better support suicide prevention and patient safety, especially through care  
128 transitions (11).

129 Study findings indicate that people with known MHP also experienced other life stressors such as job/financial,  
130 relationship, and/or physical health problems. These findings point to the need to both prevent the conditions  
131 associated with mental health problems in the first place, and to support people with known MHP to decrease  
132 their risk of poor social, health, and economic outcomes (12).

133 Together, these results underscore the importance of comprehensive statewide suicide prevention activities  
134 that address multiple factors associated with suicide. Prevention strategies may include: strengthening  
135 economic supports (e.g., housing stabilization policies, household financial support); teaching coping and  
136 problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in  
137 life; promoting social connectedness to increase a sense of belongingness and access to informational, tangible,  
138 emotional, and social support; and identifying and better supporting people at risk. Other strategies include  
139 creating protective environments (e.g., reducing access to lethal means among people at risk, creating  
140 organizational and workplace policies to promote help-seeking, easing transitions into and out of work for  
141 people with MHP and other life challenges), supporting family and friends after a suicide, and assuring safe  
142 reporting by the media in order to prevent suicide contagion (11). Some states, such as Colorado, are planning  
143 to implement such a comprehensive approach to suicide prevention (13).

144 These findings have at least three limitations. In the state-level analysis, rankings for four states (MD, MA, RI,  
145 UT) might have been impacted by large proportions of injury deaths of undetermined intent (potentially biasing  
146 reported suicide rates downward), or decreased percentages of such deaths over time (potentially biasing  
147 estimated rate trends upward). Second, NVDRS is not yet nationally representative; the 27 states included  
148 represent 49.6% of the population  
149 (<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml>).

150 Third, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the  
151 extent of informant knowledge can impact data completeness and accuracy. Studies including more in-depth  
152 interviews with next-of-kin often see greater attributions to mental disorders (14), however many  
153 methodological variations across studies exist (15). It is likely that some people without known MHP in the  
154 current study were experiencing mental health challenges that were unknown, and hence underreported by key  
155 informants. However, any lack of awareness of decedent MHP suggests the importance of addressing the broad  
156 range of contributing circumstances.

157 Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are  
158 available. States and communities can use data from NVDRS and resources such as CDC's *Preventing Suicide: a*  
159 *Technical Package of Policies, Programs, and Practices* (11) to better understand their suicide problem and  
160 prioritize evidence-based comprehensive suicide prevention.

#### 161 Acknowledgments

162 The authors acknowledge Robert Anderson, Holly Hedegaard, and Margaret Warner from the Division of Vital  
163 Statistics, National Center for Health Statistics, CDC, for their statistical consultation.

165 Conflict of Interest No conflicts of interest were reported.

167 Corresponding author: Deborah M. Stone, [dstone3@cdc.gov](mailto:dstone3@cdc.gov), 770-488-3942

169 Author Affiliations:

**Comment [FC]:** I like the evolution I have seen of the results and discussion to emphasize the difficulties of those without known MHP. I do think it's important as done for the discussion to talk specifically about those with known MPH. But, the two MPH group paragraphs in the discussion seem to tip the balance more toward the MPH group. I suggest weaving into the previous paragraph that those with known MHP had other difficulties rather than this being a standalone paragraph.

Also consider if the prevention implication described here is also applicable to those without MPH. There seemed to be a gap in discussion paragraph #2 where similar precipitating circumstances are noted for the non-MPH group but no prevention strategies are presented. Prevention strategies for these types of risk factor could be described either in the non-MPH paragraph or this paragraph could be framed more broadly about the prevention needs of both non-MPH and MPH groups.

170 <sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis,  
171 Research, and Practice Integration, National Center for Injury Prevention and Control, CDC

172 **References:**

- 173 1. Centers for Disease Control and Prevention. Web-based Injury Statistics Query and Reporting System  
174 (WISQARS). Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018. In.
- 175 2. Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide Trends Among and  
176 Within Urbanization Levels by Sex, Race/Ethnicity, Age Group, and Mechanism of Death - United States,  
177 2001-2015. *MMWR Surveill Summ* 2017;66(18):1-16.
- 178 3. Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999-2014. In: US Department  
179 of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health  
180 Statistics Hyattsville, MD; 2016.
- 181 4. Kochanek K, Murphy S, Xu J, Arias E. Mortality in the United States, 2016. *NCHS Data Brief*, no 293. National  
182 Center for Health Statistics 2017.
- 183 5. Office of the Surgeon General, National Action Alliance for Suicide Prevention. 2012 National strategy for  
184 suicide prevention: goals and objectives for action: a report of the US Surgeon General and of the National  
185 Action Alliance for Suicide Prevention. 2012.
- 186 6. Zalsman G, Hawton K, Wasserman D, van Heeringen K, Arensman E, Sarchiapone M, et al. Suicide prevention  
187 strategies revisited: 10-year systematic review. *The Lancet Psychiatry* 2016;3(7):646-659.
- 188 7. Torguson K, O'Brien A. Leading Suicide Prevention Efforts Unite to Address Rising National Suicide Rate. In.  
189 Washington, D.C.; 2017.
- 190 8. Crepeau-Hobson F. The Psychological Autopsy and Determination of Child Suicides: A Survey of Medical  
191 Examiners. *Archives of Suicide Research* 2010;14(1):24-34.
- 192 9. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5®): American  
193 Psychiatric Pub; 2013.
- 194 10. Simon TR, Swann AC, Powell KE, Potter LB, Kresnow Mj, O'Carroll PW. Characteristics of impulsive suicide  
195 attempts and attempters. *Suicide and Life-Threatening Behavior* 2002;32(s1):49-59.
- 196 11. Stone DM, Holland KM, Bartholow BN, Crosby AE, Davis SP, Wilkins N. Preventing suicide: A technical  
197 package of policies, programs, and practice. 2017.
- 198 12. World Health Organization. Risks to mental health: An overview of vulnerabilities and risk factors. Geneva:  
199 WHO 2012.
- 200 13. Caine ED, Reed J, Hindman J, Quinlan K. Comprehensive, integrated approaches to suicide prevention:  
201 practical guidance. *Injury prevention* 2017;injuryprev-2017-042366.
- 202 14. Milner A, Sveticic J, De Leo D. Suicide in the absence of mental disorder? A review of psychological autopsy  
203 studies across countries. *Int J Soc Psychiatry* 2013;59(6):545-54.
- 204 15. Pouliot L, De Leo D. Critical issues in psychological autopsy studies. *Suicide Life Threat Behav*  
205 2006;36(5):491-510.

206 **Attachments:**

207 Stone\_Suicide Vital Signs MMWR 3.27.18 (table 1.fig 1)

208 Stone\_Suicide Vital Signs MMWR 3.27.18 (Tables 2&3)

209 **Word Count:** 1858/1800



**Short Title:** Vital Signs: Contributing Circumstances to Suicide and Increasing Trends in State Suicide Rates

Deborah M. Stone, ScD;<sup>1</sup> Thomas R. Simon PhD;<sup>1</sup> Katherine A. Fowler, PhD;<sup>1</sup> Scott R. Kegler, PhD;<sup>2</sup> Keming Yuan, MS;<sup>1</sup> Kristin M. Holland, PhD;<sup>1</sup> Asha Z. Ivey-Stephenson, PhD;<sup>1</sup> Alex E. Crosby, MD<sup>1</sup>

**Background:** Suicide rates in the United States have risen nearly 30% since 1999. Mental health problems (MHP) are just one factor contributing to suicide. Examining state-level trends in, and the multiple contributing circumstances to, suicide can inform comprehensive state suicide prevention planning.

**Methods:** Trends in age-adjusted suicide rates among people aged  $\geq 10$  years, by state and sex, across six consecutive three-year periods (1999-2016), were assessed using data from the National Vital Statistics System for 50 states and Washington, D.C. Data from the National Violent Death Reporting System, covering 27 states in 2015, were used to examine contributing circumstances among decedents with and without known mental health problems (MHP).

**Results:** From 1999-2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases of more than 30%. Rates increased significantly among males and females in 34 and 43 states, respectively. In 2015, more than half (54%) of decedents in 27 states did not have a known MHP. Among people with circumstance information, several circumstances, including relationship problems/loss (45.1% vs 39.6%), life stressors (54.2% vs 49.7%), and recent/impending crises (32.9% vs 26.0%) were significantly more likely among those without a known MHP than decedents with MHP, but were common across groups.

**Conclusions:** Suicide rates increased significantly across most states from 1999-2016. Various circumstances contributed to suicides among people with and without known MHP.

**Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach to prevent suicide risk before it occurs, identify and support people at risk, prevent reattempts, and help friends/family after a suicide occurs.

## INTRODUCTION

### BACKGROUND AND PURPOSE

In 2016, nearly 45,000 suicides (15.6/100,000 [age-adjusted]) occurred in the United States (U.S.), among people  $\geq 10$  years old (1). Between 1999 and 2015, suicide rates increased across sexes, racial/ethnic groups, and urbanization levels (2, 3). Suicide is the 10<sup>th</sup> leading cause of death and is one of just three leading causes that are *increasing* (1, 4). Additionally, rates of Emergency Department visits for nonfatal self-harm, a key risk factor for suicide, increased nearly 45% between 2001 and 2015 (1). Together, suicides and self-harm injuries cost the nation more than \$69 billion in direct medical and work loss costs (1).

The *National Strategy for Suicide Prevention (NSSP)* (5) calls for a public health approach to suicide prevention with efforts spanning across multiple levels (i.e., individual, family/relationship, community, and societal). Such an approach underscores that suicide is rarely caused by any single factor, but rather, is multi-determined. Despite the NSSP guidance, suicide prevention efforts are largely clinically-oriented, focused on treating mental health problems (MHP) and preventing re-attempts (6). Apart from MHP and prior attempts, other contributing circumstances to suicide include social and economic problems, access to lethal means (e.g., substances, firearms, bridges) among people at risk, and poor coping and problem-solving skills (5). Expanded awareness of these additional circumstances contributing to suicide risk and action to address them, can help reach the nation's goal of reducing suicide rates 20% by 2025 (7). To assist states in achieving this goal, this study analyzes

state-specific trends in suicide rates, assesses the multiple contributing factors to suicide, and provides recommendations for multi-level comprehensive suicide prevention.

## METHODS

Suicide rates were analyzed for people aged  $\geq 10$  years only, as determining suicidal intent in younger children can be difficult (8). Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases 10<sup>th</sup> Revision*, underlying-cause-of death codes X60-X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods spanning 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Characteristics and circumstances of suicide decedents  $\geq 10$  years old, with and without known MHP, were compared in the 27 states with complete data participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines MHP as disorders and syndromes listed in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (9), with the exception of alcohol and other substance dependence, which are captured separately in NVDRS. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known MHP were compared using Chi-square tests. Logistic regression analyses estimated adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and race/ethnicity.

## RESULTS (665)

The most recent overall suicide rates (representing 2014-2016) varied four-fold, from 6.9 (D.C.) to 29.2 (Montana) per 100,000 persons per year (Table 1). Across the study period, rates increased in all states, except Nevada (which had a consistently high rate throughout), with absolute increases ranging from +0.8 (Delaware) to +8.1 (Wyoming) per 100,000. Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with increases of more than 30% observed in 25 states (Table 1, Figure 1).

Modeled suicide rate trends indicated significant increases for 44 states, for males (34 states) and females (43 states), as well as for the U.S. overall (Table 1). Nationally, the model-estimated AAPC for the overall suicide rate was +1.5%. By sex, estimated national rate trends further indicated significant increases for males (AAPC +1.1%) and females (AAPC +2.6%).

Suicide decedents without known MHP (N=11,039) were compared to those with MHP (N=9,407) in 27 states. While all decedents were predominately male (Table 2; 76.8%) and non-Hispanic white (83.6%), those without known MHP, relative to those with MHP, were more likely male (83.6% vs. 68.8%; odds ratio (OR)=2.3, 95% CI = 2.2-2.5) and racial/ethnic minorities (OR range: 1.2-2.0). Suicide decedents without known MHP also had significantly greater odds of perpetrating homicide-suicide (adjusted odds ratio aOR = 2.9, 95% CI = 2.2-3.8). Among adult decedents, 20.1% and 15.3% of people without and with MHP, respectively, ever served, or were currently serving, in the U.S. military.

While firearms were the most common method of suicide used overall (48.5%) and for both groups, decedents without known MHP were more likely to die by firearm (55.3% vs. 40.6%) and less likely to die by



84 hanging/strangulation/suffocation (26.9% vs 31.3%) or poisoning (10.4% vs 19.8%) than those with known MHP.  
85 These differences remained significant in the adjusted models.

86 Decedents without known MHP were less likely to receive toxicology testing. Among those with toxicology  
87 results, decedents without known MHP were less likely to test positive for any substance overall (aOR=0.8, 95%  
88 CI=0.7-0.8) but more likely to test positive for alcohol (aOR=1.2, 95% CI=1.1-1.3).

89 All suicide decedents with MHP (N=9,407) and approximately 85% without known MHP (N=9,357) had available  
90 circumstances information (Table 3). People without known MHP were less likely to have any substance abuse  
91 problems (aOR=0.7, 95% CI=0.7-0.8). While two-thirds of those with known MHP had a history of mental health  
92 or substance abuse treatment (67.2%), just over half (54.0%) were in current treatment.

93 Decedents without, versus those with, known MHP, had significantly greater likelihood of any relationship  
94 problem/loss (45.1% vs. 39.6%), specifically intimate partner problems (30.2% vs. 24.1%), arguments/conflicts  
95 (17.5% vs. 13.6%), and recently perpetrating interpersonal violence (3.0% vs. 1.4%). They also were more likely  
96 to have experienced any life stressors (54.2% vs 49.7%), such as criminal-legal problems (10.7% vs. 6.2%), or  
97 eviction/loss of home (4.3% vs. 3.4%) and were more likely to have had a crisis within the preceding or  
98 upcoming two weeks (32.9% vs. 26.0%). All of these differences remained significant in the adjusted models.  
99 Among all people with crises, intimate partner problems were the most common types and did not differ by  
100 group. Similarly, among people without versus with MHP, physical health problems (23.2% and 21.4%) and  
101 job/financial problems (15.6% and 16.8%) were commonly experienced and did not differ by group.

102 Decedents without known MHP had significantly lower odds of recent release from any institution (aOR=0.5,  
103 95% CI=0.4-0.5), but among those who were recently released (5.1%), they were significantly more likely to be  
104 released from a correctional facility (25.7% vs. 8.7%) or hospital (43.7% vs. 33.0%) than those with a known  
105 MHP. Among decedents with known MHP who were recently released from an institution (10.2%), 46.7% of this  
106 group were released from psychiatric facilities.

107 Decedents without known MHP, compared to those with MHP, were significantly less likely to have a history of  
108 suicidal ideation (23.0% vs. 40.8%) and prior suicide attempts (10.3% vs. 29.4%). More than one in five people in  
109 both groups disclosed suicide intent (22.4% vs. 24.5%).

## 110 Conclusions and Comments

111 From 1999-2016, 44 states saw significant increases in suicide rates and 25 states experienced substantial  
112 increases in suicide rates of more than 30%. Rates increased significantly among males, in 34 states, and  
113 females, in 43 states. This finding is consistent with prior research showing a decreasing gender gap in male-  
114 female suicide rates between 1999-2014 (3). Additional research into the specific causes of these trends is  
115 necessary. Fortunately, data from the 27 states participating in NVDRS provides important insight into suicide  
116 circumstances and can help states identify prevention priorities.

117 Suicidologists regularly state that suicide is not caused by a single factor; (5) however, suicide prevention  
118 research and practice is heavily oriented towards downstream treatment of MHP and prevention of reattempts.  
119 Additional focus on non-mental health factors, further upstream, is essential to a public health approach (10), as  
120 the current study found that more than half of suicide decedents in NVDRS did *not* have a known MHP. This  
121 group suffered more from relationship problems and other life stressors such as criminal-legal matters,  
122 eviction/loss of home, and recent or impending crises.

123 Similarly, people with MHP also experienced other life stressors such as job/financial, relationship, and/or  
124 physical health problems. These findings point to the need to both prevent the conditions associated with

Comment [HDE(): I would add in the %  
for opioids as it is timely and relevant

Comment [HDE(): I thought they were  
also 2x likely to be released from other  
facility which included drug rehab?



mental health problems in the first place, and to support people with known MHP to decrease their risk of poor outcomes (11). Two-thirds of this group had a history of any mental health and/or substance abuse treatment, with over half in treatment when they died. This suggests the need for additional safety supports, including broader implementation of affordable and effective treatment modalities such as doctor-patient collaborative care models and proven cognitive-behavioral therapies. Additionally, greater access to behavioral health providers in underserved areas is needed, as is expansion of healthcare systems needed that integrates physical and behavioral health with a priority on suicide prevention and patient safety, especially through care transitions (12).

Comprehensive statewide suicide prevention activities are needed to address the full range of factors contributing to suicide. Prevention strategies include: strengthening economic supports (e.g., housing stabilization policies, household financial support); teaching coping and problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in life; promoting social connectedness to increase a sense of belongingness and access to informational, tangible, emotional, and social support; and identifying and better supporting people at risk (e.g., Veterans, people with physical/mental health problems) (12). Other strategies include creating protective environments (e.g., reducing access to lethal means among people at risk, creating organizational and workplace policies to promote help-seeking, easing transitions into and out of work for people with MHP and other life challenges), supporting family and friends after a suicide, and assuring safe reporting by the media in order to prevent suicide contagion (12). Some states, such as Colorado, are planning to implement such a comprehensive approach to suicide prevention (10).

These findings have at least three limitations. In the state-level analysis, rankings for four states (MD, MA, RI, UT) might have been impacted by large proportions of injury deaths of undetermined intent (potentially biasing reported suicide rates downward), or decreased percentages of such deaths over time (potentially biasing estimated rate trends upward). Second, NVDRS is not yet nationally representative; the 27 states included represent 49.6% of the population (<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml>).

Third, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the extent of informant knowledge can impact data completeness and accuracy. Studies including more in-depth interviews with next-of-kin often see greater attributions to mental disorders (13), however many methodological variations across studies exist (14). It is likely that some people without known MHP in the current study were experiencing mental health challenges that were unknown, and hence underreported by key informants. However, any lack of awareness of decedent MHP suggests the importance of addressing the broad range of contributing circumstances.

Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are available. States and communities can use data from NVDRS and resources such as CDC's *Preventing Suicide: a Technical Package of Policies, Programs, and Practices* (12) to better understand their suicide problem, prioritize evidence-based comprehensive suicide prevention, and save lives.

## Acknowledgments

The authors acknowledge Robert Anderson, Holly Hedegaard, and Margaret Warner from the Division of Vital Statistics, National Center for Health Statistics, CDC, for their statistical consultation.

**Conflict of Interest** No conflicts of interest were reported.



168 **Corresponding author:** Deborah M. Stone, [dstone3@cdc.gov](mailto:dstone3@cdc.gov), 770-488-3942

169 **Author Affiliations:**

170 <sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis,  
171 Research, and Practice Integration, National Center for Injury Prevention and Control, CDC

172 **References:**

- 173 1. Centers for Disease Control and Prevention. Web-based Injury Statistics Query and Reporting System  
174 (WISQARS). Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018. In.
- 175 2. Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide Trends Among and  
176 Within Urbanization Levels by Sex, Race/Ethnicity, Age Group, and Mechanism of Death - United States,  
177 2001-2015. *MMWR Surveill Summ* 2017;66(18):1-16.
- 178 3. Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999-2014. In: US Department  
179 of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health  
180 Statistics Hyattsville, MD; 2016.
- 181 4. Kochanek K, Murphy S, Xu J, Arias E. Mortality in the United States, 2016. *NCHS Data Brief*, no 293.  
182 National Center for Health Statistics 2017.
- 183 5. Office of the Surgeon General, National Action Alliance for Suicide Prevention. 2012 National strategy for  
184 suicide prevention: Goals and objectives for action: a report of the US Surgeon General and of the National  
185 Action Alliance for Suicide Prevention. 2012.
- 186 6. Zalsman G, Hawton K, Wasserman D, van Heeringen K, Arensman E, Sarchiapone M, et al. Suicide  
187 prevention strategies revisited: 10-year systematic review. *The Lancet Psychiatry* 2016;3(7):646-659.
- 188 7. Torguson K, O'Brien A. Leading Suicide Prevention Efforts Unite to Address Rising National Suicide Rate. In.  
189 Washington, D.C.; 2017.
- 190 8. Crepeau-Hobson F. The Psychological Autopsy and Determination of Child Suicides: A Survey of Medical  
191 Examiners. *Archives of Suicide Research* 2010;14(1):24-34.
- 192 9. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5®):  
193 American Psychiatric Pub; 2013.
- 194 10. Caine ED, Reed J, Hindman J, Quinlan K. Comprehensive, integrated approaches to suicide prevention:  
195 practical guidance. *Injury prevention* 2017;injuryprev-2017-042366.
- 196 11. World Health Organization. Risks to mental health: An overview of vulnerabilities and risk factors. Geneva:  
197 WHO 2012.
- 198 12. Stone DM, Holland KM, Bartholow BN, Crosby AE, Davis SP, Wilkins N. Preventing suicide: A technical  
199 package of policies, programs, and practice. 2017.
- 200 13. Milner A, Svetcic J, De Leo D. Suicide in the absence of mental disorder? A review of psychological autopsy  
201 studies across countries. *Int J Soc Psychiatry* 2013;59(6):545-54.
- 202 14. Pouliot L, De Leo D. Critical issues in psychological autopsy studies. *Suicide Life Threat Behav*  
203 2006;36(5):491-510.

204 **Attachments:**

205 Stone\_Suicide Vital Signs MMWR 3.27.18 (table 1.fig 1)

206 Stone\_Suicide Vital Signs MMWR 4.5.18 (Tables 2&3)

207 **Word Count:** 1868/1800

**Short Title:** Vital Signs: Contributing Circumstances to Suicide and Increasing Trends in State Suicide Rates

Deborah M. Stone, ScD;<sup>1</sup> Thomas R. Simon PhD;<sup>1</sup> Katherine A. Fowler, PhD;<sup>1</sup> Scott R. Kegler, PhD;<sup>2</sup> Keming Yuan, MS;<sup>1</sup> Kristin M. Holland, PhD;<sup>1</sup> Asha Z. Ivey-Stephenson, PhD;<sup>1</sup> Alex E. Crosby, MD<sup>1</sup>

**Background:** Suicide rates in the United States have risen nearly 30% since 1999. Mental health problems (MHP) are just one factor contributing to suicide. Examining state-level trends in suicide and other contributing circumstances can inform comprehensive state suicide prevention planning.

**Methods:** Trends in age-adjusted suicide rates among people aged  $\geq 10$  years, by state and sex, across six consecutive three-year periods (1999-2016), were assessed using data from the National Vital Statistics System for 50 states and Washington, D.C. Data from the National Violent Death Reporting System, covering 27 states in 2015, were used to examine contributing circumstances among decedents with and without known MHP.

**Results:** From 1999-2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases of more than 30%. Rates increased significantly among males and females in 34 and 43 states, respectively. Over half (54.0%) of decedents did *not* have a known MHP. Among decedents with circumstance information, several circumstances, including relationship problems/loss (45.1% vs 39.6%), life stressors (54.2% vs 49.7%) and recent/impending crises (32.9% vs 26.0%), were significantly more likely among those without a known MHP than decedents with MHP, but were common across groups.

**Conclusions:** Suicide rates increased significantly across most states from 1999-2016. Various circumstances contributed to suicides among people with and without known MHP.

**Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach to prevent suicide risk before it occurs, identify and support people at risk, prevent reattempts, and help friends/family after a suicide occurs.

## INTRODUCTION

### BACKGROUND AND PURPOSE

In 2016, nearly 45,000 suicides (15.6/100,000 [age-adjusted]) occurred in the United States (U.S.), among people  $\geq 10$  years old (1). Between 1999 and 2015, suicide rates increased across sexes, racial/ethnic groups, and urbanization levels (2, 3). Suicide is the 10<sup>th</sup> leading cause of death and is one of just three leading causes that are *increasing* (1, 4). Additionally, rates of Emergency Department visits for nonfatal self-harm, a key risk factor for suicide, increased nearly 45% between 2001 and 2015 (1). Together, suicides and self-harm injuries cost the nation more than \$69 billion in direct medical and work loss costs (1).

The *National Strategy for Suicide Prevention* (NSSP) (5) calls for a public health approach to suicide prevention with efforts spanning across multiple levels (i.e., individual, family/relationship, community, and societal). Such an approach underscores that suicide is rarely caused by any single factor, but rather, is multi-determined. Despite the NSSP guidance, suicide prevention efforts largely focus on identifying and treating individuals with mental health problems (MHP) (6). Other contributing circumstances include social and economic problems, access to lethal means (e.g., substances, firearms, bridges) among people at risk, poor coping and problem-solving skills, and prior suicide attempts (5). Expanded awareness of the additional circumstances that contribute to suicide risk apart from MHP, and action to address them, can help reach the nation's goal of reducing suicide rates 20% by 2025 (7). To assist states in achieving this goal, this study analyzes state-specific trends in suicide rates, assesses the multiple contributing factors, and provides recommendations for multi-level comprehensive suicide prevention.

**Comment [HJ]:** Is there a more up-to-date US-based reference than Rosenman 1998?



## 41 METHODS

42 Suicide rates were analyzed for people aged  $\geq 10$  years only, as attributions of suicidal intent in younger children  
 43 are variable (8). Age-specific suicide counts were tabulated based on National Vital Statistics System coded death  
 44 certificate records (*International Classification of Diseases 10<sup>th</sup> Revision*, underlying-cause-of death codes X60-  
 45 X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for  
 46 Health Statistics bridged-race population data releases.

48 National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods  
 49 spanning 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed  
 50 per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data  
 51 aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends  
 52 are reported in terms of average annual percentage changes (AAPCs).

54 Characteristics (Table 2) and circumstances (Table 3) of suicide decedents  $\geq 10$  years, with and without known  
 55 MHP, were compared in the 27 states with complete data participating in CDC's National Violent Death  
 56 Reporting System (NVDRS) in 2015. NVDRS defines MHP as disorders and syndromes listed in the Diagnostic and  
 57 Statistical Manual of Mental Disorders, Fifth Edition (9), with the exception of alcohol and other substance  
 58 dependence, which are captured separately in NVDRS. NVDRS aggregates data from three primary data sources:  
 59 death certificates, coroner/medical examiner reports (including toxicology), and law enforcement  
 60 reports. Decedents with and without known MHP were compared using Chi-square tests. Logistic regression  
 61 analyses estimated adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and  
 62 race/ethnicity.

## 63 RESULTS

64 The most recent overall suicide rates (representing 2014-2016) varied four-fold, from 6.9 (D.C.) to 29.2  
 65 (Montana) per 100,000 persons per year (Table 1). Across the study period, rates increased in all states, except  
 66 Nevada (which had a consistently high rate throughout), with absolute increases ranging from +0.8 (Delaware)  
 67 to +8.1 (Wyoming) per 100,000. Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North  
 68 Dakota), with increases of more than 30% observed in 25 states (Table 1, Figure 1).

70 Modeled suicide rate trends indicated significant increases for 44 states, for males (34 states) and females (43  
 71 states), as well as for the U.S. overall (Table 1). Nationally, the model-estimated AAPC for the overall suicide  
 72 rate was +1.5%. By sex, estimated national rate trends further indicated significant increases for males (AAPC  
 73 +1.1%) and females (AAPC +2.6%).

75 Suicide decedents without known MHP (N=11,039) were compared to those with MHP (N=9,407) in 27 states.  
 76 While all decedents were predominately male (Table 2; 76.8%) and non-Hispanic white (83.6%), those without  
 77 known MHP, relative to those with MHP, were more likely male (83.6% vs. 68.8%; odds ratio (OR)=2.3, 95% CI =  
 78 2.2-2.5) and racial/ethnic minorities (OR range: 1.2-2.0). Suicide decedents without known MHP also had  
 79 significantly greater odds of perpetrating homicide-suicide (adjusted odds ratio aOR = 2.9, 95% CI = 2.2-3.8).  
 80 Among adult decedents, 20.1% and 15.3% of people without and with MHP, respectively, ever served, or were  
 81 currently serving, in the U.S. military.

82 While firearms were the most common method of suicide overall (48.5%) and for both groups, decedents  
 83 without known MHP were more likely to die by firearm (55.3% vs. 40.6%) and less likely to die by  
 84 hanging/strangulation/suffocation (26.9% vs 31.3%) or poisoning (10.4% vs 19.8%) than those without known  
 85 MHP. These differences remained significant in the adjusted models.

86 Decedents without known MHP were less likely to receive toxicology testing. Among those with toxicology  
87 results, decedents without known MHP were less likely to test positive for any substance overall (aOR=0.8, 95%  
88 CI=0.7-0.8) but more likely to test positive for alcohol (aOR=1.2, 95% CI=1.1-1.3).

89 All suicide decedents with MHP (N=9,407) and approximately 85% without known MHP (N=9,357) had available  
90 circumstances information (Table 3). People without known MHP were less likely to have any substance abuse  
91 problems (aOR=0.7, 95% CI=0.7-0.8). While two-thirds of those with known MHP had a history of mental health  
92 or substance abuse treatment (67.2%), just over half (54.0%) were in current treatment.

93 Decedents without known MHP versus those with known MHP had significantly greater likelihood of any  
94 relationship problem/loss (45.1% vs. 39.6%), specifically intimate partner problems (30.2% vs. 24.1%),  
95 arguments/conflicts (17.5% vs. 13.6%), and recently perpetrating interpersonal violence (3.0% vs. 1.4%). They  
96 were also more likely to have experienced any life stressors (54.2% vs 49.7%), such as criminal-legal problems  
97 (10.7% vs. 6.2%) or eviction/loss of home (4.3% vs. 3.4%), and they were more likely to have had a crisis within  
98 the preceding or upcoming two weeks (32.9% vs. 26.0%). All of these differences remained significant in the  
99 adjusted models. Among those with crises, intimate partner and physical health problems were the most  
100 common types for both groups and did not differ between them.

101 Decedents without known MHP had significantly lower odds of recent release from any institution (aOR=0.5,  
102 95% CI=0.4-0.5), but among those who were recently released (5.1%), they were significantly more likely to be  
103 released from a correctional facility (25.7% vs. 8.7%) or hospital (43.7% vs. 33.0%) than those with a known  
104 MHP. Among decedents with known MHP who were recently released from an institution (10.2%), 46.7% of this  
105 group were released from psychiatric facilities.

106 Decedents without known MHP, compared to those with MHP, were significantly less likely to have a history of  
107 suicidal ideation (23.0% vs. 40.8%) and prior suicide attempt (10.3% vs. 29.4%). More than 1 in five people in  
108 both groups disclosed suicide intent (22.4% vs. 24.5%).

## 109 Conclusions and Comments

110 From 1999-2016, 44 states saw significant suicide rate increases. Rates increased significantly for males, in 34  
111 states, and for females, in 43 states. This finding is consistent with prior research showing a decreasing gender  
112 gap in male-female suicide rates between 1999-2014 (3). Overall, half of the states experienced substantial  
113 increases in suicide rates of more than 30%. Additional research into the specific causes of these trends is  
114 necessary. Fortunately, data from the 27 states participating in NVDRS can shed light on the circumstances that  
115 contributed to recent suicides, and can help guide prevention activities.

116 Researchers and practitioners regularly state that 'suicide is not caused by a single factor;' however, research  
117 and prevention practices, almost solely, focus on identifying and treating MHP. The current study found that  
118 more than half of suicide decedents in NVDRS did *not* have a known MHP. This group suffered more relationship  
119 problems and life stressors such as criminal-legal matters, eviction/loss of home, and recent or impending crises.  
120 This is particularly noteworthy in light of findings that suggest many suicides and attempts occur with minimal  
121 deliberation (10).

122 Among people with MHP, two-thirds had a history of mental health and/or substance abuse treatment and over  
123 half were in current treatment. This suggests that additional supports for this population are needed to keep  
124 them safe. This includes broader implementation of affordable and effective treatment modalities such as  
125 doctor-patient collaborative care models and cognitive-behavioral therapy. Additionally, greater access to  
126 behavioral health providers in underserved areas is needed, as is expansion of healthcare systems to integrate

Comment [HJ]: Add citations to support this statement.

Comment [za19]: Alex-- add Zalsman again? Don't have room for another ref.



127 physical and behavioral health that better support suicide prevention and patient safety, especially through care  
128 transitions (11).

129 Study findings indicate that people with known MHP also experienced other life stressors such as job/financial,  
130 relationship, and/or physical health problems. These findings point to the need to both prevent the conditions  
131 associated with mental health problems in the first place, and to support people with known MHP to decrease  
132 their risk of poor social, health, and economic outcomes (12).

133 Together, these results underscore the importance of comprehensive statewide suicide prevention activities  
134 that address multiple factors associated with suicide. Prevention strategies may include: strengthening  
135 economic supports (e.g., housing stabilization policies, household financial support); teaching coping and  
136 problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in  
137 life; promoting social connectedness to increase a sense of belongingness and access to informational, tangible,  
138 emotional, and social support; and identifying and better supporting people at risk. Other strategies include  
139 creating protective environments (e.g., reducing access to lethal means among people at risk, creating  
140 organizational and workplace policies to promote help-seeking, easing transitions into and out of work for  
141 people with MHP and other life challenges), supporting family and friends after a suicide, and assuring safe  
142 reporting by the media in order to prevent suicide contagion (11). Some states, such as Colorado, are planning  
143 to implement such a comprehensive approach to suicide prevention (13).

144 These findings have at least three limitations. In the state-level analysis, rankings for four states (MD, MA, RI,  
145 UT) might have been impacted by large proportions of injury deaths of undetermined intent (potentially biasing  
146 reported suicide rates downward), or decreased percentages of such deaths over time (potentially biasing  
147 estimated rate trends upward). Second, NVDRS is not yet nationally representative; the 27 states included  
148 represent 49.6% of the population  
149 (<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml>).

150 Third, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the  
151 extent of informant knowledge can impact data completeness and accuracy. Studies including more in-depth  
152 interviews with next-of-kin often see greater attributions to mental disorders (14), however many  
153 methodological variations across studies exist (15). It is likely that some people without known MHP in the  
154 current study were experiencing mental health challenges that were unknown, and hence underreported by key  
155 informants. However, any lack of awareness of decedent MHP suggests the importance of addressing the broad  
156 range of contributing circumstances.

157 Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are  
158 available. States and communities can use data from NVDRS and resources such as CDC's *Preventing Suicide: a*  
159 *Technical Package of Policies, Programs, and Practices* (11) to better understand their suicide problem and  
160 prioritize evidence-based comprehensive suicide prevention.

#### 161 **Acknowledgments**

162 The authors acknowledge Robert Anderson, Holly Hedegaard, and Margaret Warner from the Division of Vital  
163 Statistics, National Center for Health Statistics, CDC, for their statistical consultation.

164  
165 **Conflict of Interest** No conflicts of interest were reported.

166  
167 **Corresponding author:** Deborah M. Stone, [dstone3@cdc.gov](mailto:dstone3@cdc.gov), 770-488-3942

168  
169 **Author Affiliations:**

170 <sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis,  
171 Research, and Practice Integration, National Center for Injury Prevention and Control, CDC

172 **References:**

- 173 1. Centers for Disease Control and Prevention. Web-based Injury Statistics Query and Reporting System  
174 (WISQARS). Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018. In.
- 175 2. Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide Trends Among and  
176 Within Urbanization Levels by Sex, Race/Ethnicity, Age Group, and Mechanism of Death - United States,  
177 2001-2015. MMWR Surveill Summ 2017;66(18):1-16.
- 178 3. Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999-2014. In: US Department of  
179 Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics  
180 Hyattsville, MD; 2016.
- 181 4. Kochanek K, Murphy S, Xu J, Arias E. Mortality in the United States, 2016. NCHS Data Brief, no 293. National  
182 Center for Health Statistics 2017.
- 183 5. Office of the Surgeon General, National Action Alliance for Suicide Prevention. 2012 National strategy for  
184 suicide prevention: goals and objectives for action: a report of the US Surgeon General and of the National  
185 Action Alliance for Suicide Prevention. 2012.
- 186 6. Rosenman SJ. Preventing suicide: what will work and what will not. The Medical Journal of Australia  
187 1998;169(2):100-102.
- 188 7. Torguson K, O'Brien A. Leading Suicide Prevention Efforts Unite to Address Rising National Suicide Rate. In.  
189 Washington, D.C.; 2017.
- 190 8. Crepeau-Hobson F. The Psychological Autopsy and Determination of Child Suicides: A Survey of Medical  
191 Examiners. Archives of Suicide Research 2010;14(1):24-34.
- 192 9. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5®): American  
193 Psychiatric Pub; 2013.
- 194 10. Simon TR, Swann AC, Powell KE, Potter LB, Kresnow Mj, O'Carroll PW. Characteristics of impulsive suicide  
195 attempts and attempters. Suicide and Life-Threatening Behavior 2002;32(s1):49-59.
- 196 11. Stone DM, Holland KM, Bartholow BN, Crosby AE, Davis SP, Wilkins N. Preventing suicide: A technical  
197 package of policies, programs, and practice. 2017.
- 198 12. World Health Organization. Risks to mental health: An overview of vulnerabilities and risk factors. Geneva:  
199 WHO 2012.
- 200 13. Caine ED, Reed J, Hindman J, Quinlan K. Comprehensive, integrated approaches to suicide prevention:  
201 practical guidance. Injury prevention 2017;injuryprev-2017-042366.
- 202 14. Milner A, Sveticic J, De Leo D. Suicide in the absence of mental disorder? A review of psychological autopsy  
203 studies across countries. Int J Soc Psychiatry 2013;59(6):545-54.
- 204 15. Pouliot L, De Leo D. Critical issues in psychological autopsy studies. Suicide Life Threat Behav 2006;36(5):491-  
205 510.

206 **Attachments:**

207 Stone\_Suicide Vital Signs MMWR 3.27.18 (table 1.fig 1)

208 Stone\_Suicide Vital Signs MMWR 3.27.18 (Tables 2&3)

209 **Word Count:** 1861/1800



**Short Title:** Vital Signs: Contributing Circumstances to Suicide and Increasing Trends in State Suicide Rates

Deborah M. Stone, ScD;<sup>1</sup> Thomas R. Simon PhD;<sup>1</sup> Katherine A. Fowler, PhD;<sup>1</sup> Scott R. Kegler, PhD;<sup>2</sup> Keming Yuan, MS;<sup>1</sup> Kristin M. Holland, PhD;<sup>1</sup> Asha Z. Ivey-Stephenson, PhD;<sup>1</sup> Alex E. Crosby, MD<sup>1</sup>

**Background:** Suicide rates in the United States have risen nearly 30% since 1999. Mental health problems (MHP) are just one factor contributing to suicide. Examining state-level trends in suicide and other contributing circumstances can inform comprehensive state suicide prevention planning.

**Methods:** Trends in age-adjusted suicide rates among people aged ≥10 years, by state and sex, across six consecutive three-year periods (1999-2016), were assessed using data from the National Vital Statistics System for 50 states and Washington, D.C. Data from the National Violent Death Reporting System, covering 27 states in 2015, were used to examine contributing circumstances among decedents with and without known MHP.

**Results:** From 1999-2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases of more than 30%. Rates increased significantly among males and females in 34 and 43 states, respectively. Over half (54.0%) of decedents did *not* have a known MHP. Among decedents with circumstance information, several circumstances, including relationship problems/loss (45.1% vs 39.6%), life stressors (54.2% vs 49.7%) and recent/impending crises (32.9% vs 26.0%), were significantly more likely among those without a known MHP than decedents with MHP, but were common across groups.

**Conclusions:** Suicide rates increased significantly across most states from 1999-2016. Various circumstances contributed to suicides among people with and without known MHP.

**Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach to prevent suicide risk before it occurs, identify and support people at risk, prevent reattempts, and help friends/family after a suicide occurs.

## INTRODUCTION

### BACKGROUND AND PURPOSE

In 2016, nearly 45,000 suicides (15.6/100,000 [age-adjusted]) occurred in the United States (U.S.), among people ≥10 years old (1). Between 1999 and 2015, suicide rates increased across sexes, racial/ethnic groups, and urbanization levels (2, 3). Suicide is the 10<sup>th</sup> leading cause of death and is one of just three leading causes that are *increasing* (1, 4). Additionally, rates of Emergency Department visits for nonfatal self-harm, a key risk factor for suicide, increased nearly 45% between 2001 and 2015 (1). Together, suicides and self-harm injuries cost the nation more than \$69 billion in direct medical and work loss costs (1).

The *National Strategy for Suicide Prevention* (NSSP) (5) calls for a public health approach to suicide prevention with efforts spanning across multiple levels (i.e., individual, family/relationship, community, and societal). Such an approach underscores that suicide is rarely caused by any single factor, but rather, is multi-determined. Despite the NSSP guidance, suicide prevention efforts largely focus on identifying and treating individuals with mental health problems (MHP) (6). Other contributing circumstances include social and economic problems, access to lethal means (e.g., substances, firearms, bridges) among people at risk, poor coping and problem-solving skills, and prior suicide attempts (5). Expanded awareness of the additional circumstances that contribute to suicide risk apart from MHP, and action to address them, can help reach the nation's goal of reducing suicide rates 20% by 2025 (7). To assist states in achieving this goal, this study analyzes state-specific trends in suicide rates, assesses the multiple contributing factors, and provides recommendations for multi-level comprehensive suicide prevention.

**Comment [HJ]:** Is there a more up-to-date US-based reference than Rosenman 1998?

**Comment [za19]:** Alex, what about the Zalsman systematic review? If you look at all the treatment strategies they appear to outweigh any other strategies and within the limiting access to lethal means, many of the studies are international.  
1. Zalsman, G., et al., *Suicide prevention strategies revisited: 10-year systematic review*. The Lancet Psychiatry, 2016. 3(7): p. 646-659.



41 **METHODS**

42 Suicide rates were analyzed for people aged  $\geq 10$  years only, as attributions of suicidal intent in younger children  
 43 are variable (8). Age-specific suicide counts were tabulated based on National Vital Statistics System coded death  
 44 certificate records (*International Classification of Diseases 10<sup>th</sup> Revision*, underlying-cause-of death codes X60-  
 45 X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for  
 46 Health Statistics bridged-race population data releases.

48 National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods  
 49 spanning 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed  
 50 per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data  
 51 aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends  
 52 are reported in terms of average annual percentage changes (AAPCs).

54 Characteristics (Table 2) and circumstances (Table 3) of suicide decedents  $\geq 10$  years, with and without known  
 55 MHP, were compared in the 27 states with complete data participating in CDC's National Violent Death  
 56 Reporting System (NVDRS) in 2015. NVDRS defines MHP as disorders and syndromes listed in the Diagnostic and  
 57 Statistical Manual of Mental Disorders, Fifth Edition (9), with the exception of alcohol and other substance  
 58 dependence, which are captured separately in NVDRS. NVDRS aggregates data from three primary data sources:  
 59 death certificates, coroner/medical examiner reports (including toxicology), and law enforcement  
 60 reports. Decedents with and without known MHP were compared using Chi-square tests. Logistic regression  
 61 analyses estimated adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and  
 62 race/ethnicity.

63 **RESULTS**

64 The most recent overall suicide rates (representing 2014-2016) varied four-fold, from 6.9 (D.C.) to 29.2  
 65 (Montana) per 100,000 persons per year (Table 1). Across the study period, rates increased in all states, except  
 66 Nevada (with the 9<sup>th</sup> highest current suicide rate which consistently has one of the highest suicide rates), with  
 67 absolute increases ranging from +0.8 (Delaware) to +8.1 (Wyoming) per 100,000. Percentage increases in rates  
 68 ranged from +5.9% (Delaware) to +57.6% (North Dakota), with increases of more than 30% observed in 25 states  
 69 (Table 1, Figure 1).

71 Modeled suicide rate trends indicated significant increases for 44 states, for males (34 states) and females (43  
 72 states), as well as for the U.S. overall (Table 1). Nationally, the model-estimated AAPC for the overall suicide  
 73 rate was +1.5%. By sex, estimated national rate trends further indicated significant increases for males (AAPC  
 74 +1.1%) and females (AAPC +2.6%).

76 Suicide decedents without known MHP (N=11,039) were compared to those with MHP (N=9,407) in 27 states.  
 77 While all decedents were predominately male (Table 2; 76.8%) and non-Hispanic white (83.6%), those without  
 78 known MHP, relative to those with MHP, were more likely male (83.6% vs. 68.8%; odds ratio (OR)=2.3, 95% CI =  
 79 2.2-2.5) and racial/ethnic minorities (OR range: 1.2-2.4; 95% CI range: 1.0-1.3) – (1.36-2.0) (63.1). Suicide  
 80 decedents without known MHP also had significantly greater odds of perpetrating homicide-suicide (adjusted  
 81 odds ratio aOR = 2.9, 95% CI = 2.2-3.8). Among adult decedents, 20.1% and 15.3% of people without and with  
 82 MHP, respectively, ever served, or were currently serving, in the U.S. military.

83 While firearms were the most common method of suicide overall (48.5%) and for both groups, decedents  
 84 without known MHP were more likely to die by firearm (55.3% vs. 40.6%) and less likely to die by  
 85 hanging/strangulation/suffocation (26.9% vs 31.3%) or poisoning (10.4% vs 19.8%) than those without known  
 86 MHP. These differences remained significant in the adjusted models.

**Comment [za9]:** SK, TS, Opinions as to whether this should stay here or be moved to limitations? I'd prefer to keep it here but realize it may not be conventional.

**Comment [ST]:** I agree with keeping it here.

**Comment [HJ]:** Per Table 2, the range in ORs for non-white racial/ethnic groups is 1.2 to 2.0. Please confirm.

**Comment [za9]:** KY, KF, Jeff looks to be correct.

**Comment [HJ]:** Per Table 2, the range in the lower bound of the 95% CIs for non-white racial/ethnic groups is 1.0 (Hispanic) to 1.6 (AI/AN).

**Comment [za9]:** KF, KY, TS--This looks correct to me. Jeff was looking at the data a little differently. For the lower limits here (LL), he took the smallest and largest numbers across all LL CIs and then did the same for upper limits. I'm guessing you guys have done this before and it's accepted?

**Comment [ST]:** I see how this could be confusing. I'm thinking that we could drop the CI range here. The reader can find them in the table.

**Comment [HJ]:** Per Table 2, the range in the upper bound of the 95% CIs for non-white racial/ethnic groups is 1.3 (Hispanic) to 3.1 (Other). Please confirm.

**Comment [za9]:** KF, KY. Actually this looks like a typo. Should be 1.6-2.6—See above comment about Jeff's interpretation.

**Comment [FKA]:** I see how Jeff is thinking about this – have made changes in line with this but talked w Keming and we are also ok w cutting it if that's better. Your call.



87 Decedents without known MHP were less likely to receive toxicology testing. Among those with toxicology  
88 results, decedents without known MHP were less likely to test positive for any substance overall (aOR=0.8, 95%  
89 CI=0.7-0.8) but more likely to test positive for alcohol (aOR=1.2, 95% CI=1.1-1.3).

90 All suicide decedents with MHP (N=9,407) and approximately 85% without known MHP (N=9,357) had available  
91 circumstances information (Table 3). People without known MHP were less likely to have any substance abuse  
92 problems (aOR=0.7, 95% CI=0.7-0.8). While two-thirds of those with known MHP had a history of mental health  
93 or substance abuse treatment (67.2%), just over half (54.0%) were in current treatment.

94 Decedents without known MHP versus those with known MHP had significantly greater likelihood of any  
95 relationship problem/loss (45.1% vs. 39.6%), specifically intimate partner problems (30.2% vs. 24.1%),  
96 arguments/conflicts (17.5% vs. 13.6%), and recently perpetrating interpersonal violence (3.0% vs. 1.4%). They  
97 were also more likely to have experienced any life stressors (54.2% vs 49.7%), such as criminal-legal problems  
98 (10.7% vs. 6.2%) or eviction/loss of home (4.3% vs. 3.4%), and they were more likely to have had a crisis within  
99 the preceding or upcoming two weeks (32.9% vs. 26.0%). All of these differences remained significant in the  
100 adjusted models. Among those with crises, intimate partner and physical health problems were the most  
101 common types for both groups and did not differ between them.

102 Decedents without known MHP had significantly lower odds of recent release from any institution (aOR=0.5,  
103 95% CI=0.4-0.5), but among those who were recently released (5.1%), they were significantly more likely to be  
104 released from a correctional facility (25.7% vs. 8.7%) or hospital (43.7% vs. 33.0%) than those with a known  
105 MHP. Among decedents with known MHP who were recently released from an institution (10.2%), 46.7% of this  
106 group were released from psychiatric facilities.

107 Decedents without known MHP, compared to those with MHP, were significantly less likely to have a history of  
108 suicidal ideation (aOR=0.4, 95% CI=0.4-0.5) and prior suicide attempt (aOR=0.3, 95% CI=0.3-0.3). More than 1 in  
109 five people in both groups disclosed suicide intent (22.4% vs. 24.5%).

## 110 Conclusions and Comments

111 From 1999-2016, 44 states saw significant suicide rate increases. Rates increased significantly for males, in 34  
112 states, and for females, in 43 states. This finding is consistent with prior research showing a decreasing gender  
113 gap in male-female suicide rates between 1999-2014 (3). Overall, half of the states experienced substantial  
114 increases in suicide rates of more than 30%. Additional research into the specific causes of these trends is  
115 necessary. Fortunately, data from the 27 states participating in NVDRS can shed light on the circumstances that  
116 contributed to recent suicides, and can help guide prevention activities.

117 Researchers and practitioners regularly state it is common parlance in the field that 'suicide is not caused by a  
118 single factor;' however, suicide research and prevention practices, almost solely, largely focus on identifying and  
119 treating MHP. The current study found that more than half of suicide decedents in NVDRS did not have a known  
120 MHP. This group suffered more relationship problems and life stressors such as criminal-legal matters,  
121 eviction/loss of home, and recent or impending crises. This is particularly noteworthy in light of findings that  
122 suggest many suicides and attempts occur with minimal deliberation (10).

123 Among people with MHP, two-thirds had a history of mental health and/or substance abuse treatment and over  
124 half were in current treatment. This suggests that additional supports for this population are needed to keep  
125 them safe. This includes broader implementation of affordable and effective treatment modalities such as  
126 doctor-patient collaborative care models and cognitive-behavioral therapy. Additionally, greater access to  
127 behavioral health providers in underserved areas is needed, as is expansion of healthcare systems to integrate

Comment [HJ(): Any comment on substance causes of death?

Comment [za9]: TS--No room ☹

Comment [ST(): I agree about the lack of room. We also don't address this in prevention. Let's see if other reviewers raise it.

Comment [HJ(): Might be better to report as: 23.0% vs. 40.8%

Comment [HJ(): Might be better to report as: 29.4% vs. 10.3%

Comment [za9]: KF, KY, TS--I tried to preserve aOR's!! Thoughts?

Comment [ST(): I see his point. The % differences are more compelling. This would also make the paragraph more consistent since the last sentence used %'s.

Comment [FKA(): I'm ok with that because these are the ones where we're speaking about the group that has significantly lower odds. My thoughts are the same in general about keeping vs. excluding odds ratios, but willing to be flexible (I think we've got to be in this process!).

Comment [HJ(): Add citations to support this statement.

Comment [za9]: Alex-- add Zalsman again? Don't have room for another ref.

Comment [HJ(): Any comment that the top ranking states are rural and mainly in the Northwest: MT, AK, WY, UT

Comment [za9]: Unfortunately we can't accommodate the added text.



128 physical and behavioral health that better support suicide prevention and patient safety, especially through care  
129 transitions (11).

130 Study findings indicate that people with known MHP also experienced other life stressors such as job/financial,  
131 relationship, and/or physical health problems. These findings point to the need to both prevent the conditions  
132 associated with mental health problems in the first place, and to support people with known MHP to decrease  
133 their risk of poor social, health, and economic outcomes (12).

134 Together, these results underscore the importance of comprehensive statewide suicide prevention activities  
135 that address multiple factors associated with suicide. Prevention strategies may include: strengthening  
136 economic supports (e.g., housing stabilization policies, household financial support); teaching coping and  
137 problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in  
138 life; promoting social connectedness to increase a sense of belongingness and access to informational, tangible,  
139 emotional, and social support; and identifying and better supporting people at risk. Other strategies include  
140 creating protective environments (e.g., reducing access to lethal means among people at risk, creating  
141 organizational and workplace policies to promote help-seeking, easing transitions into and out of work for  
142 people with MHP and other life challenges), supporting family and friends after a suicide, and assuring safe  
143 reporting by the media in order to prevent suicide contagion (11). Some states, such as Colorado, are planning  
144 to implement such a comprehensive approach to suicide prevention (13).

145 These findings have at least three limitations. In the state-level analysis, rankings for four states (MD, MA, RI,  
146 UT) might have been impacted by large proportions of injury deaths of undetermined intent (potentially biasing  
147 reported suicide rates downward), or decreased percentages of such deaths over time (potentially biasing  
148 estimated rate trends upward). **Second**, NVDRS is not yet nationally representative; the 27 states included  
149 represent 49.6% of the population

150 (<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml>).

151 Third, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the  
152 extent of informant knowledge can impact data completeness and accuracy. Studies including more in-depth  
153 interviews with next-of-kin often see greater attributions to mental disorders (14), however many  
154 methodological variations across studies exist (15). It is likely that some people without known MHP in the  
155 current study were experiencing mental health challenges that were unknown, and hence underreported by key  
156 informants. However, any lack of awareness of decedent MHP suggests the importance of addressing the broad  
157 range of contributing circumstances.

158 Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are  
159 available. States and communities can use data from NVDRS and resources such as CDC's *Preventing Suicide: a*  
160 *Technical Package of Policies, Programs, and Practices* (11) to better understand their suicide problem and  
161 prioritize evidence-based comprehensive suicide prevention.

#### 162 **Acknowledgments**

163 The authors acknowledge Robert Anderson, Holly Hedegaard, and Margaret Warner from the Division of Vital  
164 Statistics, National Center for Health Statistics, CDC, for their statistical consultation.

165

166 **Conflict of Interest** No conflicts of interest were reported.

167

168 **Corresponding author:** Deborah M. Stone, [dstone3@cdc.gov](mailto:dstone3@cdc.gov) , 770-488-3942

169

170 **Author Affiliations:**

**Comment [HJ]:** Comment about NV?

**Comment [za9]:** SK, TS--Not sure there's a weakness in there. I inserted language above to state that it consistently has one of the highest rates.

**Comment [ST]:** I don't think we should call out NV here. I think text you provide above is sufficient.



<sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis, Research, and Practice Integration, National Center for Injury Prevention and Control, CDC

## References:

1. Centers for Disease Control and Prevention. Web-based Injury Statistics Query and Reporting System (WISQARS). Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018. In.
2. Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide Trends Among and Within Urbanization Levels by Sex, Race/Ethnicity, Age Group, and Mechanism of Death - United States, 2001-2015. *MMWR Surveill Summ* 2017;66(18):1-16.
3. Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999-2014. In: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics Hyattsville, MD; 2016.
4. Kochanek K, Murphy S, Xu J, Arias E. Mortality in the United States, 2016. *NCHS Data Brief*, no 293. National Center for Health Statistics 2017.
5. Office of the Surgeon General, National Action Alliance for Suicide Prevention. 2012 National strategy for suicide prevention: goals and objectives for action: a report of the US Surgeon General and of the National Action Alliance for Suicide Prevention. 2012.
6. Rosenman SJ. Preventing suicide: what will work and what will not. *The Medical Journal of Australia* 1998;169(2):100-102.
7. Torguson K, O'Brien A. Leading Suicide Prevention Efforts Unite to Address Rising National Suicide Rate. In. Washington, D.C.; 2017.
8. Crepeau-Hobson F. The Psychological Autopsy and Determination of Child Suicides: A Survey of Medical Examiners. *Archives of Suicide Research* 2010;14(1):24-34.
9. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5®): American Psychiatric Pub; 2013.
10. Simon TR, Swann AC, Powell KE, Potter LB, Kresnow Mj, O'Carroll PW. Characteristics of impulsive suicide attempts and attempters. *Suicide and Life-Threatening Behavior* 2002;32(s1):49-59.
11. Stone DM, Holland KM, Bartholow BN, Crosby AE, Davis SP, Wilkins N. Preventing suicide: A technical package of policies, programs, and practice. 2017.
12. World Health Organization. Risks to mental health: An overview of vulnerabilities and risk factors. Geneva: WHO 2012.
13. Caine ED, Reed J, Hindman J, Quinlan K. Comprehensive, integrated approaches to suicide prevention: practical guidance. *Injury prevention* 2017;injuryprev-2017-042366.
14. Milner A, Svetcic J, De Leo D. Suicide in the absence of mental disorder? A review of psychological autopsy studies across countries. *Int J Soc Psychiatry* 2013;59(6):545-54.
15. Pouliot L, De Leo D. Critical issues in psychological autopsy studies. *Suicide Life Threat Behav* 2006;36(5):491-510.

## Attachments:

Stone\_Suicide Vital Signs MMWR 3.27.18 (table 1.fig 1)

Stone\_Suicide Vital Signs MMWR 3.27.18 (Tables 2&3)

**Word Count:** 1861/1800

**Comment [HJ]:** Are these references formatted appropriately for MMWR?

The source for #7 is not included: American Foundation for Suicide Prevention.

For #9, the location of the DSM-5 is Arlington, VA.

**Comment [za19]:** I'll fix this after I replace #6 once alex weighs in.

**Short Title:** Vital Signs: Contributing Circumstances to Suicide and Increasing Trends in State Suicide Rates

Deborah M. Stone, ScD;<sup>1</sup> Thomas R. Simon PhD;<sup>1</sup> Katherine A. Fowler, PhD;<sup>1</sup> Scott R. Kegler, PhD;<sup>2</sup> Keming Yuan, MS;<sup>1</sup> Kristin M. Holland, PhD;<sup>1</sup> Asha Z. Ivey-Stephenson, PhD;<sup>1</sup> Alex E. Crosby, MD<sup>1</sup>

**Background:** Suicide rates in the United States have risen nearly 30% since 1999. Mental health problems (MHP) are just one factor contributing to suicide. Examining state-level trends in suicide and other contributing circumstances can inform comprehensive state suicide prevention planning.

**Methods:** Trends in age-adjusted suicide rates among people aged  $\geq 10$  years, by state and sex, across six consecutive three-year periods (1999-2016), were assessed using data from the National Vital Statistics System for 50 states and Washington, D.C. Data from the National Violent Death Reporting System, covering 27 states in 2015, were used to examine contributing circumstances among decedents with and without known MHP.

**Results:** From 1999-2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases of more than 30%. Rates increased significantly among males and females in 34 and 43 states, respectively. Over half (54.0%) of decedents did *not* have a known MHP. Among decedents with circumstance information, several circumstances, including relationship problems/loss (45.1% vs 39.6%), life stressors (54.2% vs 49.7%) and recent/impending crises (32.9% vs 26.0%), were significantly more likely among those without a known MHP than decedents with MHP, but were common across groups.

**Conclusions:** Suicide rates increased significantly across most states from 1999-2016. Various circumstances contributed to suicides among people with and without known MHP.

**Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach to prevent suicide risk before it occurs, identify and support people at risk, prevent reattempts, and help friends/family after a suicide occurs.

## INTRODUCTION

### BACKGROUND AND PURPOSE

In 2016, nearly 45,000 suicides (15.6/100,000 [age-adjusted]) occurred in the United States (U.S.), among people  $\geq 10$  years old (1). Between 1999 and 2015, suicide rates increased across sexes, racial/ethnic groups, and urbanization levels (2, 3). Suicide is the 10<sup>th</sup> leading cause of death and is one of just three leading causes that are *increasing* (1, 4). Additionally, rates of Emergency Department visits for nonfatal self-harm, a key risk factor for suicide, increased nearly 45% between 2001 and 2015 (1). Together, suicides and self-harm injuries cost the nation more than \$69 billion in direct medical and work loss costs (1).

The *National Strategy for Suicide Prevention* (NSSP) (5) calls for a public health approach to suicide prevention with efforts spanning across multiple levels (i.e., individual, family/relationship, community, and societal). Such an approach underscores that suicide is rarely caused by any single factor, but rather, is multi-determined. Despite the NSSP guidance, suicide prevention efforts largely focus on identifying and treating individuals with mental health problems (MHP) (6). Other contributing circumstances include social and economic problems, access to lethal means (e.g., substances, firearms, bridges) among people at risk, poor coping and problem-solving skills, and prior suicide attempts (5). Expanded awareness of the additional circumstances that contribute to suicide risk apart from MHP, and action to address them, can help reach the nation's goal of reducing suicide rates 20% by 2025 (7). To assist states in achieving this goal, this study analyzes state-specific trends in suicide rates, assesses the multiple contributing factors, and provides recommendations for multi-level comprehensive suicide prevention.

**Comment [HJ]:** Is there a more up-to-date US-based reference than Rosenman 1998?

**Comment [za19]:** Alex, what about the Zalsman systematic review? If you look at all the treatment strategies they appear to outweigh any other strategies and within the limiting access to lethal means, many of the studies are international.  
1. Zalsman, G., et al., *Suicide prevention strategies revisited: 10-year systematic review*. The Lancet Psychiatry, 2016. 3(7): p. 646-659.



41 **METHODS**

42 Suicide rates were analyzed for people aged  $\geq 10$  years only, as attributions of suicidal intent in younger children  
 43 are variable (8). Age-specific suicide counts were tabulated based on National Vital Statistics System coded death  
 44 certificate records (*International Classification of Diseases 10<sup>th</sup> Revision*, underlying-cause-of death codes X60-  
 45 X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for  
 46 Health Statistics bridged-race population data releases.

47  
 48 National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods  
 49 spanning 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed  
 50 per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data  
 51 aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends  
 52 are reported in terms of average annual percentage changes (AAPCs).

53  
 54 Characteristics (Table 2) and circumstances (Table 3) of suicide decedents  $\geq 10$  years, with and without known  
 55 MHP, were compared in the 27 states with complete data participating in CDC's National Violent Death  
 56 Reporting System (NVDRS) in 2015. NVDRS defines MHP as disorders and syndromes listed in the Diagnostic and  
 57 Statistical Manual of Mental Disorders, Fifth Edition (9), with the exception of alcohol and other substance  
 58 dependence, which are captured separately in NVDRS. NVDRS aggregates data from three primary data sources:  
 59 death certificates, coroner/medical examiner reports (including toxicology), and law enforcement  
 60 reports. Decedents with and without known MHP were compared using Chi-square tests. Logistic regression  
 61 analyses estimated adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and  
 62 race/ethnicity.

63 **RESULTS**

64 The most recent overall suicide rates (representing 2014-2016) varied four-fold, from 6.9 (D.C.) to 29.2  
 65 (Montana) per 100,000 persons per year (Table 1). Across the study period, rates increased in all states, except  
 66 Nevada (with the 9<sup>th</sup> highest current suicide rate which consistently has one of the highest suicide rates), with  
 67 absolute increases ranging from +0.8 (Delaware) to +8.1 (Wyoming) per 100,000. Percentage increases in rates  
 68 ranged from +5.9% (Delaware) to +57.6% (North Dakota), with increases of more than 30% observed in 25 states  
 69 (Table 1, Figure 1).

70  
 71 Modeled suicide rate trends indicated significant increases for 44 states, for males (34 states) and females (43  
 72 states), as well as for the U.S. overall (Table 1). Nationally, the model-estimated AAPC for the overall suicide  
 73 rate was +1.5%. By sex, estimated national rate trends further indicated significant increases for males (AAPC  
 74 +1.1%) and females (AAPC +2.6%).

75  
 76 Suicide decedents without known MHP (N=11,039) were compared to those with MHP (N=9,407) in 27 states.  
 77 While all decedents were predominately male (Table 2; 76.8%) and non-Hispanic white (83.6%), those without  
 78 known MHP, relative to those with MHP, were more likely male (83.6% vs. 68.8%; odds ratio (OR)=2.3, 95% CI =  
 79 2.2-2.5) and racial/ethnic minorities (OR range: 1.2-2.4; 95% CI range 1.0-1.3) – 1.6-2.9 (6). Suicide decedents  
 80 without known MHP also had significantly greater odds of perpetrating homicide-suicide (adjusted odds ratio  
 81 aOR = 2.9, 95% CI = 2.2-3.8). Among adult decedents, 20.1% and 15.3% of people without and with MHP,  
 82 respectively, ever served, or were currently serving, in the U.S. military.

83 While firearms were the most common method of suicide overall (48.5%) and for both groups, decedents  
 84 without known MHP were more likely to die by firearm (55.3% vs. 40.6%) and less likely to die by  
 85 hanging/strangulation/suffocation (26.9% vs 31.3%) or poisoning (10.4% vs 19.8%) than those without known  
 86 MHP. These differences remained significant in the adjusted models.

**Comment [za9]:** SK, TS, Opinions as to whether this should stay here or be moved to limitations? I'd prefer to keep it here but realize it may not be conventional.

**Comment [HJ]:** Per Table 2, the range in ORs for non-white racial/ethnic groups is 1.2 to 2.0. Please confirm.

**Comment [za9]:** KY, KF, Jeff looks to be correct.

**Comment [HJ]:** Per Table 2, the range in the lower bound of the 95% CIs for non-white racial/ethnic groups is 1.0 (Hispanic) to 1.6 (AI/AN).

**Comment [za9]:** KF, KY, TS—This looks correct to me. Jeff was looking at the data a little differently. For the lower limits here (LL), he took the smallest and largest numbers across all LL CIs and then did the same for upper limits. I'm guessing you guys have done this before and it's accepted?

**Comment [HJ]:** Per Table 2, the range in the upper bound of the 95% CIs for non-white racial/ethnic groups is 1.3 (Hispanic) to 3.1 (Other). Please confirm.

**Comment [za9]:** KF, KY. Actually this looks like a typo. Should be 1.6-2.6—See above comment about Jeff's interpretation.



87 Decedents without known MHP were less likely to receive toxicology testing. Among those with toxicology  
88 results, decedents without known MHP were less likely to test positive for any substance overall (aOR=0.8, 95%  
89 CI=0.7-0.8) but more likely to test positive for alcohol (aOR=1.2, 95% CI=1.1-1.3).

90 All suicide decedents with MHP (N=9,407) and approximately 85% without known MHP (N=9,357) had available  
91 circumstances information (Table 3). People without known MHP were less likely to have any substance abuse  
92 problems (aOR=0.7, 95% CI=0.7-0.8). While two-thirds of those with known MHP had a history of mental health  
93 or substance abuse treatment (67.2%), just over half (54.0%) were in current treatment.

94 Decedents without known MHP versus those with known MHP had significantly greater likelihood of any  
95 relationship problem/loss (45.1% vs. 39.6%), specifically intimate partner problems (30.2% vs. 24.1%),  
96 arguments/conflicts (17.5% vs. 13.6%), and recently perpetrating interpersonal violence (3.0% vs. 1.4%). They  
97 were also more likely to have experienced any life stressors (54.2% vs 49.7%), such as criminal-legal problems  
98 (10.7% vs. 6.2%) or eviction/loss of home (4.3% vs. 3.4%), and they were more likely to have had a crisis within  
99 the preceding or upcoming two weeks (32.9% vs. 26.0%). All of these differences remained significant in the  
100 adjusted models. Among those with crises, intimate partner and physical health problems were the most  
101 common types for both groups and did not differ between them.

102 Decedents without known MHP had significantly lower odds of recent release from any institution (aOR=0.5,  
103 95% CI=0.4-0.5), but among those who were recently released (5.1%), they were significantly more likely to be  
104 released from a correctional facility (25.7% vs. 8.7%) or hospital (43.7% vs. 33.0%) than those with a known  
105 MHP. Among decedents with known MHP who were recently released from an institution (10.2%), 46.7% of this  
106 group were released from psychiatric facilities.

107 Decedents without known MHP, compared to those with MHP, were significantly less likely to have a history of  
108 suicidal ideation (aOR=0.4, 95% CI=0.4-0.5) and prior suicide attempt (aOR=0.3, 95% CI=0.3-0.3). More than 1 in  
109 five people in both groups disclosed suicide intent (22.4% vs. 24.5%).

## 110 Conclusions and Comments

111 From 1999-2016, 44 states saw significant suicide rate increases. Rates increased significantly for males, in 34  
112 states, and for females, in 43 states. This finding is consistent with prior research showing a decreasing gender  
113 gap in male-female suicide rates between 1999-2014 (3). Overall, half of the states experienced substantial  
114 increases in suicide rates of more than 30%. Additional research into the specific causes of these trends is  
115 necessary. Fortunately, data from the 27 states participating in NVDRS can shed light on the circumstances that  
116 contributed to recent suicides, and can help guide prevention activities.

117 Researchers and practitioners regularly state it is common parlance in the field that 'suicide is not caused by a  
118 single factor,' however, suicide research and prevention practices, almost solely, largely focus on identifying and  
119 treating MHP. The current study found that more than half of suicide decedents in NVDRS did not have a known  
120 MHP. This group suffered more relationship problems and life stressors such as criminal-legal matters,  
121 eviction/loss of home, and recent or impending crises. This is particularly noteworthy in light of findings that  
122 suggest many suicides and attempts occur with minimal deliberation (10).

123 Among people with MHP, two-thirds had a history of mental health and/or substance abuse treatment and over  
124 half were in current treatment. This suggests that additional supports for this population are needed to keep  
125 them safe. This includes broader implementation of affordable and effective treatment modalities such as  
126 doctor-patient collaborative care models and cognitive-behavioral therapy. Additionally, greater access to  
127 behavioral health providers in underserved areas is needed, as is expansion of healthcare systems to integrate

Comment [HJ]: Any comment on substance causes of death?

Comment [za9]: TS--No room ☹

Comment [HJ]: Might be better to report as: 23.0% vs. 40.8%

Comment [HJ]: Might be better to report as: 29.4% vs. 10.3%

Comment [za9]: KF, KY, TS--I tried to preserve aOR's!! Thoughts?

Comment [HJ]: Add citations to support this statement.

Comment [za9]: Alex-- add Zalsman again? Don't have room for another ref.

Comment [HJ]: Any comment that the top ranking states are rural and mainly in the Northwest: MT, AK, WY, UT

Comment [za9]: Unfortunately we can't accommodate the added text.



128 physical and behavioral health that better support suicide prevention and patient safety, especially through care  
129 transitions (11).

130 Study findings indicate that people with known MHP also experienced other life stressors such as job/financial,  
131 relationship, and/or physical health problems. These findings point to the need to both prevent the conditions  
132 associated with mental health problems in the first place, and to support people with known MHP to decrease  
133 their risk of poor social, health, and economic outcomes (12).

134 Together, these results underscore the importance of comprehensive statewide suicide prevention activities  
135 that address multiple factors associated with suicide. Prevention strategies may include: strengthening  
136 economic supports (e.g., housing stabilization policies, household financial support); teaching coping and  
137 problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in  
138 life; promoting social connectedness to increase a sense of belongingness and access to informational, tangible,  
139 emotional, and social support; and identifying and better supporting people at risk. Other strategies include  
140 creating protective environments (e.g., reducing access to lethal means among people at risk, creating  
141 organizational and workplace policies to promote help-seeking, easing transitions into and out of work for  
142 people with MHP and other life challenges), supporting family and friends after a suicide, and assuring safe  
143 reporting by the media in order to prevent suicide contagion (11). Some states, such as Colorado, are planning  
144 to implement such a comprehensive approach to suicide prevention (13).

145 These findings have at least three limitations. In the state-level analysis, rankings for four states (MD, MA, RI,  
146 UT) might have been impacted by large proportions of injury deaths of undetermined intent (potentially biasing  
147 reported suicide rates downward), or decreased percentages of such deaths over time (potentially biasing  
148 estimated rate trends upward). **Second**, NVDRS is not yet nationally representative; the 27 states included  
149 represent 49.6% of the population

150 (<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml>).

151 Third, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the  
152 extent of informant knowledge can impact data completeness and accuracy. Studies including more in-depth  
153 interviews with next-of-kin often see greater attributions to mental disorders (14), however many  
154 methodological variations across studies exist (15). It is likely that some people without known MHP in the  
155 current study were experiencing mental health challenges that were unknown, and hence underreported by key  
156 informants. However, any lack of awareness of decedent MHP suggests the importance of addressing the broad  
157 range of contributing circumstances.

158 Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are  
159 available. States and communities can use data from NVDRS and resources such as CDC's *Preventing Suicide: a*  
160 *Technical Package of Policies, Programs, and Practices* (11) to better understand their suicide problem and  
161 prioritize evidence-based comprehensive suicide prevention.

#### 162 **Acknowledgments**

163 The authors acknowledge Robert Anderson, Holly Hedegaard, and Margaret Warner from the Division of Vital  
164 Statistics, National Center for Health Statistics, CDC, for their statistical consultation.

165

166 **Conflict of Interest** No conflicts of interest were reported.

167

168 **Corresponding author:** Deborah M. Stone, [dstone3@cdc.gov](mailto:dstone3@cdc.gov) , 770-488-3942

169

170 **Author Affiliations:**

**Comment [HJ]:** Comment about NV?

**Comment [za19]:** SK, TS--Not sure there's a weakness in there. I inserted language above to state that it consistently has one of the highest rates.

<sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis, Research, and Practice Integration, National Center for Injury Prevention and Control, CDC

## References:

1. Centers for Disease Control and Prevention. Web-based Injury Statistics Query and Reporting System (WISQARS). Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018. In.
2. Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide Trends Among and Within Urbanization Levels by Sex, Race/Ethnicity, Age Group, and Mechanism of Death - United States, 2001-2015. *MMWR Surveill Summ* 2017;66(18):1-16.
3. Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999-2014. In: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics Hyattsville, MD; 2016.
4. Kochanek K, Murphy S, Xu J, Arias E. Mortality in the United States, 2016. *NCHS Data Brief*, no 293. National Center for Health Statistics 2017.
5. Office of the Surgeon General, National Action Alliance for Suicide Prevention. 2012 National strategy for suicide prevention: goals and objectives for action: a report of the US Surgeon General and of the National Action Alliance for Suicide Prevention. 2012.
6. Rosenman SJ. Preventing suicide: what will work and what will not. *The Medical Journal of Australia* 1998;169(2):100-102.
7. Torguson K, O'Brien A. Leading Suicide Prevention Efforts Unite to Address Rising National Suicide Rate. In. Washington, D.C.; 2017.
8. Crepeau-Hobson F. The Psychological Autopsy and Determination of Child Suicides: A Survey of Medical Examiners. *Archives of Suicide Research* 2010;14(1):24-34.
9. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5®): American Psychiatric Pub; 2013.
10. Simon TR, Swann AC, Powell KE, Potter LB, Kresnow Mj, O'Carroll PW. Characteristics of impulsive suicide attempts and attempters. *Suicide and Life-Threatening Behavior* 2002;32(s1):49-59.
11. Stone DM, Holland KM, Bartholow BN, Crosby AE, Davis SP, Wilkins N. Preventing suicide: A technical package of policies, programs, and practice. 2017.
12. World Health Organization. Risks to mental health: An overview of vulnerabilities and risk factors. Geneva: WHO 2012.
13. Caine ED, Reed J, Hindman J, Quinlan K. Comprehensive, integrated approaches to suicide prevention: practical guidance. *Injury prevention* 2017;injuryprev-2017-042366.
14. Milner A, Svetcic J, De Leo D. Suicide in the absence of mental disorder? A review of psychological autopsy studies across countries. *Int J Soc Psychiatry* 2013;59(6):545-54.
15. Pouliot L, De Leo D. Critical issues in psychological autopsy studies. *Suicide Life Threat Behav* 2006;36(5):491-510.

## Attachments:

Stone\_Suicide Vital Signs MMWR 3.27.18 (table 1.fig 1)

Stone\_Suicide Vital Signs MMWR 3.27.18 (Tables 2&3)

**Word Count:** 1861/1800

**Comment [HJ]:** Are these references formatted appropriately for MMWR?

The source for #7 is not included: American Foundation for Suicide Prevention.

For #9, the location of the DSM-5 is Arlington, VA.

**Comment [za19]:** I'll fix this after I replace #6 once alex weighs in.



**Short Title:** Vital Signs: Contributing Circumstances to Suicide and Increasing Trends in State Suicide Rates

Deborah M. Stone, ScD;<sup>1</sup> Thomas R. Simon PhD;<sup>1</sup> Katherine A. Fowler, PhD;<sup>1</sup> Scott R. Kegler, PhD;<sup>2</sup> Keming Yuan, MS;<sup>1</sup> Kristin M. Holland, PhD;<sup>1</sup> Asha Z. Ivey-Stephenson, PhD;<sup>1</sup> Alex E. Crosby, MD<sup>1</sup>

**Background:** Suicide rates in the United States have risen nearly 30% since 1999. Mental health problems (MHP) are just one factor contributing to suicide. Examining state-level trends in suicide and other contributing circumstances can inform comprehensive state suicide prevention planning.

**Methods:** Trends in age-adjusted suicide rates among people aged  $\geq 10$  years, by state and sex, across six consecutive three-year periods (1999-2016), were assessed using data from the National Vital Statistics System for 50 states and Washington, D.C. (D.C.). Data from the National Violent Death Reporting System, covering 27 states in 2015, were used to examine contributing circumstances among decedents with and without known MHP.

**Results:** From 1999-2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases of more than 30%. Rates increased significantly among males and females, in 34 and 43 states, respectively. Over half (54.0%) of decedents did *not* have a known MHP. Among decedents with circumstance information, several circumstances, including relationship problems/loss (45.1% vs 39.6%), life stressors (54.2% vs 49.7%) and recent/impending crises (32.9% vs 26.0%), were significantly more likely among those without a known MHP than decedents with MHP, but were common across groups.

**Conclusions:** Suicide rates increased significantly across most states from 1999-2016. Various circumstances contributed to suicides among people with and without known MHP.

**Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach to prevent suicide risk before it occurs, identify and support people at risk, prevent reattempts, and help friends/family after a suicide occurs.

## INTRODUCTION

### BACKGROUND AND PURPOSE

In 2016, nearly 45,000 suicides (15.6/100,000 [age-adjusted]) occurred in the United States (U.S.), among people  $\geq 10$  years old [1]. Between 1999 and 2015, suicide rates increased across sexes, racial/ethnic groups, and urbanization levels [2, 3]. Suicide is the 10<sup>th</sup> leading cause of death and is one of just three leading causes that are *increasing* [1, 4]. Additionally, rates of Emergency Department visits for nonfatal self-harm, a key risk factor for suicide, increased nearly 45% between 2001 and 2015 [1]. Together, suicides and self-harm injuries cost the nation more than \$69 billion in direct medical and work loss costs [1].

The *National Strategy for Suicide Prevention* (NSSP) [5] calls for a public health approach to suicide prevention with efforts spanning across multiple levels (i.e., individual, family/relationship, community, and societal). Such an approach underscores that suicide is rarely caused by any single factor, but rather, is multi-determined. Despite the NSSP guidance, suicide prevention efforts largely focus on identifying and treating individuals with mental health problems (MHP) [6]. Other contributing circumstances include social and economic problems, access to lethal means (e.g., substances, firearms, bridges) among people at risk, poor coping and problem-solving skills, and prior suicide attempts [5]. Expanded awareness of the additional circumstances that contribute to suicide risk apart from MHP, and action to address them, can help reach the nation's goal of reducing suicide rates 20% by 2025 [7]. To assist states in achieving this goal, this study analyzes state-specific

**Comment [HJ]:** Is there a more up-to-date US-based reference than Rosenman 1998?



40 trends in suicide rates, assesses the multiple contributing factors, and provides recommendations for multi-level  
41 comprehensive suicide prevention.

## 42 METHODS

43 Suicide rates were analyzed for people aged ≥10 years only, as attributions of suicidal intent in younger children  
44 are variable [8]. Age-specific suicide counts were tabulated based on National Vital Statistics System coded death  
45 certificate records (*International Classification of Diseases 10<sup>th</sup> Revision*, underlying-cause-of death codes X60-  
46 X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for  
47 Health Statistics bridged-race population data releases.

48  
49 National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods  
50 spanning 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed  
51 per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data  
52 aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends  
53 are reported in terms of average annual percentage changes (AAPCs).

54  
55 Characteristics (Table 2) and circumstances (Table 3) of suicide decedents ≥10 years, with and without known  
56 MHP, were compared in the 27 states with complete data participating in CDC's National Violent Death  
57 Reporting System (NVDRS) in 2015. NVDRS defines MHP as disorders and syndromes listed in the Diagnostic and  
58 Statistical Manual of Mental Disorders, Fifth Edition [9], with the exception of alcohol and other substance  
59 dependence, which are captured separately in NVDRS. NVDRS aggregates data from three primary data sources:  
60 death certificates, coroner/medical examiner reports (including toxicology), and law enforcement  
61 reports. Decedents with and without known MHP were compared using Chi-square tests. Logistic regression  
62 analyses estimated adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and  
63 race/ethnicity.

## 64 RESULTS

65 The most recent overall suicide rates (representing 2014-2016) varied four-fold, from 6.9 (D.C.) to 29.2  
66 (Montana) per 100,000 persons per year (Table 1). Across the study period, rates increased in all states, except  
67 Nevada (with the 9<sup>th</sup> highest current suicide rate), with absolute increases ranging from +0.8 (Delaware) to +8.1  
68 (Wyoming) per 100,000. Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota),  
69 with increases of more than 30% observed in 25 states (Table 1, Figure 1).

70  
71 Modeled suicide rate trends indicated significant increases for 44 states, for males (34 states) and females (43  
72 states), as well as for the U.S. overall (Table 1). Nationally, the model-estimated AAPC for the overall suicide  
73 rate was +1.5%. By sex, estimated national rate trends further indicated significant increases for males (AAPC  
74 +1.1%) and females (AAPC +2.6%).

75  
76 Suicide decedents in 27 states without known MHP (N=11,039) were compared to those with MHP (N=9,407).  
77 While all decedents were predominately male (Table 2; 76.8%) and non-Hispanic white (83.6%), those without  
78 known MHP, relative to those with MHP, were more likely male (83.6% vs. 68.8%; odds ratio (OR)=2.3, 95% CI =  
79 2.2-2.5) and racial/ethnic minorities (OR range: 1.2-2.1; 95% CI range 1.0-1.3 – 1.6-2.0). Suicide decedents  
80 without known MHP also had significantly greater odds of perpetrating homicide-suicide (adjusted odds ratio  
81 aOR = 2.9, 95% CI = 2.2-3.8). Among adult decedents, 20.1% and 15.3% of people without and with MHP,  
82 respectively, ever served, or were currently serving, in the U.S. military.

83 While firearms were the most common method of suicide overall (48.5%) and for both groups, decedents  
84 without known MHP were more likely to die by firearm (55.3% vs. 40.6%) and less likely to die by

**Comment [HJ]:** And consistently high rates since 1999-2001.

**Comment [HJ]:** Per Table 2, the range in ORs for non-white racial/ethnic groups is 1.2 to 2.0. Please confirm.

**Comment [HJ]:** Per Table 2, the range in the lower bound of the 95% CIs for non-white racial/ethnic groups is 1.0 (Hispanic) to 1.6 (AI/AN).

**Comment [HJ]:** Per Table 2, the range in the upper bound of the 95% CIs for non-white racial/ethnic groups is 1.3 (Hispanic) to 3.1 (Other). Please confirm.



85 hanging/strangulation/suffocation (26.9% vs 31.3%) or poisoning (10.4% vs 19.8%) than those without known  
86 MHP. These differences remained significant in the adjusted models.

87 Decedents without known MHP were less likely to receive toxicology testing. Among those with toxicology  
88 results, decedents without known MHP were less likely to test positive for any substance overall (aOR=0.8, 95%  
89 CI=0.7-0.8) but more likely to test positive for alcohol (aOR=1.2, 95% CI=1.1-1.3).

90 All suicide decedents with MHP (N=9,407) and approximately 85% without known MHP (N=9,357) had available  
91 circumstances information (Table 3). People without known MHP were less likely to have any substance abuse  
92 problems (aOR=0.7, 95% CI=0.7-0.8). While two-thirds of those with known MHP had a history of mental health  
93 or substance abuse treatment (67.2%), just over half (54.0%) were in current treatment.

94 Decedents without known MHP versus those with known MHP, had a significantly greater likelihood of any  
95 relationship problem/loss (45.1% vs. 39.6%), specifically intimate partner problems (30.2% vs. 24.1%),  
96 arguments/conflicts (17.5% vs. 13.6%), and recently perpetrating interpersonal violence (3.0% vs. 1.4%). They  
97 were also more likely to have experienced other any life stressors (54.2% vs 49.7%), such as criminal-legal  
98 problems (10.7% vs. 6.2%) or eviction/loss of home (4.3% vs. 3.4%), and they were more likely to have had a  
99 crisis within the preceding or upcoming two weeks (32.9% vs. 26.0%). All of these differences remained  
100 significant in the adjusted models. Among those with crises, intimate partner and physical health problems were  
101 the most common types for both groups and did not differ between them.

102 Decedents without known MHP had significantly lower odds of recent release (aOR=0.5 95% CI 0.4-0.5) from  
103 any institution (aOR=0.5, 95% CI=0.4-0.5), but among those who were recently released (5.1%), they were  
104 significantly more likely to be released from a correctional facility (25.7% vs. 8.7%) or hospital (43.7% vs. 33.0%)  
105 than those with a known MHP. Among decedents with known MHP who were recently released from an  
106 institution (10.2%), 46.7% of this group were released from psychiatric facilities.

107 Decedents without known MHP, compared to those with MHP, were significantly less likely to have a history of  
108 suicidal ideation (aOR=0.4, 95% CI=0.4-0.5) and prior suicide attempt (aOR=0.3, 95% CI=0.3-0.3). More than 1 in  
109 five people in both groups disclosed suicide intent (22.4% vs. 24.5%).

## 110 Conclusions and Comments

111 From 1999-2016, 44 states saw significant suicide rate increases. Rates increased significantly for males, in 34  
112 states, and for females, in 43 states. This finding is consistent with prior research showing a decreasing gender  
113 gap in male-female suicide rates between 1999-2014 [3]. Overall, half of the states experienced substantial  
114 increases in suicide rates of more than 30%. Additional research into the specific causes of these trends is  
115 necessary. Fortunately, data from the 27 states participating in NVDRS can shed light on the circumstances that  
116 contributed to recent suicides, and can help guide prevention activities.

117 Researchers and practitioners regularly state that suicide is not caused by a single factor; however, the focus of  
118 suicide research and prevention practices, almost solely, focus on identify and treating MHP. The current study  
119 found that more than half of suicide decedents in NVDRS did not have a known MHP. This group suffered more  
120 relationship problems and life stressors such as criminal-legal matters, eviction/loss of home, and recent or  
121 impending crises. This is particularly noteworthy in light of findings that suggest many suicides and attempts  
122 occur with minimal deliberation [10].

123 Among people with MHP, two-thirds had a history of mental health and/or substance abuse treatment and over  
124 half were in current treatment. This suggests that additional supports for this population are needed to keep  
125 them safe. This includes broader implementation of affordable and effective treatment modalities such as

Comment [HJ()]: Any comment on substance causes of death?

Comment [HJ()]: Might be better to report as: 23.0% vs. 40.8%

Comment [HJ()]: Might be better to report as: 29.4% vs. 10.3%

Comment [HJ()]: Add citations to support this statement.



126 doctor-patient collaborative care models and cognitive-behavioral therapy. Additionally, greater access to  
127 behavioral health providers, ~~especially in underserved~~ areas is needed, as is expansion of healthcare systems  
128 ~~needed that to~~ integrate physical and behavioral health ~~and that~~ better support suicide prevention and patient  
129 safety, especially through care transitions [11].

130 Study findings indicate that people with known MHP also experienced other life stressors such as job/financial,  
131 relationship, and/or physical health problems. These findings point to the need to both prevent the conditions  
132 associated with mental health problems in the first place, ~~and the need to~~ support people with known MHP to  
133 decrease their risk of poor social, health, and economic outcomes [12].

134 ~~Together,~~ these results, ~~together,~~ underscore the importance of comprehensive statewide suicide prevention  
135 activities that address multiple factors associated with suicide. Prevention strategies may include: strengthening  
136 economic supports (e.g., housing stabilization policies, household financial support); teaching coping and  
137 problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in  
138 life; promoting social connectedness to increase a sense of belongingness and access to informational, tangible,  
139 emotional, and social support; ~~and~~ identifying and better supporting people at risk. Other strategies include  
140 creating protective environments (e.g., reducing access to lethal means among people at risk, creating  
141 organizational and workplace policies to promote help-seeking, easing transitions into and out of work for  
142 people with MHP and other life challenges), supporting family and friends after a suicide, and assuring safe  
143 reporting by the media in order to prevent suicide contagion [11]. Some states, such as Colorado, are planning  
144 ~~and implementing to implement~~ such a comprehensive approach to suicide prevention [13].

145 These findings have at least three limitations. In the state-level analysis, rankings for four states (MD, MA, RI,  
146 UT) might have been impacted by large proportions of injury deaths of undetermined intent (potentially biasing  
147 reported suicide rates downward), or decreased percentages of such deaths over time (potentially biasing  
148 estimated rate trends upward). ~~Second,~~ NVDRS is not yet nationally representative; the 27 states included  
149 represent 49.6% of the population  
150 (<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml>).

151 Third, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the  
152 extent of informant knowledge can impact data completeness and accuracy. Studies including more in-depth  
153 interviews with next-of-kin often see greater attributions to mental disorders [14], however many  
154 methodological variations across studies exist [15]. It is likely that some people without known MHP in the  
155 current study were experiencing mental health challenges that were unknown, and hence ~~under~~reported by key  
156 informants. However, any lack of awareness of decedent MHP suggests, ~~even further,~~ the importance of  
157 addressing the broad range of contributing circumstances.

158 Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are  
159 available. States and communities can use data from NVDRS and resources such as CDC's *Preventing Suicide: a*  
160 *Technical Package of Policies, Programs, and Practices* [11] to better understand their suicide problem and  
161 prioritize evidence-based comprehensive suicide prevention.

## 162 Acknowledgments

163 The authors acknowledge Robert Anderson, Holly Hedegaard, and Margaret Warner from the Division of Vital  
164 Statistics, National Center for Health Statistics, CDC, for their statistical consultation.

165

166 **Conflict of Interest** No conflicts of interest were reported.

167

168 **Corresponding author:** Deborah M. Stone, [dstone3@cdc.gov](mailto:dstone3@cdc.gov), 770-488-3942

Comment [HJ]: Any comment that the top ranking states are rural and mainly in the Northwest: MT, AK, WY, UT

Comment [HJ]: Comment about NV?



169

170 **Author Affiliations:**

171 <sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis,  
172 Research, and Practice Integration, National Center for Injury Prevention and Control, CDC

173 **References:**

- 174 1. Centers for Disease Control and Prevention, *Web-based Injury Statistics Query and Reporting System*  
175 *(WISQARS)*. Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018.  
176 2016.
- 177 2. Ivey-Stephenson, A.Z., et al., *Suicide Trends Among and Within Urbanization Levels by Sex,*  
178 *Race/Ethnicity, Age Group, and Mechanism of Death - United States, 2001-2015*. MMWR Surveill Summ,  
179 2017. **66**(18): p. 1-16.
- 180 3. Curtin, S.C., M. Warner, and H. Hedegaard, *Increase in suicide in the United States, 1999-2014*. 2016, US  
181 Department of Health and Human Services, Centers for Disease Control and Prevention, National Center  
182 for Health Statistics Hyattsville, MD.
- 183 4. Kochanek, K., et al., *Mortality in the United States, 2016*. NCHS Data Brief, no 293. National Center for  
184 Health Statistics, 2017.
- 185 5. Office of the Surgeon General and National Action Alliance for Suicide Prevention, *2012 National*  
186 *strategy for suicide prevention: goals and objectives for action: a report of the US Surgeon General and*  
187 *of the National Action Alliance for Suicide Prevention*. 2012.
- 188 6. Rosenman, S.J., *Preventing suicide: what will work and what will not*. The Medical Journal of Australia,  
189 1998. **169**(2): p. 100-102.
- 190 7. Torguson, K. and A. O'Brien, *Leading Suicide Prevention Efforts Unite to Address Rising National Suicide*  
191 *Rate*. 2017: Washington, D.C.
- 192 8. Crepeau-Hobson, F., *The Psychological Autopsy and Determination of Child Suicides: A Survey of Medical*  
193 *Examiners*. Archives of Suicide Research, 2010. **14**(1): p. 24-34.
- 194 9. American Psychiatric Association, *Diagnostic and statistical manual of mental disorders (DSM-5®)*. 2013:  
195 American Psychiatric Pub.
- 196 10. Simon, T.R., et al., *Characteristics of impulsive suicide attempts and attempters*. Suicide and Life-  
197 Threatening Behavior, 2002. **32**(s1): p. 49-59.
- 198 11. Stone, D.M., et al., *Preventing suicide: A technical package of policies, programs, and practice*. 2017.
- 199 12. World Health Organization, *Risks to mental health: An overview of vulnerabilities and risk factors*.  
200 Geneva: WHO, 2012.
- 201 13. Caine, E.D., et al., *Comprehensive, integrated approaches to suicide prevention: practical guidance*.  
202 Injury prevention, 2017: p. injuryprev-2017-042366.
- 203 14. Milner, A., J. Svetcic, and D. De Leo, *Suicide in the absence of mental disorder? A review of psychological*  
204 *autopsy studies across countries*. Int J Soc Psychiatry, 2013. **59**(6): p. 545-54.
- 205 15. Pouliot, L. and D. De Leo, *Critical issues in psychological autopsy studies*. Suicide Life Threat Behav, 2006.  
206 **36**(5): p. 491-510.

207 **Attachments:**

208 Stone\_Suicide Vital Signs MMWR 3.27.18 (table 1.fig 1)

209 Stone\_Suicide Vital Signs MMWR 3.27.18 (Tables 2&3)

210 **Word Count:** 1861/1800

**Comment [HJ]:** Are these references formatted appropriately for MMWR?

The source for #7 is not included: American Foundation for Suicide Prevention.

For #9, the location of the DSM-5 is Arlington, VA.

**Short Title:** Vital Signs: Contributing Circumstances to Suicide and Increasing Trends in State Suicide Rates

Deborah M. Stone, ScD;<sup>1</sup> Thomas R. Simon PhD;<sup>1</sup> Katherine A. Fowler, PhD;<sup>1</sup> Scott R. Kegler, PhD;<sup>2</sup> Keming Yuan, MS;<sup>1</sup> Kristin M. Holland, PhD;<sup>1</sup> Asha Z. Ivey-Stephenson, PhD;<sup>1</sup> Alex E. Crosby, MD<sup>1</sup>

**Background:** Suicide rates in the United States have risen nearly 30% since 1999. Mental health problems (MHP) are just one factor contributing to suicide. Examining state-level trends in suicide and other contributing circumstances can inform comprehensive state suicide prevention planning.

**Methods:** Trends in age-adjusted suicide rates among people aged  $\geq 10$  years, by state and sex, across six consecutive three-year periods (1999-2016), were assessed using data from the National Vital Statistics System for 50 states and Washington, D.C (D.C.). Data from the National Violent Death Reporting System, covering 27 states in 2015, were used to examine contributing circumstances among decedents with and without known MHP.

**Results:** From 1999-2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases of more than 30%. Rates increased significantly among males and females, in 34 and 43 states, respectively. Over half (54.0%) of decedents did *not* have a known MHP. Among decedents with circumstance information, several circumstances, including relationship problems/loss (45.1% vs 39.6%), life stressors (54.2% vs 49.7%) and recent/impending crises (32.9% vs 26.0%), were significantly more likely among those without a known MHP, but were common across groups.

**Conclusions:** Suicide rates increased significantly across most states from 1999-2016. Various circumstances contributed to suicides among people with and without known MHP.

**Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach to prevent suicide risk before it occurs, identify and support people at risk, prevent reattempts, and help friends/family after a suicide occurs.

## INTRODUCTION

### BACKGROUND AND PURPOSE

In 2016, nearly 45,000 suicides (15.6/100,000 [age-adjusted]) occurred in the United States (U.S.), among people  $\geq 10$  years old [1]. Between 1999 and 2015, suicide rates increased across sexes, racial/ethnic groups, and urbanization levels [2, 3]. Suicide is the 10<sup>th</sup> leading cause of death and is one of just three leading causes that are *increasing* [1, 4]. Additionally, rates of Emergency Department visits for nonfatal self-harm, a key risk factor for suicide, increased nearly 45% between 2001 and 2015 [1]. Together, suicides and self-harm injuries cost the nation more than \$69 billion in direct medical and work loss costs [1].

The *National Strategy for Suicide Prevention (NSSP)* [5] calls for a public health approach to suicide prevention with efforts spanning across multiple levels (i.e., individual, family/relationship, community, and societal). Such an approach underscores that suicide is rarely caused by any single factor, but rather, is multi-determined. Despite the NSSP guidance, suicide prevention efforts largely focus on identifying and treating individuals with mental health problems (MHP) [6]. Other contributing circumstances include social and economic problems, access to lethal means (e.g., substances, firearms, bridges) among people at risk, poor coping and problem-solving skills, and prior suicide attempts [5]. Expanded awareness of the additional circumstances that contribute to suicide risk apart from MHP, and action to address them, can help reach the nation's goal of reducing suicide rates 20% by 2025 [7]. To assist states in achieving this goal, this study analyzes state-specific



trends in suicide rates, assesses the multiple contributing factors, and provides recommendations for multi-level comprehensive suicide prevention.

## METHODS

Suicide rates were analyzed for people aged  $\geq 10$  years only, as attributions of suicidal intent in younger children are variable [8]. Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases 10<sup>th</sup> Revision*, underlying-cause-of death codes X60-X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods spanning 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Characteristics (Table 2) and circumstances (Table 3) of suicide decedents  $\geq 10$  years, with and without known MHP, were compared in the 27 states with complete data participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines MHP as disorders and syndromes listed in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition [9], with the exception of alcohol and other substance dependence, which are captured separately in NVDRS. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known MHP were compared using Chi-square tests. Logistic regression analyses estimated adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and race/ethnicity.

## RESULTS

The most recent overall suicide rates (representing 2014-2016) varied four-fold, from 6.9 (D.C.) to 29.2 (Montana) per 100,000 persons per year (Table 1). Across the study period, rates increased in all states, except Nevada (with the 9<sup>th</sup> highest current suicide rate), with absolute increases ranging from +0.8 (Delaware) to +8.1 (Wyoming) per 100,000. Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with increases of more than 30% observed in 25 states (Table 1, Figure 1).

Modeled suicide rate trends indicated significant increases for 44 states, for males (34 states) and females (43 states), as well as for the U.S. overall (Table 1). Nationally, the model-estimated AAPC for the overall suicide rate was +1.5%. By sex, estimated national rate trends further indicated significant increases for males (AAPC +1.1%) and females (AAPC +2.6%).

Suicide decedents without known MHP (N=11,039) were compared to those with MHP (N=9,407). While all decedents were predominately male (Table 2; 76.8%) and non-Hispanic white (83.6%), those without known MHP, relative to those with MHP, were more likely male (83.6% vs. 68.8%; odds ratio (OR)=2.3, 95% CI = 2.2-2.5) and racial/ethnic minorities (OR range: 1.2-2.1; 95% CI range [1.0-1.3] – [1.6-2.0]). Suicide decedents without known MHP also had significantly greater odds of perpetrating homicide-suicide (adjusted odds ratio aOR = 2.9, 95% CI = 2.2-3.8). Among adult decedents, 20.1% and 15.3% of people without and with MHP, respectively, ever served, or were currently serving, in the U.S. military.

While firearms were the most common method of suicide overall (48.5%) and for both groups, decedents without known MHP were more likely to die by firearm (55.3% vs. 40.6%) and less likely to die by suffocation

### 3.27.18 MMWR for e-clearance

85 (26.9% vs 31.3%) or poisoning (10.4% vs 19.8%) than those without known MHP. These differences remained  
86 significant in the adjusted models.

87 Decedents without known MHP were less likely to receive toxicology testing. Among those with toxicology  
88 results, decedents without known MHP were less likely to test positive for any substance overall (aOR=0.8, 95%  
89 CI=0.7-0.8) but more likely to test positive for alcohol (aOR=1.2, 95% CI=1.1-1.3).

90 All suicide decedents with MHP (N=9,407) and approximately 85% without known MHP (N=9,357) had available  
91 circumstances information (Table 3). People without known MHP were less likely to have any substance abuse  
92 problems (aOR=0.7, 95% CI=0.7-0.8). While two-thirds of those with known MHP had a history of mental health  
93 or substance abuse treatment (67.2%), just over half (54.0%) were in current treatment.

94 Decedents without known MHP versus those with known MHP, had a greater likelihood of any relationship  
95 problem/loss (45.1% vs. 39.6%), specifically intimate partner problems (30.2% vs. 24.1%), arguments/conflicts  
96 (17.5% vs. 13.6%), and recently perpetrating interpersonal violence (3.0% vs. 1.4%). They were also more likely  
97 to have experienced other life stressors (54.2% vs 49.7%), such as criminal-legal problems (10.7% vs. 6.2%) or  
98 eviction/loss of home (4.3% vs. 3.4%), and they were more likely to have had a crisis within the preceding or  
99 upcoming two weeks (32.9% vs. 26.0%). All of these differences remained significant in the adjusted models.  
100 Among those with crises, intimate partner and physical health problems were the most common types for both  
101 groups and did not differ between them.

102 Decedents without known MHP had significantly lower odds of recent release (aOR=0.5 95% CI (0.4-0.5) from  
103 any institution, but among those who were recently released (5.1%), they were significantly more likely to be  
104 released from a correctional facility (25.7% vs. 8.7%) or hospital (43.7% vs. 33.0%) than those with a known  
105 MHP. Among decedents with known MHP who were recently released from an institution (10.2%), 46.7% of this  
106 group were released from psychiatric facilities.

107 Decedents without known MHP, compared to those with MHP, were less likely to have a history of suicidal  
108 ideation (aOR=0.4, 95% CI=0.4-0.5) and prior suicide attempt (aOR=0.3, 95% CI=0.3-0.3). More than 1 in five  
109 people in both groups disclosed suicide intent (22.4% vs. 24.5%).

### 110 **Conclusions and Comments**

111 From 1999-2016, 44 states saw significant suicide rate increases. Rates increased significantly for males, in 34  
112 states, and for females, in 43 states. This finding is consistent with prior research showing a decreasing gender  
113 gap in male-female suicide rates between 1999-2014 [3]. Overall, half of the states experienced substantial  
114 increases in suicide rates of more than 30%. Additional research into the specific causes of these trends is  
115 necessary. Fortunately, data from the states participating in NVDRS can shed light on the circumstances that  
116 contributed to recent suicides, and can help guide prevention activities.

117 Researchers and practitioners regularly state that suicide is not caused by a single factor, however, the focus of  
118 suicide research and prevention practices, almost solely, focus on identify and treating MHP. The current study  
119 found that more than half of suicide decedents in NVDRS did *not* have a known MHP. This group suffered more  
120 relationship problems and life stressors such as criminal-legal matters, eviction/loss of home, and recent or  
121 impending crises. This is particularly noteworthy in light of findings that suggest many suicides and attempts  
122 occur with minimal deliberation [10].

123 Among people with MHP, two-thirds had a history of mental health and/or substance abuse treatment and over  
124 half were in current treatment. This suggests that additional supports for this population are needed to keep  
125 them safe. This includes broader implementation of affordable and effective treatment modalities such as



126 doctor-patient collaborative care models and cognitive-behavioral therapy. Additionally, greater access to  
127 behavioral health providers, especially in underserved areas is needed, as is expansion of healthcare systems  
128 needed that integrate physical and behavioral health and that better support suicide prevention and patient  
129 safety, especially through care transitions [11].

130 Study findings indicate that people with known MHP also experienced other life stressors such as job/financial,  
131 relationship, and/or physical health problems. These findings point to the need to both prevent the conditions  
132 associated with mental health problems in the first place and the need to support people with known MHP to  
133 decrease their risk of poor social, health, and economic outcomes [12].

134 These results, together, underscore the importance of comprehensive statewide suicide prevention activities  
135 that address multiple factors associated with suicide. Prevention strategies may include: strengthening  
136 economic supports (e.g., housing stabilization policies, household financial support); teaching coping and  
137 problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in  
138 life; promoting social connectedness to increase a sense of belongingness and access to informational, tangible,  
139 emotional, and social support, and identifying and better supporting people at risk. Other strategies include  
140 creating protective environments (e.g., reducing access to lethal means among people at risk, creating  
141 organizational and workplace policies to promote help-seeking, easing transitions into and out of work for  
142 people with MHP and other life challenges), supporting family and friends after a suicide, and assuring safe  
143 reporting by the media in order to prevent suicide contagion [11]. Some states, such as Colorado, are planning  
144 and implementing such a comprehensive approach to suicide prevention [13].

145 These findings have at least three limitations. In the state-level analysis, rankings for four states (MD, MA, RI,  
146 UT) might have been impacted by large proportions of injury deaths of undetermined intent (potentially biasing  
147 reported suicide rates downward), or decreased percentages of such deaths over time (potentially biasing  
148 estimated rate trends upward). Second, NVDRS is not yet nationally representative; the 27 states included  
149 represent 49.6% of the population  
150 (<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml>).

151 Third, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the  
152 extent of informant knowledge can impact data completeness and accuracy. Studies including more in-depth  
153 interviews with next-of-kin often see greater attributions to mental disorders [14], however many  
154 methodological variations across studies exist [15]. It is likely that some people without known MHP in the  
155 current study were experiencing mental health challenges that were unknown, and hence unreported by key  
156 informants. However, any lack of awareness of decedent MHP suggests, even further, the importance of  
157 addressing the broad range of contributing circumstances.

158 Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are  
159 available. States and communities can use data from NVDRS and resources such as CDC's *Preventing Suicide: a*  
160 *Technical Package of Policies, Programs, and Practices* [11] to better understand their suicide problem and  
161 prioritize evidence-based comprehensive suicide prevention.

## 162 **Acknowledgments**

163 The authors acknowledge Robert Anderson, Holly Hedegaard, and Margaret Warner from the Division of Vital  
164 Statistics, National Center for Health Statistics, CDC, for their statistical consultation.

165

166 **Conflict of Interest** No conflicts of interest were reported.

167

168 **Corresponding author:** Deborah M. Stone, [dstone3@cdc.gov](mailto:dstone3@cdc.gov), 770-488-3942

169

170 **Author Affiliations:**

171 <sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis,  
172 Research, and Practice Integration, National Center for Injury Prevention and Control, CDC

173 **References:**

- 174 1. Centers for Disease Control and Prevention, *Web-based Injury Statistics Query and Reporting System*  
175 *(WISQARS)*. Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018.  
176 2016.
- 177 2. Ivey-Stephenson, A.Z., et al., *Suicide Trends Among and Within Urbanization Levels by Sex,*  
178 *Race/Ethnicity, Age Group, and Mechanism of Death - United States, 2001-2015*. MMWR Surveill Summ,  
179 2017. **66**(18): p. 1-16.
- 180 3. Curtin, S.C., M. Warner, and H. Hedegaard, *Increase in suicide in the United States, 1999-2014*. 2016, US  
181 Department of Health and Human Services, Centers for Disease Control and Prevention, National Center  
182 for Health Statistics Hyattsville, MD.
- 183 4. Kochanek, K., et al., *Mortality in the United States, 2016*. NCHS Data Brief, no 293. National Center for  
184 Health Statistics, 2017.
- 185 5. Office of the Surgeon General and National Action Alliance for Suicide Prevention, *2012 National*  
186 *strategy for suicide prevention: goals and objectives for action: a report of the US Surgeon General and*  
187 *of the National Action Alliance for Suicide Prevention*. 2012.
- 188 6. Rosenman, S.J., *Preventing suicide: what will work and what will not*. The Medical Journal of Australia,  
189 1998. **169**(2): p. 100-102.
- 190 7. Torguson, K. and A. O'Brien, *Leading Suicide Prevention Efforts Unite to Address Rising National Suicide*  
191 *Rate*. 2017: Washington, D.C.
- 192 8. Crepeau-Hobson, F., *The Psychological Autopsy and Determination of Child Suicides: A Survey of Medical*  
193 *Examiners*. Archives of Suicide Research, 2010. **14**(1): p. 24-34.
- 194 9. American Psychiatric Association, *Diagnostic and statistical manual of mental disorders (DSM-5®)*. 2013:  
195 American Psychiatric Pub.
- 196 10. Simon, T.R., et al., *Characteristics of impulsive suicide attempts and attempters*. Suicide and Life-  
197 Threatening Behavior, 2002. **32**(s1): p. 49-59.
- 198 11. Stone, D.M., et al., *Preventing suicide: A technical package of policies, programs, and practice*. 2017.
- 199 12. World Health Organization, *Risks to mental health: An overview of vulnerabilities and risk factors*.  
200 Geneva: WHO, 2012.
- 201 13. Caine, E.D., et al., *Comprehensive, integrated approaches to suicide prevention: practical guidance*.  
202 Injury prevention, 2017: p. injuryprev-2017-042366.
- 203 14. Milner, A., J. Svetcic, and D. De Leo, *Suicide in the absence of mental disorder? A review of psychological*  
204 *autopsy studies across countries*. Int J Soc Psychiatry, 2013. **59**(6): p. 545-54.
- 205 15. Pouliot, L. and D. De Leo, *Critical issues in psychological autopsy studies*. Suicide Life Threat Behav, 2006.  
206 **36**(5): p. 491-510.

207 **Attachments:**

208 Stone\_Suicide Vital Signs MMWR 3.27.18 (table 1.fig 1)

209 Stone\_Suicide Vital Signs MMWR 3.27.18 (Tables 2&3)

210 **Word Count:** 1861/1800



1 **Short Title:** Vital Signs: Contributing Circumstances to Suicide and Increasing Trends in State Suicide Rates

2 Deborah M. Stone, ScD;<sup>1</sup> Thomas R. Simon PhD;<sup>1</sup> Katherine A. Fowler, PhD;<sup>1</sup> Scott R. Kegler, PhD;<sup>2</sup> Keming Yuan,  
3 MS;<sup>1</sup> Kristin M. Holland, PhD;<sup>1</sup> Asha Z. Ivey-Stephenson, PhD;<sup>1</sup> Alex E. Crosby, MD<sup>1</sup>

4 **Background:** Suicide rates in the United States have risen nearly 30% since 1999. Mental health problems (MHP)  
5 are just one factor contributing to suicide. Examining state-level trends in suicide and other contributing  
6 circumstances can inform comprehensive state suicide prevention planning.

7 **Methods:** Trends in age-adjusted suicide rates among people aged ≥10 years, by state and sex, across six  
8 consecutive three-year periods (1999-2016), were assessed using data from the National Vital Statistics System  
9 for 50 states and Washington, D.C. Data from the National Violent Death Reporting System, covering 27 states  
10 in 2015, were used to examine contributing circumstances among decedents with and without known MHP.

11 **Results:** From 1999-2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases  
12 of more than 30%. Rates increased significantly among males and females in 34 and 43 states, respectively.

13 Among decedents in 2015 in 27 states, Over half (54.0%) of decedents did not have a known MHP. Among  
14 decedents with circumstance information, several circumstances, including relationship problems/loss (45.1% vs  
15 39.6%), life stressors (54.2% vs 49.7%) and recent/impending crises (32.9% vs 26.0%), were significantly more  
16 likely among those without a known MHP than decedents with MHP, but were common across groups.

17 **Conclusions:** Suicide rates increased significantly across most states from 1999-2016. Various circumstances  
18 contributed to suicides among people with and without known MHP.

19 **Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach  
20 to prevent suicide risk before it occurs, identify and support people at risk, prevent reattempts, and help  
21 friends/family after a suicide occurs.

22 **INTRODUCTION**

23 **BACKGROUND AND PURPOSE**

24 In 2016, nearly 45,000 suicides (15.6/100,000 [age-adjusted]) occurred in the United States (U.S.), among people  
25 ≥10 years old (1). Between 1999 and 2015, suicide rates increased across sexes, racial/ethnic groups, and  
26 urbanization levels (2, 3). Suicide is the 10<sup>th</sup> leading cause of death and is one of just three leading causes that  
27 are *increasing* (1, 4). Additionally, rates of Emergency Department visits for nonfatal self-harm, a key risk factor  
28 for suicide, increased nearly 45% between 2001 and 2015 (1). Together, suicides and self-harm injuries cost the  
29 nation more than \$69 billion in direct medical and work loss costs (1).

30 The *National Strategy for Suicide Prevention*(NSSP) (5) calls for a public health approach to suicide prevention  
31 with efforts spanning across multiple levels (i.e., individual, family/relationship, community, and societal). Such  
32 an approach underscores that suicide is rarely caused by any single factor, but rather, is multi-determined.  
33 Despite the NSSP guidance, suicide prevention efforts largely focus on identifying and treating individuals with  
34 mental health problems (MHP) or providing follow-up care to people who have attempted suicide (6). Other  
35 contributing circumstances include social and economic problems, access to lethal means (e.g., substances,  
36 firearms, bridges) among people at risk, poor coping and problem-solving skills, and prior suicide attempts (5).  
37 Expanded awareness of the additional circumstances that contribute to suicide risk apart from MHP, and action  
38 to address them, can help reach the nation's goal of reducing suicide rates 20% by 2025 (7). To assist states in  
39 achieving this goal, this study analyzes state-specific trends in suicide rates, assesses the multiple contributing  
40 factors, and provides recommendations for multi-level comprehensive suicide prevention.

**Comment [FC]:** I think some sort of clarification is needed to distinguish from previous two sentences since what is reported here are not data on full examined time period or all 50 states. Tracked an idea but there are likely other ways to clarify.

**Comment [aig0]:** Suggest change in wording here for flow: In 2015, more than half (54.0%) of decedents in 27 states did not have..... (just suggestion not required change)

**Comment [RM]:** Is it prevent suicide RISK before it occurs? Or prevent suicide? Haven't seen it phrased that way before.



41 **METHODS**

42 Suicide rates were analyzed for people aged  $\geq 10$  years only, as attributions of suicidal intent in younger children  
 43 are variable (8). Age-specific suicide counts were tabulated based on National Vital Statistics System coded death  
 44 certificate records (*International Classification of Diseases 10<sup>th</sup> Revision*, underlying-cause-of death codes X60-  
 45 X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for  
 46 Health Statistics bridged-race population data releases.

47  
 48 National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods  
 49 spanning 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed  
 50 per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data  
 51 aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends  
 52 are reported in terms of average annual percentage changes (AAPCs).

53  
 54 Characteristics (Table 2) and circumstances (Table 3) of suicide decedents  $\geq 10$  years, with and without known  
 55 MHP, were compared in the 27 states with complete data participating in CDC's National Violent Death  
 56 Reporting System (NVDRS) in 2015. NVDRS defines MHP as disorders and syndromes listed in the Diagnostic and  
 57 Statistical Manual of Mental Disorders, Fifth Edition (9), with the exception of alcohol and other substance  
 58 dependence, which are captured separately in NVDRS. NVDRS aggregates data from three primary data sources:  
 59 death certificates, coroner/medical examiner reports (including toxicology), and law enforcement  
 60 reports. Decedents with and without known MHP were compared using Chi-square tests. Logistic regression  
 61 analyses estimated adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and  
 62 race/ethnicity.

63 **RESULTS**

64 The most recent overall suicide rates (representing 2014-2016) varied four-fold, from 6.9 (D.C.) to 29.2  
 65 (Montana) per 100,000 persons per year (Table 1). Across the study period, rates increased in all states, except  
 66 Nevada (which had a consistently high rate throughout), with absolute increases ranging from +0.8 (Delaware)  
 67 to +8.1 (Wyoming) per 100,000. Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North  
 68 Dakota), with increases of more than 30% observed in 25 states (Table 1, Figure 1).

69  
 70 Modeled suicide rate trends indicated significant increases for 44 states, for males (34 states) and females (43  
 71 states), as well as for the U.S. overall (Table 1). Nationally, the model-estimated AAPC for the overall suicide  
 72 rate was +1.5%. By sex, estimated national rate trends further indicated significant increases for males (AAPC  
 73 +1.1%) and females (AAPC +2.6%).

74  
 75 Suicide decedents without known MHP (N=11,039) were compared to those with MHP (N=9,407) in 27 states.  
 76 While all decedents were predominately male (Table 2; 76.8%) and non-Hispanic white (83.6%), those without  
 77 known MHP, relative to those with MHP, were more likely male (83.6% vs. 68.8%; odds ratio (OR)=2.3, 95% CI =  
 78 2.2-2.5) and racial/ethnic minorities (OR range: 1.2-2.0). Suicide decedents without known MHP also had  
 79 significantly greater odds of perpetrating homicide-suicide (adjusted odds ratio aOR = 2.9, 95% CI = 2.2-3.8).  
 80 Among adult decedents, 20.1% and 15.3% of people without and with MHP, respectively, ever served, or were  
 81 currently serving, in the U.S. military.

82 While use of firearms were was the most common method of suicide overall (48.5%) and for both groups,  
 83 decedents without known MHP were more likely to die by firearm (55.3% vs. 40.6%) and less likely to die by  
 84 hanging/strangulation/suffocation (26.9% vs 31.3%) or poisoning (10.4% vs 19.8%) than those without known  
 85 MHP. These differences remained significant in the adjusted models.

**Comment [aig0]:** This is unclear to me. Do you mean that assigning intent in a younger person is variable or difficult to determine? Not sure variable is the correct word

**Comment [FC]:** Suggest pulling out the references to tables 2 and 3 since table 1 hasn't been mentioned yet and helps saves on word count. If you want to keep them in, suggest adding "table 1" somewhere into the above paragraph.

**Comment [FC]:** Given attention to this particular at-risk population in the results, made me wonder if some mention of needs of this group should be in the discussion. There are other higher risk groups described below. A consideration could be in the discussion about prevention needs of underserved areas (bottom of page 3) some phrasing could be added about the need for services for higher risk groups, such as those who have served in the military and those who have difficulties, such as MPH, intimate partner problems, have physical health problems, and have financial and legal difficulties. Or on page 4 where "identifying and better supporting people at risk" is stated an e.g. could be added.

**Comment [FC]:** It appears non-MHP is being compared to non-MHP. Tracked what I think the edit is but please double check.



86 Decedents without known MHP were less likely to receive toxicology testing. Among those with toxicology  
87 results, decedents without known MHP were less likely to test positive for any substance overall (aOR=0.8, 95%  
88 CI=0.7-0.8) but more likely to test positive for alcohol (aOR=1.2, 95% CI=1.1-1.3).

89 All suicide decedents with MHP (N=9,407) and approximately 85% without known MHP (N=9,357) had available  
90 circumstances information (Table 3). People without known MHP were less likely to have any substance abuse  
91 problems (aOR=0.7, 95% CI=0.7-0.8). While two-thirds of those with known MHP had a history of mental health  
92 or substance abuse treatment (67.2%), just over half (54.0%) were in current treatment.

93 Decedents without known MHP versus those with known MHP had significantly greater likelihood of any  
94 relationship problem/loss (45.1% vs. 39.6%), specifically intimate partner problems (30.2% vs. 24.1%),  
95 arguments/conflicts (17.5% vs. 13.6%), and recently perpetrating interpersonal violence (3.0% vs. 1.4%). They  
96 also were also more likely to have experienced any life stressors (54.2% vs 49.7%), such as criminal-legal  
97 problems (10.7% vs. 6.2%) or eviction/loss of home (4.3% vs. 3.4%), and they were more likely to have had a  
98 crisis within the preceding or upcoming two weeks (32.9% vs. 26.0%). All of these differences remained  
99 significant in the adjusted models. Among those with crises, intimate partner and physical health problems were  
100 the most common types for both groups and did not differ between them.

101 Decedents without known MHP had significantly lower odds of recent release from any institution (aOR=0.5,  
102 95% CI=0.4-0.5), but among those who were recently released (5.1%), they were significantly more likely to be  
103 released from a correctional facility (25.7% vs. 8.7%) or hospital (43.7% vs. 33.0%) than those with a known  
104 MHP. Among decedents with known MHP who were recently released from an institution (10.2%), 46.7% of this  
105 group were released from psychiatric facilities.

106 Decedents without known MHP, compared to those with MHP, were significantly less likely to have a history of  
107 suicidal ideation (23.0% vs. 40.8%) and prior suicide attempts (10.3% vs. 29.4%). More than 1 in five people in  
108 both groups disclosed suicide intent (22.4% vs. 24.5%).

## 109 Conclusions and Comments

110 From 1999-2016, 44 states saw significant suicide rate increases. Rates increased significantly for males, in 34  
111 states, and for females, in 43 states. This finding is consistent with prior research showing a decreasing gender  
112 gap in male-female suicide rates between 1999-2014 (3). Overall, half of the states experienced substantial  
113 increases in suicide rates of more than 30%. Additional research into the specific causes of these trends is  
114 necessary. Fortunately, data from the 27 states participating in NVDRS can shed light on the circumstances that  
115 contributed to recent suicides, and can help guide prevention activities.

116 Researchers and practitioners regularly state that 'suicide is not caused by a single factor,' however, research  
117 and prevention practices often focus on identifying and treating MHP (6). The current study found that more  
118 than half of suicide decedents in NVDRS did not have a known MHP. This group suffered more relationship  
119 problems and life stressors such as criminal-legal matters, eviction/loss of home, and recent or impending crises.  
120 This is particularly noteworthy in light of findings that suggest many suicides and attempts occur with minimal  
121 deliberation (10).

122 Among people with MHP, two-thirds had a history of mental health and/or substance abuse treatment and over  
123 half were in current treatment. This suggests that additional supports for this population are needed to keep  
124 them safe. This includes broader implementation of affordable and effective treatment modalities such as  
125 doctor-patient collaborative care models and cognitive-behavioral therapy. Additionally, greater access to  
126 behavioral health providers in underserved areas is needed, as is expansion of healthcare systems to integrate

**Comment [aig0]:** This statement needs a reference. Not sure if reference 6 covers both parts of the sentence.

**Comment [FC():** True point but it suggests at least to me there is limited prevention opportunity. Given 22% disclosed suicide intent, perhaps there needs to be more stated here. Idea: suicides can occur with minimal deliberation but many individuals disclose suicidal intent or demonstrate other risk factors that help in identifying at-risk individual who need immediate access to supportive services.

**Comment [FC():** Wonder if it might be good to move this point down into the paragraph about comprehensive strategies or its own paragraph since it is applicable to those with known and not known MPH. If moved out of this paragraph specific to MPH, and framed more broadly about what all persons need, then attention to a couple of vulnerable populations per earlier comment could be added to this idea.



127 physical and behavioral health that better support suicide prevention and patient safety, especially through care  
128 transitions (11).

129 Study findings indicate that people with known MHP also experienced other life stressors such as job/financial,  
130 relationship, and/or physical health problems. These findings point to the need to both prevent the conditions  
131 associated with mental health problems in the first place, and to support people with known MHP to decrease  
132 their risk of poor social, health, and economic outcomes (12).

133 Together, these results underscore the importance of comprehensive statewide suicide prevention activities  
134 that address multiple factors associated with suicide. Prevention strategies may include: strengthening  
135 economic supports (e.g., housing stabilization policies, household financial support); teaching coping and  
136 problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in  
137 life; promoting social connectedness to increase a sense of belongingness and access to informational, tangible,  
138 emotional, and social support; and identifying and better supporting people at risk. Other strategies include  
139 creating protective environments (e.g., reducing access to lethal means among people at risk, creating  
140 organizational and workplace policies to promote help-seeking, easing transitions into and out of work for  
141 people with MHP and other life challenges), supporting family and friends after a suicide, and assuring safe  
142 reporting by the media in order to prevent suicide contagion (11). Some states, such as Colorado, are planning  
143 to implement such a comprehensive approach to suicide prevention (13).

144 These findings have at least three limitations. In the state-level analysis, rankings for four states (MD, MA, RI,  
145 UT) might have been impacted by large proportions of injury deaths of undetermined intent (potentially biasing  
146 reported suicide rates downward), or decreased percentages of such deaths over time (potentially biasing  
147 estimated rate trends upward). Second, NVDRS is not yet nationally representative; the 27 states included  
148 represent 49.6% of the population  
149 (<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml>).

150 Third, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the  
151 extent of informant knowledge can impact data completeness and accuracy. Studies including more in-depth  
152 interviews with next-of-kin often see greater attributions to mental disorders (14), however many  
153 methodological variations across studies exist (15). It is likely that some people without known MHP in the  
154 current study were experiencing mental health challenges that were unknown, and hence underreported by key  
155 informants. However, any lack of awareness of decedent MHP suggests the importance of addressing the broad  
156 range of contributing circumstances.

157 Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are  
158 available. States and communities can use data from NVDRS and resources such as CDC's *Preventing Suicide: a*  
159 *Technical Package of Policies, Programs, and Practices* (11) to better understand their suicide problem and  
160 prioritize evidence-based comprehensive suicide prevention.

#### 161 Acknowledgments

162 The authors acknowledge Robert Anderson, Holly Hedegaard, and Margaret Warner from the Division of Vital  
163 Statistics, National Center for Health Statistics, CDC, for their statistical consultation.

165 Conflict of Interest No conflicts of interest were reported.

167 Corresponding author: Deborah M. Stone, [dstone3@cdc.gov](mailto:dstone3@cdc.gov), 770-488-3942

169 Author Affiliations:

**Comment [FC]:** I like the evolution I have seen of the results and discussion to emphasize the difficulties of those without known MHP. I do think it's important as done for the discussion to talk specifically about those with known MPH. But, the two MPH group paragraphs in the discussion seem to tip the balance more toward the MPH group. I suggest weaving into the previous paragraph that those with known MHP had other difficulties rather than this being a standalone paragraph.

Also consider if the prevention implication described here is also applicable to those without MPH. There seemed to be a gap in discussion paragraph #2 where similar precipitating circumstances are noted for the non-MPH group but no prevention strategies are presented. Prevention strategies for these types of risk factor could be described either in the non-MPH paragraph or this paragraph could be framed more broadly about the prevention needs of both non-MPH and MPH groups.



170 <sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis,  
171 Research, and Practice Integration, National Center for Injury Prevention and Control, CDC

172 **References:**

- 173 1. Centers for Disease Control and Prevention. Web-based Injury Statistics Query and Reporting System  
174 (WISQARS). Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018. In.
- 175 2. Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide Trends Among and  
176 Within Urbanization Levels by Sex, Race/Ethnicity, Age Group, and Mechanism of Death - United States,  
177 2001-2015. *MMWR Surveill Summ* 2017;66(18):1-16.
- 178 3. Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999-2014. In: US Department  
179 of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health  
180 Statistics Hyattsville, MD; 2016.
- 181 4. Kochanek K, Murphy S, Xu J, Arias E. Mortality in the United States, 2016. NCHS Data Brief, no 293. National  
182 Center for Health Statistics 2017.
- 183 5. Office of the Surgeon General, National Action Alliance for Suicide Prevention. 2012 National strategy for  
184 suicide prevention: goals and objectives for action: a report of the US Surgeon General and of the National  
185 Action Alliance for Suicide Prevention. 2012.
- 186 6. Zalsman G, Hawton K, Wasserman D, van Heeringen K, Arensman E, Sarchiapone M, et al. Suicide prevention  
187 strategies revisited: 10-year systematic review. *The Lancet Psychiatry* 2016;3(7):646-659.
- 188 7. Torguson K, O'Brien A. Leading Suicide Prevention Efforts Unite to Address Rising National Suicide Rate. In.  
189 Washington, D.C.; 2017.
- 190 8. Crepeau-Hobson F. The Psychological Autopsy and Determination of Child Suicides: A Survey of Medical  
191 Examiners. *Archives of Suicide Research* 2010;14(1):24-34.
- 192 9. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5®): American  
193 Psychiatric Pub; 2013.
- 194 10. Simon TR, Swann AC, Powell KE, Potter LB, Kresnow Mj, O'Carroll PW. Characteristics of impulsive suicide  
195 attempts and attempters. *Suicide and Life-Threatening Behavior* 2002;32(s1):49-59.
- 196 11. Stone DM, Holland KM, Bartholow BN, Crosby AE, Davis SP, Wilkins N. Preventing suicide: A technical  
197 package of policies, programs, and practice. 2017.
- 198 12. World Health Organization. Risks to mental health: An overview of vulnerabilities and risk factors. Geneva:  
199 WHO 2012.
- 200 13. Caine ED, Reed J, Hindman J, Quinlan K. Comprehensive, integrated approaches to suicide prevention:  
201 practical guidance. *Injury prevention* 2017;injuryprev-2017-042366.
- 202 14. Milner A, Sveticic J, De Leo D. Suicide in the absence of mental disorder? A review of psychological autopsy  
203 studies across countries. *Int J Soc Psychiatry* 2013;59(6):545-54.
- 204 15. Pouliot L, De Leo D. Critical issues in psychological autopsy studies. *Suicide Life Threat Behav*  
205 2006;36(5):491-510.

206 **Attachments:**

207 Stone\_Suicide Vital Signs MMWR 3.27.18 (table 1.fig 1)

208 Stone\_Suicide Vital Signs MMWR 3.27.18 (Tables 2&3)

209 **Word Count:** 1858/1800

**Short Title:** Vital Signs: Contributing Circumstances to Suicide and Increasing Trends in State Suicide Rates

Deborah M. Stone, ScD;<sup>1</sup> Thomas R. Simon PhD;<sup>1</sup> Katherine A. Fowler, PhD;<sup>1</sup> Scott R. Kegler, PhD;<sup>2</sup> Keming Yuan, MS;<sup>1</sup> Kristin M. Holland, PhD;<sup>1</sup> Asha Z. Ivey-Stephenson, PhD;<sup>1</sup> Alex E. Crosby, MD<sup>1</sup>

**Background:** Suicide rates in the United States have risen nearly 30% since 1999. Mental health problems (MHP) are just one factor contributing to suicide. Examining state-level trends in suicide and other contributing circumstances can inform comprehensive state suicide prevention planning.

**Methods:** Trends in age-adjusted suicide rates among people aged  $\geq 10$  years, by state and sex, across six consecutive three-year periods (1999-2016), were assessed using data from the National Vital Statistics System for 50 states and Washington, D.C. Data from the National Violent Death Reporting System, covering 27 states in 2015, were used to examine contributing circumstances among decedents with and without known MHP.

**Results:** From 1999-2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases of more than 30%. Rates increased significantly among males and females in 34 and 43 states, respectively. Over half (54.0%) of decedents did *not* have a known MHP. Among decedents with circumstance information, several circumstances, including relationship problems/loss (45.1% vs 39.6%), life stressors (54.2% vs 49.7%) and recent/impending crises (32.9% vs 26.0%), were significantly more likely among those without a known MHP than decedents with MHP, but were common across groups.

**Conclusions:** Suicide rates increased significantly across most states from 1999-2016. Various circumstances contributed to suicides among people with and without known MHP.

**Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach to prevent suicide risk before it occurs, identify and support people at risk, prevent reattempts, and help friends/family after a suicide occurs.

## INTRODUCTION

### BACKGROUND AND PURPOSE

In 2016, nearly 45,000 suicides (15.6/100,000 [age-adjusted]) occurred in the United States (U.S.), among people  $\geq 10$  years old (1). Between 1999 and 2015, suicide rates increased across sexes, racial/ethnic groups, and urbanization levels (2, 3). Suicide is the 10<sup>th</sup> leading cause of death and is one of just three leading causes that are *increasing* (1, 4). Additionally, rates of Emergency Department visits for nonfatal self-harm, a key risk factor for suicide, increased nearly 45% between 2001 and 2015 (1). Together, suicides and self-harm injuries cost the nation more than \$69 billion in direct medical and work loss costs (1).

The *National Strategy for Suicide Prevention* (NSSP) (5) calls for a public health approach to suicide prevention with efforts spanning across multiple levels (i.e., individual, family/relationship, community, and societal). Such an approach underscores that suicide is rarely caused by any single factor, but rather, is multi-determined. Despite the NSSP guidance, suicide prevention efforts largely focus on identifying and treating individuals with mental health problems (MHP) or providing follow-up care to people who have attempted suicide (6). Other contributing circumstances include social and economic problems, access to lethal means (e.g., substances, firearms, bridges) among people at risk, poor coping and problem-solving skills, and prior suicide attempts (5). Expanded awareness of the additional circumstances that contribute to suicide risk apart from MHP, and action to address them, can help reach the nation's goal of reducing suicide rates 20% by 2025 (7). To assist states in achieving this goal, this study analyzes state-specific trends in suicide rates, assesses the multiple contributing factors, and provides recommendations for multi-level comprehensive suicide prevention.



## 41 METHODS

42 Suicide rates were analyzed for people aged  $\geq 10$  years only, as attributions of suicidal intent in younger children  
 43 are variable (8). Age-specific suicide counts were tabulated based on National Vital Statistics System coded death  
 44 certificate records (*International Classification of Diseases 10<sup>th</sup> Revision*, underlying-cause-of death codes X60-  
 45 X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for  
 46 Health Statistics bridged-race population data releases.

48 National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods  
 49 spanning 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed  
 50 per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data  
 51 aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends  
 52 are reported in terms of average annual percentage changes (AAPCs).

54 Characteristics (Table 2) and circumstances (Table 3) of suicide decedents  $\geq 10$  years, with and without known  
 55 MHP, were compared in the 27 states with complete data participating in CDC's National Violent Death  
 56 Reporting System (NVDRS) in 2015. NVDRS defines MHP as disorders and syndromes listed in the Diagnostic and  
 57 Statistical Manual of Mental Disorders, Fifth Edition (9), with the exception of alcohol and other substance  
 58 dependence, which are captured separately in NVDRS. NVDRS aggregates data from three primary data sources:  
 59 death certificates, coroner/medical examiner reports (including toxicology), and law enforcement  
 60 reports. Decedents with and without known MHP were compared using Chi-square tests. Logistic regression  
 61 analyses estimated adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and  
 62 race/ethnicity.

## 63 RESULTS

64 The most recent overall suicide rates (representing 2014-2016) varied four-fold, from 6.9 (D.C.) to 29.2  
 65 (Montana) per 100,000 persons per year (Table 1). Across the study period, rates increased in all states, except  
 66 Nevada (which had a consistently high rate throughout), with absolute increases ranging from +0.8 (Delaware)  
 67 to +8.1 (Wyoming) per 100,000. Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North  
 68 Dakota), with increases of more than 30% observed in 25 states (Table 1, Figure 1).

70 Modeled suicide rate trends indicated significant increases for 44 states, for males (34 states) and females (43  
 71 states), as well as for the U.S. overall (Table 1). Nationally, the model-estimated AAPC for the overall suicide  
 72 rate was +1.5%. By sex, estimated national rate trends further indicated significant increases for males (AAPC  
 73 +1.1%) and females (AAPC +2.6%).

75 Suicide decedents without known MHP (N=11,039) were compared to those with MHP (N=9,407) in 27 states.  
 76 While all decedents were predominately male (Table 2; 76.8%) and non-Hispanic white (83.6%), those without  
 77 known MHP, relative to those with MHP, were more likely male (83.6% vs. 68.8%; odds ratio (OR)=2.3, 95% CI =  
 78 2.2-2.5) and racial/ethnic minorities (OR range: 1.2-2.0). Suicide decedents without known MHP also had  
 79 significantly greater odds of perpetrating homicide-suicide (adjusted odds ratio aOR = 2.9, 95% CI = 2.2-3.8).  
 80 Among adult decedents, 20.1% and 15.3% of people without and with MHP, respectively, ever served, or were  
 81 currently serving, in the U.S. military.

82 While firearms were the most common method of suicide overall (48.5%) and for both groups, decedents  
 83 without known MHP were more likely to die by firearm (55.3% vs. 40.6%) and less likely to die by  
 84 hanging/strangulation/suffocation (26.9% vs 31.3%) or poisoning (10.4% vs 19.8%) than those without known  
 85 MHP. These differences remained significant in the adjusted models.

Decedents without known MHP were less likely to receive toxicology testing. Among those with toxicology results, decedents without known MHP were less likely to test positive for any substance overall (aOR=0.8, 95% CI=0.7-0.8) but more likely to test positive for alcohol (aOR=1.2, 95% CI=1.1-1.3).

All suicide decedents with MHP (N=9,407) and approximately 85% without known MHP (N=9,357) had available circumstances information (Table 3). People without known MHP were less likely to have any substance abuse problems (aOR=0.7, 95% CI=0.7-0.8). While two-thirds of those with known MHP had a history of mental health or substance abuse treatment (67.2%), just over half (54.0%) were in current treatment.

Decedents without known MHP versus those with known MHP had significantly greater likelihood of any relationship problem/loss (45.1% vs. 39.6%), specifically intimate partner problems (30.2% vs. 24.1%), arguments/conflicts (17.5% vs. 13.6%), and recently perpetrating interpersonal violence (3.0% vs. 1.4%). They were also more likely to have experienced any life stressors (54.2% vs 49.7%), such as criminal-legal problems (10.7% vs. 6.2%) or eviction/loss of home (4.3% vs. 3.4%), and they were more likely to have had a crisis within the preceding or upcoming two weeks (32.9% vs. 26.0%). All of these differences remained significant in the adjusted models. Among those with crises, intimate partner and physical health problems were the most common types for both groups and did not differ between them.

Decedents without known MHP had significantly lower odds of recent release from any institution (aOR=0.5, 95% CI=0.4-0.5), but among those who were recently released (5.1%), they were significantly more likely to be released from a correctional facility (25.7% vs. 8.7%) or hospital (43.7% vs. 33.0%) than those with a known MHP. Among decedents with known MHP who were recently released from an institution (10.2%), 46.7% of this group were released from psychiatric facilities.

Decedents without known MHP, compared to those with MHP, were significantly less likely to have a history of suicidal ideation (23.0% vs. 40.8%) and prior suicide attempts (10.3% vs. 29.4%). More than 1 in five people in both groups disclosed suicide intent (22.4% vs. 24.5%).

## Conclusions and Comments

From 1999-2016, 44 states saw significant suicide rate increases. Rates increased significantly for males, in 34 states, and for females, in 43 states. This finding is consistent with prior research showing a decreasing gender gap in male-female suicide rates between 1999-2014 (3). Overall, half of the states experienced substantial increases in suicide rates of more than 30%. Additional research into the specific causes of these trends is necessary. Fortunately, data from the 27 states participating in NVDRS can shed light on the circumstances that contributed to recent suicides, and can help guide prevention activities.

Researchers and practitioners regularly state that ‘suicide is not caused by a single factor;’ however, research and prevention practices often focus on identifying and treating MHP (6). The current study found that more than half of suicide decedents in NVDRS did *not* have a known MHP. This group suffered more relationship problems and life stressors such as criminal-legal matters, eviction/loss of home, and recent or impending crises. This is particularly noteworthy in light of findings that suggest many suicides and attempts occur with minimal deliberation (10).

Among people with MHP, two-thirds had a history of mental health and/or substance abuse treatment and over half were in current treatment. This suggests that additional supports for this population are needed to keep them safe. This includes broader implementation of affordable and effective treatment modalities such as doctor-patient collaborative care models and cognitive-behavioral therapy. Additionally, greater access to behavioral health providers in underserved areas is needed, as is expansion of healthcare systems to integrate



127 physical and behavioral health that better support suicide prevention and patient safety, especially through care  
128 transitions (11).

129 Study findings indicate that people with known MHP also experienced other life stressors such as job/financial,  
130 relationship, and/or physical health problems. These findings point to the need to both prevent the conditions  
131 associated with mental health problems in the first place, and to support people with known MHP to decrease  
132 their risk of poor social, health, and economic outcomes (12).

133 Together, these results underscore the importance of comprehensive statewide suicide prevention activities  
134 that address multiple factors associated with suicide. Prevention strategies may include: strengthening  
135 economic supports (e.g., housing stabilization policies, household financial support); teaching coping and  
136 problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in  
137 life; promoting social connectedness to increase a sense of belongingness and access to informational, tangible,  
138 emotional, and social support; and identifying and better supporting people at risk. Other strategies include  
139 creating protective environments (e.g., reducing access to lethal means among people at risk, creating  
140 organizational and workplace policies to promote help-seeking, easing transitions into and out of work for  
141 people with MHP and other life challenges), supporting family and friends after a suicide, and assuring safe  
142 reporting by the media in order to prevent suicide contagion (11). Some states, such as Colorado, are planning  
143 to implement such a comprehensive approach to suicide prevention (13).

144 These findings have at least three limitations. In the state-level analysis, rankings for four states (MD, MA, RI,  
145 UT) might have been impacted by large proportions of injury deaths of undetermined intent (potentially biasing  
146 reported suicide rates downward), or decreased percentages of such deaths over time (potentially biasing  
147 estimated rate trends upward). Second, NVDRS is not yet nationally representative; the 27 states included  
148 represent 49.6% of the population  
149 (<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml>).

150 Third, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the  
151 extent of informant knowledge can impact data completeness and accuracy. Studies including more in-depth  
152 interviews with next-of-kin often see greater attributions to mental disorders (14), however many  
153 methodological variations across studies exist (15). It is likely that some people without known MHP in the  
154 current study were experiencing mental health challenges that were unknown, and hence underreported by key  
155 informants. However, any lack of awareness of decedent MHP suggests the importance of addressing the broad  
156 range of contributing circumstances.

157 Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are  
158 available. States and communities can use data from NVDRS and resources such as CDC's *Preventing Suicide: a*  
159 *Technical Package of Policies, Programs, and Practices* (11) to better understand their suicide problem and  
160 prioritize evidence-based comprehensive suicide prevention.

#### 161 **Acknowledgments**

162 The authors acknowledge Robert Anderson, Holly Hedegaard, and Margaret Warner from the Division of Vital  
163 Statistics, National Center for Health Statistics, CDC, for their statistical consultation.

164  
165 **Conflict of Interest** No conflicts of interest were reported.

166  
167 **Corresponding author:** Deborah M. Stone, [dstone3@cdc.gov](mailto:dstone3@cdc.gov), 770-488-3942

168  
169 **Author Affiliations:**

170 <sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis,  
171 Research, and Practice Integration, National Center for Injury Prevention and Control, CDC

172 **References:**

- 173 1. Centers for Disease Control and Prevention. Web-based Injury Statistics Query and Reporting System  
174 (WISQARS). Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018. In.
- 175 2. Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide Trends Among and  
176 Within Urbanization Levels by Sex, Race/Ethnicity, Age Group, and Mechanism of Death - United States,  
177 2001-2015. *MMWR Surveill Summ* 2017;66(18):1-16.
- 178 3. Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999-2014. In: US Department  
179 of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health  
180 Statistics Hyattsville, MD; 2016.
- 181 4. Kochanek K, Murphy S, Xu J, Arias E. Mortality in the United States, 2016. NCHS Data Brief, no 293. National  
182 Center for Health Statistics 2017.
- 183 5. Office of the Surgeon General, National Action Alliance for Suicide Prevention. 2012 National strategy for  
184 suicide prevention: goals and objectives for action: a report of the US Surgeon General and of the National  
185 Action Alliance for Suicide Prevention. 2012.
- 186 6. Zalsman G, Hawton K, Wasserman D, van Heeringen K, Arensman E, Sarchiapone M, et al. Suicide prevention  
187 strategies revisited: 10-year systematic review. *The Lancet Psychiatry* 2016;3(7):646-659.
- 188 7. Torguson K, O'Brien A. Leading Suicide Prevention Efforts Unite to Address Rising National Suicide Rate. In.  
189 Washington, D.C.; 2017.
- 190 8. Crepeau-Hobson F. The Psychological Autopsy and Determination of Child Suicides: A Survey of Medical  
191 Examiners. *Archives of Suicide Research* 2010;14(1):24-34.
- 192 9. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5®): American  
193 Psychiatric Pub; 2013.
- 194 10. Simon TR, Swann AC, Powell KE, Potter LB, Kresnow Mj, O'Carroll PW. Characteristics of impulsive suicide  
195 attempts and attempters. *Suicide and Life-Threatening Behavior* 2002;32(s1):49-59.
- 196 11. Stone DM, Holland KM, Bartholow BN, Crosby AE, Davis SP, Wilkins N. Preventing suicide: A technical  
197 package of policies, programs, and practice. 2017.
- 198 12. World Health Organization. Risks to mental health: An overview of vulnerabilities and risk factors. Geneva:  
199 WHO 2012.
- 200 13. Caine ED, Reed J, Hindman J, Quinlan K. Comprehensive, integrated approaches to suicide prevention:  
201 practical guidance. *Injury prevention* 2017;injuryprev-2017-042366.
- 202 14. Milner A, Sveticic J, De Leo D. Suicide in the absence of mental disorder? A review of psychological autopsy  
203 studies across countries. *Int J Soc Psychiatry* 2013;59(6):545-54.
- 204 15. Pouliot L, De Leo D. Critical issues in psychological autopsy studies. *Suicide Life Threat Behav*  
205 2006;36(5):491-510.

206 **Attachments:**

207 Stone\_Suicide Vital Signs MMWR 3.27.18 (table 1.fig 1)

208 Stone\_Suicide Vital Signs MMWR 3.27.18 (Tables 2&3)

209 **Word Count:** 1858/1800



**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, National Vital Statistics System, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
U.S.	Both	12.3 (n/a)	12.7 (+ 0.4)	12.9 (+ 0.2)	13.8 (+ 0.9)	14.5 (+ 0.8)	15.4 (+ 0.9)	+ 1.5 % (p<.01)	n/a	+ 3.1 (n/a)	+ 25.4 % (n/a)
	Male	20.9 (n/a)	21.2 (+ 0.4)	21.3 (+ 0.0)	22.5 (+1.3)	23.5 (+ 1.0)	24.5 (+ 1.0)	+ 1.1 % (p<.01)			
	Female	4.7 (n/a)	5.0 (+ 0.3)	5.3 (+ 0.2)	5.7 (+ 0.4)	6.2 (+ 0.5)	6.9 (+ 0.7)	+ 2.6 % (p<.01)			
AL	Both	14.3 (n/a)	13.4 (- 0.9)	14.1 (+ 0.6)	15.6 (+ 1.6)	16.4 (+ 0.7)	17.5 (+ 1.1)	+ 1.6 % (p<.05)	25	+ 3.1 (31)	+ 21.9 % (33)
	Male	25.1 (n/a)	23.4 (- 1.7)	24.4 (+ 1.0)	26.4 (+ 2.0)	27.6 (+ 1.1)	29.1 (+ 1.5)	+ 1.3 % (p<.05)			
	Female	5.1 (n/a)	4.8 (- 0.3)	5.0 (+ 0.2)	6.1 (+ 1.1)	6.4 (+ 0.3)	7.0 (+ 0.7)	+ 2.6 % (p<.01)			
AK	Both	21.0 (n/a)	24.8 (+ 3.8)	24.2 (- 0.6)	26.0 (+ 1.7)	25.4 (- 0.5)	28.8 (+ 3.4)	+ 1.7 % (p<.05)	2	+ 7.8 ( 4)	+ 37.4 % (13)
	Male	33.2 (n/a)	38.1 (+ 4.9)	38.9 (+ 0.8)	40.1 (+ 1.2)	40.1 (- 0.1)	42.9 (+ 2.8)	+ 1.4 % (p<.01)			
	Female	8.6 (n/a)	11.4 (+ 2.9)	9.8 (- 1.6)	11.1 (+ 1.2)	9.9 (- 1.2)	13.2 (+ 3.4)	+ 1.7 % n/s			
AZ	Both	17.8 (n/a)	18.5 (+ 0.7)	19.1 (+ 0.5)	19.1 (- 0.0)	20.4 (+ 1.3)	20.9 (+ 0.5)	+ 1.0 % (p<.01)	15	+ 3.1 (32)	+ 17.3 % (42)
	Male	29.3 (n/a)	30.2 (+ 1.0)	30.6 (+ 0.4)	30.2 (- 0.5)	32.0 (+ 1.9)	32.4 (+ 0.4)	+ 0.6 % (p<.05)			
	Female	7.1 (n/a)	7.5 (+ 0.4)	8.2 (+ 0.7)	8.6 (+ 0.5)	9.2 (+ 0.6)	9.9 (+ 0.6)	+ 2.2 % (p<.01)			
AR	Both	15.5 (n/a)	15.8 (+ 0.3)	16.2 (+ 0.5)	17.6 (+ 1.4)	19.2 (+ 1.6)	21.2 (+ 2.0)	+ 2.2 % (p<.01)	12	+ 5.7 (14)	+ 36.8 % (15)
	Male	26.7 (n/a)	26.7 (+ 0.0)	27.2 (+ 0.5)	28.2 (+ 1.0)	31.7 (+ 3.5)	33.5 (+ 1.9)	+ 1.6 % (p<.05)			
	Female	5.6 (n/a)	5.9 (+ 0.3)	6.2 (+ 0.4)	7.9 (+ 1.7)	7.5 (- 0.4)	9.6 (+ 2.1)	+ 3.6 % (p<.01)			
CA	Both	10.6 (n/a)	11.3 (+ 0.7)	11.0 (- 0.3)	12.0 (+ 1.0)	11.8 (- 0.1)	12.1 (+ 0.3)	+ 0.9 % (p<.05)	45	+ 1.6 (46)	+ 14.8 % (46)
	Male	17.9 (n/a)	18.4 (+ 0.5)	17.7 (- 0.7)	19.1 (+ 1.4)	18.9 (- 0.2)	19.2 (+ 0.3)	+ 0.5 % n/s			
	Female	4.1 (n/a)	5.0 (+ 0.9)	4.9 (- 0.1)	5.4 (+ 0.5)	5.3 (- 0.1)	5.6 (+ 0.3)	+ 1.7 % (p<.05)			
CO	Both	17.3 (n/a)	19.2 (+ 1.9)	19.0 (- 0.2)	20.0 (+ 1.0)	21.6 (+ 1.5)	23.2 (+ 1.6)	+ 1.8 % (p<.01)	8	+ 5.9 (12)	+ 34.1 % (22)
	Male	28.6 (n/a)	30.9 (+ 2.3)	30.5 (- 0.4)	31.5 (+ 1.0)	33.4 (+ 1.9)	36.3 (+ 2.9)	+ 1.4 % (p<.01)			
	Female	7.0 (n/a)	8.2 (+ 1.3)	8.2 (+ 0.0)	9.1 (+ 0.9)	10.1 (+ 1.0)	10.4 (+ 0.3)	+ 2.6 % (p<.01)			
CT	Both	9.6 (n/a)	8.9 (- 0.7)	9.1 (+ 0.2)	10.2 (+ 1.1)	11.0 (+ 0.8)	11.5 (+ 0.5)	+ 1.6 % (p<.05)	46	+ 1.9 (43)	+ 19.2 % (34)
	Male	16.4 (n/a)	14.6 (- 1.8)	15.0 (+ 0.4)	16.6 (+ 1.6)	17.6 (+ 1.0)	17.3 (- 0.3)	+ 0.9 % n/s			
	Female	3.6 (n/a)	3.8 (+ 0.2)	3.7 (- 0.2)	4.4 (+ 0.7)	4.9 (+ 0.5)	6.2 (+ 1.3)	+ 3.5 % (p<.05)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.

**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, National Vital Statistics System, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
DE	Both	13.6 (n/a)	12.2 (- 1.4)	11.9 (- 0.3)	13.6 (+ 1.7)	14.2 (+ 0.6)	14.4 (+ 0.2)	+ 0.9 % n/s	42	+ 0.8 (50)	+ 5.9 % (50)
	Male	23.0 (n/a)	20.3 (- 2.7)	19.9 (- 0.4)	23.1 (+ 3.2)	22.7 (- 0.4)	23.5 (+ 0.8)	+ 0.6 % n/s			
	Female	5.3 (n/a)	5.0 (- 0.2)	4.6 (- 0.4)	4.9 (+ 0.3)	6.4 (+ 1.5)	6.2 (- 0.2)	+ 1.6 % n/s			
DC	Both	5.9 (n/a)	6.4 (+ 0.5)	6.4 (- 0.0)	7.3 (+ 0.8)	6.6 (- 0.7)	6.9 (+ 0.3)	+ 0.9 % n/s	51	+ 1.0 (48)	+ 16.1 % (45)
	Male	10.7 (n/a)	11.1 (+ 0.4)	10.3 (- 0.8)	12.7 (+ 2.4)	10.0 (- 2.6)	11.7 (+ 1.7)	+ 0.3 % n/s			
	Female	1.7 (n/a) ††	2.3 (+ 0.6) ††	3.3 (+ 1.0)	2.6 (- 0.7)	3.6 (+ 1.0)	2.8 (- 0.8)	+ 3.5 % n/s			
FL	Both	14.8 (n/a)	15.2 (+ 0.4)	14.9 (- 0.3)	16.3 (+ 1.4)	16.3 (- 0.0)	16.4 (+ 0.1)	+ 0.8 % (p<.05)	29	+ 1.6 (45)	+ 10.6 % (48)
	Male	24.3 (n/a)	24.4 (+ 0.1)	23.6 (- 0.8)	26.2 (+ 2.6)	25.6 (- 0.6)	25.6 (- 0.1)	+ 0.5 % n/s			
	Female	6.3 (n/a)	6.8 (+ 0.5)	6.8 (+ 0.0)	7.1 (+ 0.3)	7.6 (+ 0.5)	7.8 (+ 0.3)	+ 1.4 % (p<.01)			
GA	Both	12.9 (n/a)	13.2 (+ 0.3)	12.3 (- 0.9)	13.2 (+ 0.9)	13.7 (+ 0.5)	15.0 (+ 1.3)	+ 0.9 % n/s	39	+ 2.1 (40)	+ 16.2 % (44)
	Male	22.1 (n/a)	23.1 (+ 1.0)	21.3 (- 1.8)	21.9 (+ 0.6)	22.6 (+ 0.7)	24.4 (+ 1.7)	+ 0.5 % n/s			
	Female	5.0 (n/a)	4.8 (- 0.2)	4.6 (- 0.2)	5.5 (+ 0.9)	5.8 (+ 0.3)	6.6 (+ 0.8)	+ 2.1 % (p<.05)			
HI	Both	12.9 (n/a)	11.1 (- 1.8)	10.3 (- 0.7)	14.5 (+ 4.1)	14.4 (- 0.1)	15.2 (+ 0.8)	+ 2.0 % n/s	35	+ 2.4 (35)	+ 18.3 % (38)
	Male	20.4 (n/a)	17.2 (- 3.1)	15.3 (- 1.9)	21.9 (+ 6.7)	22.5 (+ 0.5)	24.3 (+ 1.8)	+ 2.1 % n/s			
	Female	5.4 (n/a)	5.0 (- 0.4)	5.5 (+ 0.5)	7.1 (+ 1.5)	6.2 (- 0.9)	5.9 (- 0.3)	+ 1.2 % n/s			
ID	Both	17.3 (n/a)	19.2 (+ 2.0)	18.3 (- 0.9)	21.6 (+ 3.3)	21.9 (+ 0.3)	24.7 (+ 2.8)	+ 2.3 % (p<.01)	6	+ 7.5 ( 6)	+ 43.2 % ( 7)
	Male	28.4 (n/a)	33.1 (+ 4.7)	31.1 (- 2.0)	34.9 (+ 3.8)	34.7 (- 0.2)	38.0 (+ 3.3)	+ 1.6 % (p<.05)			
	Female	7.2 (n/a)	6.1 (- 1.1)	6.1 (+ 0.0)	9.0 (+ 2.9)	9.5 (+ 0.5)	11.8 (+ 2.3)	+ 4.4 % (p<.05)			
IL	Both	9.9 (n/a)	9.8 (- 0.1)	9.7 (- 0.1)	10.6 (+ 0.8)	11.2 (+ 0.6)	12.2 (+ 1.0)	+ 1.5 % (p<.05)	44	+ 2.3 (38)	+ 22.8 % (32)
	Male	17.1 (n/a)	16.7 (- 0.4)	16.2 (- 0.4)	17.6 (+ 1.4)	18.5 (+ 0.9)	19.8 (+ 1.3)	+ 1.1 % (p<.05)			
	Female	3.7 (n/a)	3.6 (- 0.0)	3.8 (+ 0.2)	4.2 (+ 0.4)	4.5 (+ 0.4)	5.2 (+ 0.6)	+ 2.4 % (p<.01)			
IN	Both	13.0 (n/a)	13.7 (+ 0.7)	14.4 (+ 0.7)	14.9 (+ 0.5)	16.4 (+ 1.4)	17.1 (+ 0.7)	+ 1.9 % (p<.01)	26	+ 4.1 (23)	+ 31.9 % (25)
	Male	22.4 (n/a)	23.2 (+ 0.8)	24.4 (+ 1.2)	24.7 (+ 0.4)	26.7 (+ 2.0)	28.3 (+ 1.6)	+ 1.5 % (p<.01)			
	Female	4.6 (n/a)	5.0 (+ 0.4)	5.3 (+ 0.2)	5.9 (+ 0.6)	6.8 (+ 0.9)	6.6 (- 0.2)	+ 2.7 % (p<.01)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.



**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, National Vital Statistics System, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
IA	Both	11.8 (n/a)	13.2 (+ 1.4)	12.8 (- 0.4)	14.2 (+ 1.4)	15.9 (+ 1.7)	16.0 (+ 0.1)	+ 2.1 % (p<.01)	31	+ 4.3 (20)	+ 36.2 % (18)
	Male	20.6 (n/a)	22.1 (+ 1.5)	20.8 (- 1.4)	23.3 (+ 2.5)	26.0 (+ 2.7)	25.7 (- 0.3)	+ 1.6 % (p<.05)			
	Female	3.7 (n/a)	4.7 (+ 1.0)	5.3 (+ 0.6)	5.5 (+ 0.2)	6.1 (+ 0.6)	6.7 (+ 0.6)	+ 3.8 % (p<.01)			
KS	Both	13.3 (n/a)	15.1 (+ 1.8)	15.8 (+ 0.7)	15.3 (- 0.5)	17.7 (+ 2.4)	19.4 (+ 1.6)	+ 2.2 % (p<.01)	19	+ 6.0 (11)	+ 45.0 % ( 5)
	Male	22.7 (n/a)	25.0 (+ 2.3)	26.5 (+ 1.5)	25.6 (- 0.9)	29.1 (+ 3.5)	30.7 (+ 1.6)	+ 1.9 % (p<.01)			
	Female	4.6 (n/a)	6.0 (+ 1.4)	5.7 (- 0.3)	5.4 (- 0.3)	6.8 (+ 1.4)	8.4 (+ 1.6)	+ 3.2 % (p<.05)			
KY	Both	14.1 (n/a)	15.4 (+ 1.3)	16.7 (+ 1.3)	16.2 (- 0.5)	18.2 (+ 2.0)	19.3 (+ 1.1)	+ 1.9 % (p<.01)	20	+ 5.2 (16)	+ 36.6 % (16)
	Male	25.0 (n/a)	26.8 (+ 1.9)	28.3 (+ 1.4)	27.2 (- 1.0)	30.1 (+ 2.9)	31.7 (+ 1.6)	+ 1.4 % (p<.01)			
	Female	4.8 (n/a)	5.2 (+ 0.4)	6.1 (+ 0.8)	6.1 (+ 0.1)	7.1 (+ 0.9)	7.7 (+ 0.6)	+ 3.2 % (p<.01)			
LA	Both	13.1 (n/a)	12.9 (- 0.2)	13.4 (+ 0.4)	13.6 (+ 0.3)	14.4 (+ 0.8)	17.0 (+ 2.5)	+ 1.6 % (p<.05)	27	+ 3.8 (27)	+ 29.3 % (26)
	Male	22.9 (n/a)	22.3 (- 0.6)	22.4 (+ 0.1)	23.3 (+ 0.8)	23.7 (+ 0.5)	27.3 (+ 3.6)	+ 1.1 % n/s			
	Female	4.8 (n/a)	4.7 (- 0.1)	5.2 (+ 0.5)	4.9 (- 0.2)	6.1 (+ 1.2)	7.5 (+ 1.4)	+ 2.8 % (p<.05)			
ME	Both	14.5 (n/a)	13.6 (- 0.9)	14.4 (+ 0.8)	15.4 (+ 1.0)	18.9 (+ 3.5)	18.5 (- 0.4)	+ 2.2 % (p<.05)	21	+ 4.0 (25)	+ 27.4 % (29)
	Male	25.0 (n/a)	22.9 (- 2.1)	24.6 (+ 1.7)	25.7 (+ 1.1)	31.1 (+ 5.4)	29.8 (- 1.3)	+ 1.8 % (p<.05)			
	Female	5.3 (n/a)	5.3 (- 0.0)	5.2 (- 0.1)	6.0 (+ 0.7)	7.6 (+ 1.6)	7.9 (+ 0.3)	+ 3.1 % (p<.05)			
MD	Both	10.0 (n/a)	10.3 (+ 0.3)	10.1 (- 0.2)	10.2 (+ 0.1)	10.7 (+ 0.5)	10.8 (+ 0.1)	+ 0.5 % (p<.05)	47 §§	+ 0.8 (49 §§)	+ 8.5 % (49 §§)
	Male	17.6 (n/a)	17.8 (+ 0.1)	17.3 (- 0.5)	17.7 (+ 0.4)	18.2 (+ 0.5)	18.0 (- 0.2)	+ 0.2 % n/s			
	Female	3.5 (n/a)	3.8 (+ 0.4)	3.9 (+ 0.0)	3.7 (- 0.2)	4.1 (+ 0.4)	4.5 (+ 0.4)	+ 1.3 % (p<.05)			
MA	Both	7.4 (n/a)	7.6 (+ 0.2)	8.4 (+ 0.8)	9.3 (+ 1.0)	9.8 (+ 0.4)	10.0 (+ 0.3)	+ 2.3 % (p<.01)	48	+ 2.6 (34 ¶¶)	+ 35.3 % (20 ¶¶)
	Male	12.1 (n/a)	12.8 (+ 0.7)	13.3 (+ 0.5)	15.4 (+ 2.1)	15.2 (- 0.2)	16.0 (+ 0.8)	+ 2.0 % (p<.01)			
	Female	3.3 (n/a)	2.9 (- 0.4)	4.0 (+ 1.0)	3.8 (- 0.1)	4.8 (+ 1.0)	4.6 (- 0.2)	+ 3.0 % (p<.05)			
MI	Both	11.8 (n/a)	12.5 (+ 0.7)	12.9 (+ 0.4)	13.9 (+ 1.0)	14.5 (+ 0.7)	15.6 (+ 1.1)	+ 1.9 % (p<.01)	33	+ 3.9 (26)	+ 32.9 % (24)
	Male	20.0 (n/a)	20.9 (+ 0.9)	21.6 (+ 0.7)	22.8 (+ 1.3)	23.9 (+ 1.0)	25.0 (+ 1.2)	+ 1.5 % (p<.01)			
	Female	4.4 (n/a)	4.8 (+ 0.4)	5.0 (+ 0.2)	5.6 (+ 0.6)	5.9 (+ 0.3)	6.7 (+ 0.9)	+ 2.8 % (p<.01)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.

**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, National Vital Statistics System, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
MN	Both	10.7 (n/a)	11.5 (+ 0.9)	12.4 (+ 0.8)	12.9 (+ 0.5)	14.2 (+ 1.3)	15.0 (+ 0.9)	+ 2.3 % (p<.01)	38	+ 4.3 (19)	+ 40.6 % ( 8)
	Male	18.3 (n/a)	19.3 (+ 1.1)	20.4 (+ 1.0)	20.9 (+ 0.6)	22.9 (+ 1.9)	23.3 (+ 0.4)	+ 1.7 % (p<.01)			
	Female	3.6 (n/a)	4.2 (+ 0.6)	4.8 (+ 0.6)	5.1 (+ 0.4)	5.8 (+ 0.6)	6.9 (+ 1.2)	+ 4.2 % (p<.01)			
MS	Both	12.9 (n/a)	14.1 (+ 1.2)	14.7 (+ 0.6)	15.5 (+ 0.8)	15.6 (+ 0.1)	15.2 (- 0.3)	+ 1.1 % (p<.05)	36	+ 2.3 (36)	+ 17.8 % (40)
	Male	22.9 (n/a)	24.6 (+ 1.7)	25.1 (+ 0.6)	26.8 (+ 1.7)	25.9 (- 0.9)	25.3 (- 0.6)	+ 0.7 % n/s			
	Female	4.3 (n/a)	5.0 (+ 0.7)	5.5 (+ 0.5)	5.5 (- 0.0)	6.4 (+ 0.9)	6.2 (- 0.2)	+ 2.4 % (p<.01)			
MO	Both	14.7 (n/a)	14.1 (- 0.6)	15.4 (+ 1.3)	16.0 (+ 0.7)	17.8 (+ 1.7)	20.0 (+ 2.3)	+ 2.2 % (p<.01)	16	+ 5.3 (15)	+ 36.4 % (17)
	Male	25.3 (n/a)	23.7 (- 1.6)	25.6 (+ 1.9)	26.6 (+ 1.0)	28.9 (+ 2.3)	32.2 (+ 3.3)	+ 1.8 % (p<.05)			
	Female	5.4 (n/a)	5.4 (+ 0.1)	6.1 (+ 0.7)	6.3 (+ 0.2)	7.4 (+ 1.1)	8.6 (+ 1.2)	+ 3.2 % (p<.01)			
MT	Both	21.1 (n/a)	22.6 (+ 1.4)	23.6 (+ 1.0)	24.7 (+ 1.1)	26.7 (+ 2.0)	29.2 (+ 2.5)	+ 2.1 % (p<.01)	1	+ 8.0 ( 2)	+ 38.0 % (11)
	Male	36.9 (n/a)	37.3 (+ 0.4)	39.8 (+ 2.5)	39.7 (- 0.1)	41.0 (+ 1.4)	45.5 (+ 4.4)	+ 1.3 % (p<.01)			
	Female	6.7 (n/a)	8.4 (+ 1.8)	8.4 (- 0.1)	10.0 (+ 1.6)	12.6 (+ 2.6)	13.1 (+ 0.5)	+ 4.6 % (p<.01)			
NE	Both	12.7 (n/a)	12.2 (- 0.5)	12.6 (+ 0.4)	11.7 (- 0.8)	13.5 (+ 1.8)	14.8 (+ 1.3)	+ 1.0 % n/s	40	+ 2.1 (42)	+ 16.2 % (43)
	Male	22.2 (n/a)	20.7 (- 1.5)	20.3 (- 0.4)	19.8 (- 0.5)	22.0 (+ 2.2)	23.9 (+ 1.9)	+ 0.6 % n/s			
	Female	3.8 (n/a)	4.2 (+ 0.4)	5.1 (+ 0.9)	4.0 (- 1.1)	5.5 (+ 1.4)	5.8 (+ 0.3)	+ 2.6 % n/s			
NV	Both	23.3 (n/a)	22.6 (- 0.6)	22.1 (- 0.5)	22.6 (+ 0.5)	21.4 (- 1.2)	23.1 (+ 1.6)	- 0.2 % n/s	9	- 0.2 (51)	- 1.0 % (51)
	Male	38.3 (n/a)	36.7 (- 1.7)	35.1 (- 1.6)	35.6 (+ 0.5)	32.5 (- 3.0)	35.4 (+ 2.8)	- 0.7 % n/s			
	Female	8.9 (n/a)	9.5 (+ 0.5)	9.6 (+ 0.1)	10.0 (+ 0.4)	10.6 (+ 0.6)	11.2 (+ 0.6)	+ 1.5 % (p<.01)			
NH	Both	13.5 (n/a)	12.5 (- 1.0)	13.3 (+ 0.8)	15.2 (+ 1.9)	15.8 (+ 0.6)	20.0 (+ 4.2)	+ 2.7 % (p<.05)	17	+ 6.5 ( 8)	+ 48.3 % ( 3)
	Male	22.5 (n/a)	21.1 (- 1.4)	21.7 (+ 0.6)	24.8 (+ 3.1)	25.4 (+ 0.6)	30.6 (+ 5.2)	+ 2.2 % (p<.05)			
	Female	5.3 (n/a)	4.8 (- 0.5)	5.9 (+ 1.0)	6.2 (+ 0.4)	6.6 (+ 0.4)	9.8 (+ 3.2)	+ 3.9 % (p<.05)			
NJ	Both	7.8 (n/a)	7.7 (- 0.1)	7.5 (- 0.2)	8.0 (+ 0.5)	8.9 (+ 0.9)	9.2 (+ 0.4)	+ 1.3 % (p<.05)	50	+ 1.5 (47)	+ 19.2 % (35)
	Male	13.0 (n/a)	13.1 (+ 0.0)	12.6 (- 0.5)	13.7 (+ 1.1)	14.5 (+ 0.8)	14.6 (+ 0.1)	+ 0.9 % (p<.05)			
	Female	3.2 (n/a)	2.9 (- 0.3)	3.0 (+ 0.0)	2.9 (- 0.1)	3.8 (+ 0.9)	4.4 (+ 0.6)	+ 2.3 % n/s			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.



**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, National Vital Statistics System, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
NM	Both	22.0 (n/a)	22.0 (- 0.1)	21.8 (- 0.2)	23.0 (+ 1.2)	24.1 (+ 1.1)	26.0 (+ 1.9)	+ 1.1 % (p<.05)	4	+ 4.0 (24)	+ 18.3 % (39)
	Male	36.8 (n/a)	37.7 (+ 0.9)	36.4 (- 1.2)	35.8 (- 0.6)	37.1 (+ 1.3)	40.7 (+ 3.6)	+ 0.4 % n/s			
	Female	8.5 (n/a)	7.4 (- 1.1)	8.2 (+ 0.7)	10.7 (+ 2.6)	11.7 (+ 0.9)	12.0 (+ 0.3)	+ 3.3 % (p<.05)			
NY	Both	7.2 (n/a)	7.1 (- 0.1)	7.7 (+ 0.6)	8.4 (+ 0.8)	9.5 (+ 1.1)	9.3 (- 0.1)	+ 2.1 % (p<.01)	49	+ 2.1 (41)	+ 28.8 % (27)
	Male	12.5 (n/a)	12.2 (- 0.3)	12.9 (+ 0.7)	13.9 (+ 1.0)	15.4 (+ 1.4)	14.5 (- 0.9)	+ 1.4 % (p<.05)			
	Female	2.7 (n/a)	2.6 (- 0.1)	3.0 (+ 0.3)	3.5 (+ 0.5)	4.2 (+ 0.7)	4.6 (+ 0.5)	+ 4.2 % (p<.01)			
NC	Both	13.6 (n/a)	13.5 (- 0.1)	13.7 (+ 0.1)	14.2 (+ 0.5)	14.5 (+ 0.4)	15.3 (+ 0.8)	+ 0.8 % (p<.01)	34	+ 1.7 (44)	+ 12.7 % (47)
	Male	22.7 (n/a)	22.7 (+ 0.0)	22.2 (- 0.6)	23.3 (+ 1.1)	23.3 (+ 0.0)	23.9 (+ 0.6)	+ 0.4 % n/s			
	Female	5.6 (n/a)	5.5 (- 0.2)	6.2 (+ 0.8)	6.0 (- 0.2)	6.7 (+ 0.7)	7.6 (+ 0.9)	+ 2.0 % (p<.05)			
ND	Both	13.3 (n/a)	14.6 (+ 1.3)	16.0 (+ 1.4)	16.6 (+ 0.6)	18.4 (+ 1.9)	20.9 (+ 2.5)	+ 2.9 % (p<.01)	14	+ 7.6 ( 5)	+ 57.6 % ( 1)
	Male	21.4 (n/a)	24.6 (+ 3.2)	28.0 (+ 3.4)	27.1 (- 0.9)	29.6 (+ 2.5)	32.7 (+ 3.0)	+ 2.5 % (p<.01)			
	Female	5.6 (n/a)	4.5 (- 1.0)	3.7 (- 0.8)	5.7 (+ 2.0)	6.7 (+ 1.0)	8.5 (+ 1.8)	+ 3.9 % n/s			
OH	Both	11.6 (n/a)	12.3 (+ 0.8)	13.1 (+ 0.8)	13.4 (+ 0.2)	14.8 (+ 1.4)	15.8 (+ 1.0)	+ 2.0 % (p<.01)	32	+ 4.2 (21)	+ 36.0 % (19)
	Male	20.4 (n/a)	20.9 (+ 0.5)	22.2 (+ 1.3)	22.1 (- 0.1)	24.2 (+ 2.1)	25.5 (+ 1.3)	+ 1.5 % (p<.01)			
	Female	4.0 (n/a)	4.7 (+ 0.7)	4.9 (+ 0.1)	5.3 (+ 0.5)	6.2 (+ 0.9)	6.7 (+ 0.6)	+ 3.4 % (p<.01)			
OK	Both	17.0 (n/a)	16.5 (- 0.6)	17.2 (+ 0.8)	18.4 (+ 1.1)	20.7 (+ 2.3)	23.5 (+ 2.8)	+ 2.3 % (p<.05)	7	+ 6.4 (10)	+ 37.6 % (12)
	Male	28.5 (n/a)	27.3 (- 1.2)	27.8 (+ 0.5)	30.3 (+ 2.5)	33.4 (+ 3.1)	37.3 (+ 3.8)	+ 2.0 % (p<.05)			
	Female	6.6 (n/a)	6.4 (- 0.2)	7.5 (+ 1.1)	7.0 (- 0.5)	8.5 (+ 1.6)	10.3 (+ 1.8)	+ 2.9 % (p<.05)			
OR	Both	16.4 (n/a)	17.7 (+ 1.3)	17.7 (- 0.0)	18.6 (+ 0.9)	19.8 (+ 1.2)	21.1 (+ 1.3)	+ 1.6 % (p<.01)	13	+ 4.6 (18)	+ 28.2 % (28)
	Male	27.4 (n/a)	29.5 (+ 2.1)	28.5 (- 0.9)	29.5 (+ 1.0)	31.4 (+ 1.8)	33.0 (+ 1.6)	+ 1.1 % (p<.01)			
	Female	6.5 (n/a)	7.1 (+ 0.6)	7.7 (+ 0.6)	8.4 (+ 0.7)	8.8 (+ 0.4)	9.8 (+ 0.9)	+ 2.7 % (p<.01)			
PA	Both	12.1 (n/a)	12.5 (+ 0.4)	12.8 (+ 0.3)	13.9 (+ 1.1)	15.0 (+ 1.1)	16.3 (+ 1.2)	+ 2.0 % (p<.01)	30	+ 4.1 (22)	+ 34.3 % (21)
	Male	21.0 (n/a)	21.3 (+ 0.3)	21.9 (+ 0.6)	23.1 (+ 1.2)	24.7 (+ 1.7)	26.1 (+ 1.3)	+ 1.5 % (p<.01)			
	Female	4.2 (n/a)	4.6 (+ 0.3)	4.6 (+ 0.0)	5.4 (+ 0.9)	6.0 (+ 0.6)	7.1 (+ 1.1)	+ 3.5 % (p<.01)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.

**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, National Vital Statistics System, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
RI	Both	9.4 (n/a)	9.0 (- 0.3)	9.0 (- 0.0)	12.8 (+ 3.8)	11.9 (- 0.9)	12.6 (+ 0.7)	+ 2.6 % (p<.05)	43	+ 3.2 (30 ¶¶)	+ 34.1 % (23 ¶¶)
	Male	15.4 (n/a)	15.2 (- 0.2)	14.8 (- 0.3)	21.2 (+ 6.4)	19.2 (- 2.0)	19.6 (+ 0.4)	+ 2.2 % n/s			
	Female	4.0 (n/a)	3.3 (- 0.7)	3.8 (+ 0.4)	5.1 (+ 1.3)	5.1 (+ 0.0)	6.1 (+ 1.0)	+ 3.7 % (p<.05)			
SC	Both	12.8 (n/a)	13.0 (+ 0.2)	13.7 (+ 0.7)	14.9 (+ 1.2)	16.0 (+ 1.1)	17.7 (+ 1.7)	+ 2.3 % (p<.01)	23	+ 4.9 (17)	+ 38.3 % (10)
	Male	21.3 (n/a)	22.5 (+ 1.2)	22.3 (- 0.1)	24.6 (+ 2.2)	26.1 (+ 1.5)	28.0 (+ 1.9)	+ 1.8 % (p<.01)			
	Female	5.4 (n/a)	4.7 (- 0.7)	6.0 (+ 1.3)	6.2 (+ 0.2)	7.0 (+ 0.8)	8.4 (+ 1.4)	+ 3.4 % (p<.05)			
SD	Both	15.7 (n/a)	15.8 (+ 0.1)	17.1 (+ 1.3)	19.3 (+ 2.2)	19.7 (+ 0.4)	22.6 (+ 2.9)	+ 2.5 % (p<.01)	10	+ 7.0 ( 7)	+ 44.5 % ( 6)
	Male	27.6 (n/a)	26.3 (- 1.3)	27.9 (+ 1.6)	30.1 (+ 2.2)	32.0 (+ 1.9)	33.6 (+ 1.6)	+ 1.6 % (p<.01)			
	Female	4.2 (n/a)	5.8 (+ 1.6)	6.4 (+ 0.6)	8.3 (+ 2.0)	7.3 (- 1.0)	11.3 (+ 4.0)	+ 5.8 % (p<.01)			
TN	Both	14.6 (n/a)	15.2 (+ 0.6)	16.1 (+ 0.8)	17.2 (+ 1.1)	17.2 (+ 0.0)	18.2 (+ 1.0)	+ 1.4 % (p<.01)	22	+ 3.5 (28)	+ 24.2 % (31)
	Male	25.1 (n/a)	25.4 (+ 0.3)	26.8 (+ 1.3)	28.0 (+ 1.2)	28.6 (+ 0.6)	29.8 (+ 1.2)	+ 1.2 % (p<.01)			
	Female	5.4 (n/a)	6.3 (+ 0.9)	6.7 (+ 0.4)	7.5 (+ 0.8)	6.9 (- 0.6)	7.6 (+ 0.7)	+ 1.9 % (p<.05)			
TX	Both	12.2 (n/a)	12.7 (+ 0.6)	12.3 (- 0.4)	13.2 (+ 0.9)	13.6 (+ 0.3)	14.5 (+ 0.9)	+ 1.1 % (p<.01)	41	+ 2.3 (37)	+ 18.9 % (36)
	Male	20.4 (n/a)	20.9 (+ 0.5)	20.4 (- 0.6)	22.0 (+ 1.6)	22.2 (+ 0.3)	23.1 (+ 0.9)	+ 0.9 % (p<.05)			
	Female	4.8 (n/a)	5.4 (+ 0.6)	5.0 (- 0.4)	5.2 (+ 0.2)	5.6 (+ 0.4)	6.4 (+ 0.8)	+ 1.6 % (p<.05)			
UT	Both	17.2 (n/a)	19.0 (+ 1.8)	18.2 (- 0.7)	20.2 (+ 2.0)	24.0 (+ 3.8)	25.2 (+ 1.2)	+ 2.7 % (p<.01)	5	+ 8.0 ( 3 ¶¶)	+ 46.5 % ( 4 ¶¶)
	Male	28.2 (n/a)	31.1 (+ 2.9)	29.4 (- 1.7)	32.1 (+ 2.7)	37.8 (+ 5.7)	38.0 (+ 0.2)	+ 2.1 % (p<.05)			
	Female	6.8 (n/a)	7.4 (+ 0.6)	7.5 (+ 0.1)	8.5 (+ 1.0)	10.6 (+ 2.1)	12.6 (+ 2.0)	+ 4.4 % (p<.01)			
VT	Both	13.2 (n/a)	16.2 (+ 3.0)	14.9 (- 1.3)	16.6 (+ 1.7)	18.7 (+ 2.1)	19.7 (+ 1.0)	+ 2.4 % (p<.01)	18	+ 6.4 ( 9)	+ 48.6 % ( 2)
	Male	23.6 (n/a)	28.3 (+ 4.6)	24.3 (- 4.0)	27.3 (+ 3.0)	31.0 (+ 3.7)	32.5 (+ 1.5)	+ 1.9 % (p<.05)			
	Female	4.3 (n/a)	5.2 (+ 0.9)	6.4 (+ 1.3)	6.6 (+ 0.2)	7.3 (+ 0.7)	7.6 (+ 0.3)	+ 3.8 % (p<.01)			
VA	Both	12.8 (n/a)	12.7 (- 0.1)	12.9 (+ 0.3)	13.6 (+ 0.7)	14.6 (+ 0.9)	15.0 (+ 0.5)	+ 1.2 % (p<.01)	37	+ 2.2 (39)	+ 17.4 % (41)
	Male	21.6 (n/a)	21.3 (- 0.2)	21.0 (- 0.4)	22.5 (+ 1.5)	23.6 (+ 1.2)	23.9 (+ 0.2)	+ 0.9 % (p<.05)			
	Female	5.3 (n/a)	5.2 (- 0.1)	5.9 (+ 0.7)	5.6 (- 0.3)	6.4 (+ 0.8)	6.9 (+ 0.5)	+ 1.8 % (p<.05)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.



**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, National Vital Statistics System, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
WA	Both	14.8 (n/a)	15.4 (+ 0.5)	14.8 (- 0.6)	15.7 (+ 0.9)	16.6 (+ 0.9)	17.6 (+ 1.0)	+ 1.1 % (p<.05)	24	+ 2.8 (33)	+ 18.8 % (37)
	Male	24.7 (n/a)	25.2 (+ 0.5)	24.1 (- 1.1)	25.1 (+ 1.0)	26.0 (+ 0.9)	27.1 (+ 1.1)	+ 0.6 % n/s			
	Female	5.9 (n/a)	6.4 (+ 0.6)	6.2 (- 0.2)	6.9 (+ 0.7)	7.7 (+ 0.8)	8.5 (+ 0.8)	+ 2.5 % (p<.01)			
WV	Both	15.6 (n/a)	17.2 (+ 1.6)	16.7 (- 0.5)	16.0 (- 0.7)	19.2 (+ 3.2)	21.4 (+ 2.2)	+ 1.8 % n/s	11	+ 5.8 (13)	+ 37.1 % (14)
	Male	27.2 (n/a)	30.1 (+ 2.9)	28.6 (- 1.5)	27.6 (- 1.0)	31.5 (+ 3.9)	33.5 (+ 2.0)	+ 1.1 % n/s			
	Female	5.3 (n/a)	5.5 (+ 0.1)	5.8 (+ 0.3)	5.3 (- 0.5)	7.6 (+ 2.3)	9.8 (+ 2.2)	+ 3.7 % n/s			
WI	Both	13.1 (n/a)	13.5 (+ 0.4)	14.0 (+ 0.5)	15.0 (+ 1.0)	15.3 (+ 0.3)	16.5 (+ 1.2)	+ 1.5 % (p<.01)	28	+ 3.4 (29)	+ 25.8 % (30)
	Male	21.7 (n/a)	22.2 (+ 0.5)	22.7 (+ 0.5)	24.0 (+ 1.2)	24.4 (+ 0.4)	25.7 (+ 1.3)	+ 1.1 % (p<.01)			
	Female	5.1 (n/a)	5.3 (+ 0.2)	5.6 (+ 0.4)	6.4 (+ 0.7)	6.5 (+ 0.1)	7.5 (+ 1.0)	+ 2.5 % (p<.01)			
WY	Both	20.7 (n/a)	23.4 (+ 2.7)	22.5 (- 0.9)	25.4 (+ 2.8)	28.9 (+ 3.5)	28.8 (- 0.1)	+ 2.3 % (p<.01)	3	+ 8.1 ( 1)	+ 39.0 % ( 9)
	Male	34.8 (n/a)	39.3 (+ 4.5)	36.3 (- 3.0)	41.5 (+ 5.2)	47.1 (+ 5.6)	44.6 (- 2.4)	+ 1.8 % (p<.05)			
	Female	7.7 (n/a)	8.2 (+ 0.6)	9.2 (+ 0.9)	9.4 (+ 0.2)	10.7 (+ 1.4)	12.6 (+ 1.9)	+ 3.2 % (p<.01)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

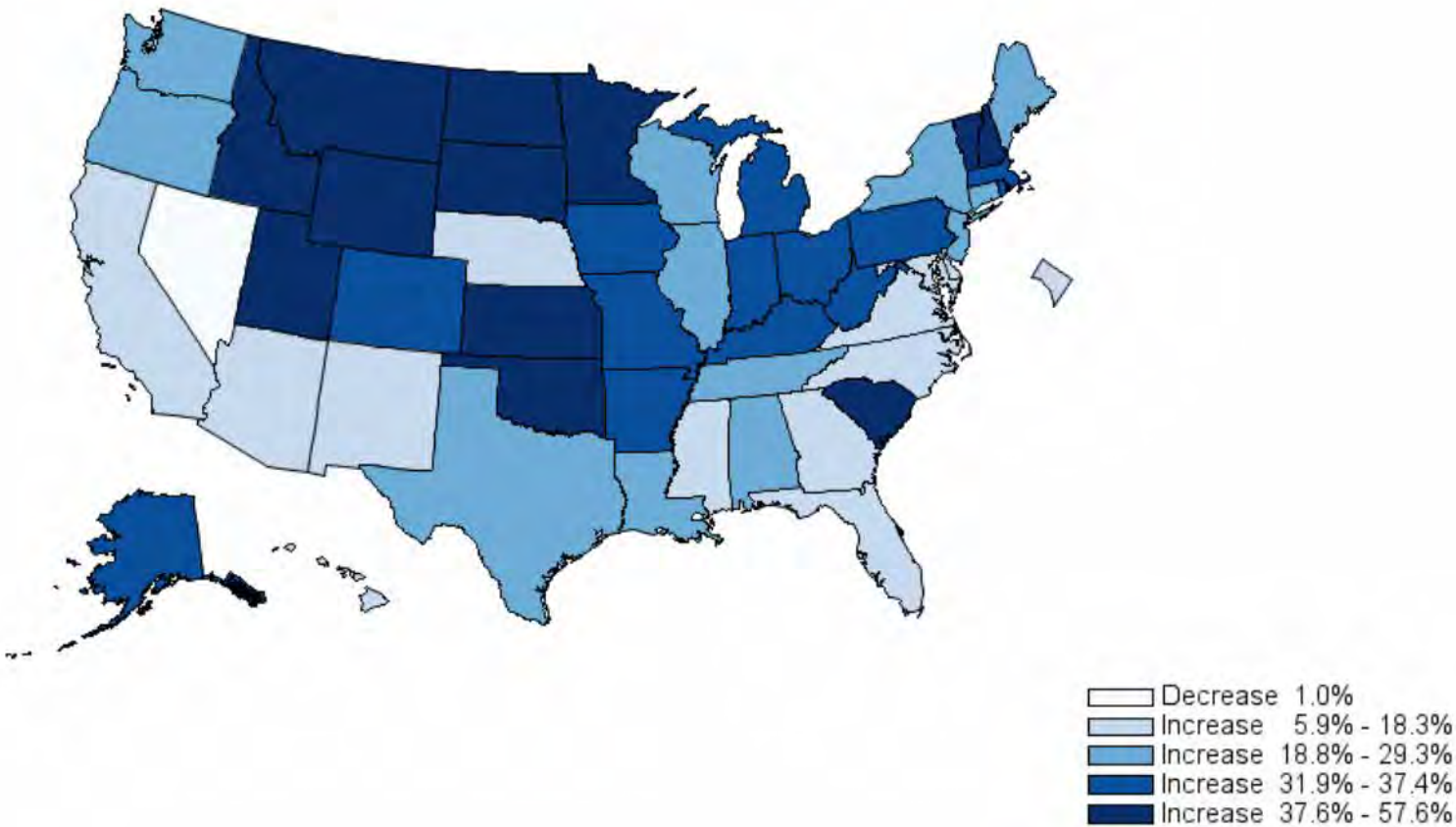
†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.

Figure 1

**Percentage Changes in Annual Suicide Rates (per 100,000, Age-Adjusted)**  
2014-2016 Compared Against 1999-2001





1 **Short Title:** Vital Signs: Identifying Increasing Trends in State Suicide Rates and Exploring Suicide’s Multiple  
2 Contributing Circumstances

3 Deborah M. Stone, ScD;<sup>1</sup> Thomas R. Simon PhD;<sup>1</sup> Katherine A. Fowler, PhD;<sup>1</sup> Scott R. Kegler, PhD;<sup>2</sup> Keming Yuan,  
4 MS;<sup>1</sup> Kristin M. Holland, PhD;<sup>1</sup> Asha Z. Ivey-Stephenson, PhD;<sup>1</sup> Alex E. Crosby, MD<sup>1</sup>

5 **Background:** Suicide rates in the United States have risen nearly 30% since 1999. Examining state-level trends in,  
6 and the multiple contributing circumstances to, suicide can inform comprehensive state suicide prevention  
7 planning.

8 **Methods:** Trends in age-adjusted suicide rates among people aged ≥10 years, by state and sex, across six  
9 consecutive three-year periods (1999-2016), were assessed using data from the National Vital Statistics System  
10 for 50 states and Washington, D.C. Data from the National Violent Death Reporting System (NVDRS), covering  
11 27 states in 2015, were used to examine contributing circumstances among decedents with and without known  
12 mental health problems (MHP).

13 **Results:** From 1999-2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases  
14 of more than 30%. Rates increased significantly among males and females in 34 and 43 states, respectively.  
15 Among decedents in NVDRS, 54.0% did *not* have a known MHP. Among decedents with circumstance  
16 information, several circumstances, including relationship problems/loss (45.1% vs 39.6%), life stressors (54.2%  
17 vs 49.7%) and recent/impending crises (32.9% vs 26.0%), were significantly more likely among those without a  
18 known MHP than decedents with MHP, but were common across groups.

19 **Conclusions:** Suicide rates increased significantly across most states from 1999-2016. A variety of circumstances  
20 contributed to suicides among people with and without known MHP.

21 **Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach  
22 to prevent suicide risk before it occurs, identify and support people at risk, prevent reattempts, and help  
23 friends/family after a suicide occurs.

24 **INTRODUCTION**

25 **BACKGROUND AND PURPOSE**

26 In 2016, nearly 45,000 suicides (15.6/100,000 [age-adjusted]) occurred in the United States (U.S.), among people  
27 ≥10 years old (1). Between 1999 and 2015, suicide rates increased across both sexes, racial/ethnic groups, and  
28 urbanization levels (2, 3). Suicide is the 10<sup>th</sup> leading cause of death and is one of just three leading causes that  
29 are *increasing* (1, 4). Additionally, rates of Emergency Department visits for nonfatal self-harm, a key risk factor  
30 for suicide, increased nearly 45% between 2001 and 2015 (1). Together, suicides and self-harm injuries cost the  
31 nation more than \$69 billion in direct medical and work loss costs (1).

32 The *National Strategy for Suicide Prevention (NSSP)* (5) calls for a public health approach to suicide prevention  
33 with efforts spanning across multiple levels (i.e., individual, family/relationship, community, and societal). Such  
34 an approach underscores that suicide is rarely caused by any single factor, but rather, is multi-determined.  
35 Despite the NSSP guidance, suicide prevention efforts largely focus on clinically-oriented interventions focused  
36 on people with mental health problems (MHP) or people who have attempted suicide (6). Other contributing  
37 circumstances include social isolation, relationship problems, economic problems, access to lethal means (e.g.,  
38 substances, firearms, bridges) among people at risk, and poor coping and problem-solving skills (5). Expanded  
39 awareness of these additional circumstances contributing to suicide risk and action to address them, can help  
40 reach the nation’s goal of reducing suicide rates 20% by 2025 (7). To assist states in achieving this goal, this

study analyzes state-specific trends in suicide rates, assesses the multiple contributing factors to suicide, and provides recommendations for multi-level comprehensive suicide prevention.

## METHODS

Suicide rates were analyzed for people aged  $\geq 10$  years only, as attributions of suicidal intent in younger children are variable (8). Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases 10<sup>th</sup> Revision*, underlying-cause-of death codes X60-X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods spanning 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Characteristics and circumstances of suicide decedents  $\geq 10$  years, with and without known MHP, were compared in the 27 states with complete data participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines MHP as disorders and syndromes listed in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (9), with the exception of alcohol and other substance dependence, which are captured separately in NVDRS. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known MHP were compared using Chi-square tests. Logistic regression analyses estimated adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and race/ethnicity.

## RESULTS

The most recent overall suicide rates (representing 2014-2016) varied four-fold, from 6.9 (D.C.) to 29.2 (Montana) per 100,000 persons per year (Table 1). Across the study period, rates increased in all states, except Nevada (which had a consistently high rate throughout), with absolute increases ranging from +0.8 (Delaware) to +8.1 (Wyoming) per 100,000. Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with increases of more than 30% observed in 25 states (Table 1, Figure 1).

Modeled suicide rate trends indicated significant increases for 44 states, for males (34 states) and females (43 states), as well as for the U.S. overall (Table 1). Nationally, the model-estimated AAPC for the overall suicide rate was +1.5%. By sex, estimated national rate trends further indicated significant increases for males (AAPC +1.1%) and females (AAPC +2.6%).

Suicide decedents without known MHP (N=11,039) were compared to those with MHP (N=9,407) in 27 states. While all decedents were predominately male (Table 2; 76.8%) and non-Hispanic white (83.6%), those without known MHP, relative to those with MHP, were more likely male (83.6% vs. 68.8%; odds ratio (OR)=2.3, 95% CI = 2.2-2.5) and racial/ethnic minorities (OR range: 1.2-2.0). Suicide decedents without known MHP also had significantly greater odds of perpetrating homicide-suicide (adjusted odds ratio aOR = 2.9, 95% CI = 2.2-3.8). Among adult decedents, 20.1% and 15.3% of people without and with MHP, respectively, ever served, or were currently serving, in the U.S. military.

While firearms were the most common method of suicide overall (48.5%) and for both groups, decedents without known MHP were more likely to die by firearm (55.3% vs. 40.6%) and less likely to die by



85 hanging/strangulation/suffocation (26.9% vs 31.3%) or poisoning (10.4% vs 19.8%) than those with known MHP.  
86 These differences remained significant in the adjusted models.

87 Decedents without known MHP were less likely to receive toxicology testing. Among those with toxicology  
88 results, decedents without known MHP were less likely to test positive for any substance overall (aOR=0.8, 95%  
89 CI=0.7-0.8) but more likely to test positive for alcohol (aOR=1.2, 95% CI=1.1-1.3).

90 All suicide decedents with MHP (N=9,407) and approximately 85% without known MHP (N=9,357) had available  
91 circumstances information (Table 3). People without known MHP were less likely to have any substance abuse  
92 problems (aOR=0.7, 95% CI=0.7-0.8). While two-thirds of those with known MHP had a history of mental health  
93 or substance abuse treatment (67.2%), just over half (54.0%) were in current treatment.

94 Decedents without known MHP versus those with known MHP had significantly greater likelihood of any  
95 relationship problem/loss (45.1% vs. 39.6%), specifically intimate partner problems (30.2% vs. 24.1%),  
96 arguments/conflicts (17.5% vs. 13.6%), and recently perpetrating interpersonal violence (3.0% vs. 1.4%). They  
97 were also more likely to have experienced any life stressors (54.2% vs 49.7%), such as criminal-legal problems  
98 (10.7% vs. 6.2%) or eviction/loss of home (4.3% vs. 3.4%), and they were more likely to have had a crisis within  
99 the preceding or upcoming two weeks (32.9% vs. 26.0%). All of these differences remained significant in the  
100 adjusted models. Among those with crises, intimate partner and physical health problems were the most  
101 common types for both groups and did not differ between them.

102 Decedents without known MHP had significantly lower odds of recent release from any institution (aOR=0.5,  
103 95% CI=0.4-0.5), but among those who were recently released (5.1%), they were significantly more likely to be  
104 released from a correctional facility (25.7% vs. 8.7%) or hospital (43.7% vs. 33.0%) than those with a known  
105 MHP. Among decedents with known MHP who were recently released from an institution (10.2%), 46.7% of this  
106 group were released from psychiatric facilities.

107 Decedents without known MHP, compared to those with MHP, were significantly less likely to have a history of  
108 suicidal ideation (23.0% vs. 40.8%) and prior suicide attempts (10.3% vs. 29.4%). More than 1 in five people in  
109 both groups disclosed suicide intent (22.4% vs. 24.5%).

## 110 **Conclusions and Comments**

111 From 1999-2016, 44 states saw significant increases in suicide rates and 25 states experienced rate increases of  
112 more than 30%. Rates increased significantly among males, (in 34 states) and females (in 43 states). This finding  
113 is consistent with prior research showing a decreasing gender gap in male-female suicide rates between 1999-  
114 2014 (3). Additional research into the specific causes of these trends is necessary. In the meantime, NVDRS  
115 provides insight into suicide circumstances and can help states identify prevention priorities.

116 Suicidologists regularly state that suicide 'is not caused by a single factor;' (5) however, suicide prevention  
117 research and practice is heavily weighted towards clinically-oriented activities (6). In contrast, the current study  
118 found that more than half of suicide decedents in NVDRS did *not* have a known MHP. This group suffered more  
119 from relationship issues and other life stressors such as criminal-legal, housing, and health problems. They also  
120 experienced more recent/impending crises which may point to suicides that took place with minimal  
121 deliberation (10). In addition to educating about how to respond to signs or disclosures of suicide risk, broader  
122 prevention to address non-clinical risks is critical and can include strengthening economic supports (e.g.,  
123 through housing stabilization policies, household financial support); teaching coping and problem-solving skills  
124 early in life to bolster healthy relationships over the life course; and promoting social connectedness to increase  
125 one's sense of belonging.

The above strategies are also applicable to people with MHP who, in the current study struggled more with job/financial problems, bereavement issues, and family crises, and who commonly experienced arguments/conflicts, intimate partner, and health problems. These findings support a body of literature indicating increased vulnerability among people with MHP to socio-economic and health problems (11). In the clinical realm, two-thirds of people with MHP had a history of any treatment and 54% were in treatment when they died. This suggests the need for broader implementation of evidence-based treatment (e.g., collaborative care, cognitive-behavioral therapy), greater access to behavioral health providers (especially in underserved areas), and expanded integration of physical and behavioral health within healthcare systems, especially through care transitions (12).

In addition to the abovementioned strategies, other components of a comprehensive approach include: creating protective environments by reducing access to lethal means (e.g., medications, firearms) among people at risk, creating workplace policies encouraging employee help-seeking and connectedness, and zoning to reduce alcohol-outlet density; better identifying people at risk; supporting friends/family after a suicide has taken place and assuring safe reporting by the media in order to prevent suicide contagion (12). Some states, such as Colorado, are underway planning such a comprehensive approach to suicide prevention (13).

These findings have at least three limitations. In the state-level analysis, rankings for four states (MD, MA, RI, UT) might have been impacted by large proportions of injury deaths of undetermined intent (potentially biasing reported suicide rates downward), or decreased percentages of such deaths over time (potentially biasing estimated rate trends upward). Second, NVDRS is not yet nationally representative; the 27 states included represent 49.6% of the population

(<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml>).

Third, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the extent of informant knowledge can impact data completeness and accuracy. Studies including more in-depth interviews with next-of-kin often see greater attributions to mental disorders (14), however many methodological variations across studies exist (15). It is likely that some people without known MHP in the current study were experiencing mental health challenges that were unknown, and hence underreported by key informants. However, any lack of awareness of decedent MHP suggests the importance of addressing the broad range of contributing circumstances.

Suicide is a growing public health problem with many associated risk factors. States and communities can use NVDRS data to better understand their suicide problem and can use resources such as CDC's *Preventing Suicide: a Technical Package of Policies, Programs, and Practices* (12) to implement evidence-based comprehensive suicide prevention to save lives.

#### **Acknowledgments**

The authors acknowledge Robert Anderson, Holly Hedegaard, and Margaret Warner from the Division of Vital Statistics, National Center for Health Statistics, CDC, for their statistical consultation.

**Conflict of Interest** No conflicts of interest were reported.

**Corresponding author:** Deborah M. Stone, [dstone3@cdc.gov](mailto:dstone3@cdc.gov), 770-488-3942

#### **Author Affiliations:**

<sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis, Research, and Practice Integration, National Center for Injury Prevention and Control, CDC



169 **References:**

- 170 1. Centers for Disease Control and Prevention. Web-based Injury Statistics Query and Reporting System  
171 (WISQARS). Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018. In.
- 172 2. Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide Trends Among and  
173 Within Urbanization Levels by Sex, Race/Ethnicity, Age Group, and Mechanism of Death - United States,  
174 2001-2015. MMWR Surveill Summ 2017;66(18):1-16.
- 175 3. Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999-2014. In: US Department  
176 of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health  
177 Statistics Hyattsville, MD; 2016.
- 178 4. Kochanek K, Murphy S, Xu J, Arias E. Mortality in the United States, 2016. NCHS Data Brief, no 293.  
179 National Center for Health Statistics 2017.
- 180 5. Office of the Surgeon General, National Action Alliance for Suicide Prevention. 2012 National strategy for  
181 suicide prevention: goals and objectives for action: a report of the US Surgeon General and of the National  
182 Action Alliance for Suicide Prevention. 2012.
- 183 6. Zalsman G, Hawton K, Wasserman D, van Heeringen K, Arensman E, Sarchiapone M, et al. Suicide  
184 prevention strategies revisited: 10-year systematic review. The Lancet Psychiatry 2016;3(7):646-659.
- 185 7. Torguson K, O'Brien A. Leading Suicide Prevention Efforts Unite to Address Rising National Suicide Rate. In.  
186 Washington, D.C.; 2017.
- 187 8. Crepeau-Hobson F. The Psychological Autopsy and Determination of Child Suicides: A Survey of Medical  
188 Examiners. Archives of Suicide Research 2010;14(1):24-34.
- 189 9. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5®):  
190 American Psychiatric Pub; 2013.
- 191 10. Simon TR, Swann AC, Powell KE, Potter LB, Kresnow Mj, O'Carroll PW. Characteristics of impulsive suicide  
192 attempts and attempters. Suicide and Life-Threatening Behavior 2002;32(s1):49-59.
- 193 11. World Health Organization. Risks to mental health: An overview of vulnerabilities and risk factors. Geneva:  
194 WHO 2012.
- 195 12. Stone DM, Holland KM, Bartholow BN, Crosby AE, Davis SP, Wilkins N. Preventing suicide: A technical  
196 package of policies, programs, and practice. 2017.
- 197 13. Caine ED, Reed J, Hindman J, Quinlan K. Comprehensive, integrated approaches to suicide prevention:  
198 practical guidance. Injury prevention 2017;injuryprev-2017-042366.
- 199 14. Milner A, Svetcic J, De Leo D. Suicide in the absence of mental disorder? A review of psychological autopsy  
200 studies across countries. Int J Soc Psychiatry 2013;59(6):545-54.
- 201 15. Pouliot L, De Leo D. Critical issues in psychological autopsy studies. Suicide Life Threat Behav  
202 2006;36(5):491-510.

203 **Attachments:**

204 Stone\_Suicide Vital Signs MMWR 3.27.18 (table 1.fig 1)

205 Stone\_Suicide Vital Signs MMWR 3.27.18 (Tables 2&3)

206 **Word Count:** 1799/1800

**Short Title:** Vital Signs: Contributing Circumstances to Suicide and Increasing Trends in State Suicide Rates

Deborah M. Stone, ScD;<sup>1</sup> Thomas R. Simon PhD;<sup>1</sup> Katherine A. Fowler, PhD;<sup>1</sup> Scott R. Kegler, PhD;<sup>2</sup> Keming Yuan, MS;<sup>1</sup> Kristin M. Holland, PhD;<sup>1</sup> Asha Z. Ivey-Stephenson, PhD;<sup>1</sup> Alex E. Crosby, MD<sup>1</sup>

**Background:** Suicide rates in the United States have risen nearly 30% since 1999. Examining state-level trends in, and the multiple contributing circumstances to, suicide can inform comprehensive state suicide prevention planning.

**Methods:** Trends in age-adjusted suicide rates among people aged  $\geq 10$  years, by state and sex, across six consecutive three-year periods (1999-2016), were assessed using data from the National Vital Statistics System for 50 states and Washington, D.C. Data from the National Violent Death Reporting System (NVDRS), covering 27 states in 2015, were used to examine contributing circumstances among decedents with and without known mental health problems (MHP).

**Results:** From 1999-2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases of more than 30%. Rates increased significantly among males and females in 34 and 43 states, respectively. Among NVDRS decedents in 27 states, 54.0% did *not* have a known MHP. Among people with circumstance information, several circumstances, including relationship problems/loss (45.1% vs 39.6%), life stressors (54.2% vs 49.7%), and recent/impending crises (32.9% vs 26.0%) were significantly more likely among those without a known MHP than decedents with MHP, but were common across groups.

**Conclusions:** Suicide rates increased significantly across most states from 1999-2016. Various circumstances contributed to suicides among people with and without known MHP.

**Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach to prevent suicide risk before it occurs, identify and support people at risk, prevent reattempts, and help friends/family after a suicide occurs.

## INTRODUCTION

### BACKGROUND AND PURPOSE

In 2016, nearly 45,000 suicides (15.6/100,000 [age-adjusted]) occurred in the United States (U.S.), among people  $\geq 10$  years old (1). Between 1999 and 2015, suicide rates increased across both sexes, racial/ethnic groups, and urbanization levels (2, 3). Suicide is the 10<sup>th</sup> leading cause of death and is one of just three leading causes that are *increasing* (1, 4). Additionally, rates of Emergency Department visits for nonfatal self-harm, a key risk factor for suicide, increased nearly 45% between 2001 and 2015 (1). Together, suicides and self-harm injuries cost the nation more than \$69 billion in direct medical and work loss costs (1).

The *National Strategy for Suicide Prevention (NSSP)* (5) calls for a public health approach to suicide prevention with efforts spanning across multiple levels (i.e., individual, family/relationship, community, and societal). Such an approach underscores that suicide is rarely caused by any single factor, but rather, is multi-determined. Despite the NSSP guidance, suicide prevention efforts largely focus on clinically-oriented interventions focused on mental health problems (MHP) and preventing re-attempts (6). Apart from MHP and prior attempts, other contributing circumstances to suicide include social and economic problems, access to lethal means (e.g., substances, firearms, bridges) among people at risk, and poor coping and problem-solving skills (5). Expanded awareness of these additional circumstances contributing to suicide risk and action to address them, can help reach the nation's goal of reducing suicide rates 20% by 2025 (7). To assist states in achieving this goal, this



study analyzes state-specific trends in suicide rates, assesses the multiple contributing factors to suicide, and provides recommendations for multi-level comprehensive suicide prevention.

## METHODS

Suicide rates were analyzed for people aged  $\geq 10$  years only, as attributions of suicidal intent in younger children are variable (8). Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases 10<sup>th</sup> Revision*, underlying-cause-of death codes X60-X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods spanning 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Characteristics and circumstances of suicide decedents  $\geq 10$  years, with and without known MHP, were compared in the 27 states with complete data participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines MHP as disorders and syndromes listed in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (9), with the exception of alcohol and other substance dependence, which are captured separately in NVDRS. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known MHP were compared using Chi-square tests. Logistic regression analyses estimated adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and race/ethnicity.

## RESULTS

The most recent overall suicide rates (representing 2014-2016) varied four-fold, from 6.9 (D.C.) to 29.2 (Montana) per 100,000 persons per year (Table 1). Across the study period, rates increased in all states, except Nevada (which had a consistently high rate throughout), with absolute increases ranging from +0.8 (Delaware) to +8.1 (Wyoming) per 100,000. Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with increases of more than 30% observed in 25 states (Table 1, Figure 1).

Modeled suicide rate trends indicated significant increases for 44 states, for males (34 states) and females (43 states), as well as for the U.S. overall (Table 1). Nationally, the model-estimated AAPC for the overall suicide rate was +1.5%. By sex, estimated national rate trends further indicated significant increases for males (AAPC +1.1%) and females (AAPC +2.6%).

Suicide decedents without known MHP (N=11,039) were compared to those with MHP (N=9,407) in 27 states. While all decedents were predominately male (Table 2; 76.8%) and non-Hispanic white (83.6%), those without known MHP, relative to those with MHP, were more likely male (83.6% vs. 68.8%; odds ratio (OR)=2.3, 95% CI = 2.2-2.5) and racial/ethnic minorities (OR range: 1.2-2.0). Suicide decedents without known MHP also had significantly greater odds of perpetrating homicide-suicide (adjusted odds ratio aOR = 2.9, 95% CI = 2.2-3.8). Among adult decedents, 20.1% and 15.3% of people without and with MHP, respectively, ever served, or were currently serving, in the U.S. military.

While firearms were the most common method of suicide overall (48.5%) and for both groups, decedents without known MHP were more likely to die by firearm (55.3% vs. 40.6%) and less likely to die by

84 hanging/strangulation/suffocation (26.9% vs 31.3%) or poisoning (10.4% vs 19.8%) than those with known MHP.  
85 These differences remained significant in the adjusted models.

86 Decedents without known MHP were less likely to receive toxicology testing. Among those with toxicology  
87 results, decedents without known MHP were less likely to test positive for any substance overall (aOR=0.8, 95%  
88 CI=0.7-0.8) but more likely to test positive for alcohol (aOR=1.2, 95% CI=1.1-1.3).

89 All suicide decedents with MHP (N=9,407) and approximately 85% without known MHP (N=9,357) had available  
90 circumstances information (Table 3). People without known MHP were less likely to have any substance abuse  
91 problems (aOR=0.7, 95% CI=0.7-0.8). While two-thirds of those with known MHP had a history of mental health  
92 or substance abuse treatment (67.2%), just over half (54.0%) were in current treatment.

93 Decedents without known MHP versus those with known MHP had significantly greater likelihood of any  
94 relationship problem/loss (45.1% vs. 39.6%), specifically intimate partner problems (30.2% vs. 24.1%),  
95 arguments/conflicts (17.5% vs. 13.6%), and recently perpetrating interpersonal violence (3.0% vs. 1.4%). They  
96 were also more likely to have experienced any life stressors (54.2% vs 49.7%), such as criminal-legal problems  
97 (10.7% vs. 6.2%), or eviction/loss of home (4.3% vs. 3.4%) and were more likely to have had a crisis within the  
98 preceding or upcoming two weeks (32.9% vs. 26.0%). All of these differences remained significant in the  
99 adjusted models. Among those with crises, intimate partner problems were the most common types for both  
100 groups and did not differ between them. Similarly, physical health problems (23.2% and 21.4%) and job/financial  
101 problems (15.6% and 16.8%) did not differ between people without MHP and those with MPH, respectively, and  
102 were instead common to both groups.

103 Decedents without known MHP had significantly lower odds of recent release from any institution (aOR=0.5,  
104 95% CI=0.4-0.5), but among those who were recently released (5.1%), they were significantly more likely to be  
105 released from a correctional facility (25.7% vs. 8.7%) or hospital (43.7% vs. 33.0%) than those with a known  
106 MHP. Among decedents with known MHP who were recently released from an institution (10.2%), 46.7% of this  
107 group were released from psychiatric facilities.

108 Decedents without known MHP, compared to those with MHP, were significantly less likely to have a history of  
109 suicidal ideation (23.0% vs. 40.8%) and prior suicide attempts (10.3% vs. 29.4%). More than one in five people in  
110 both groups disclosed suicide intent (22.4% vs. 24.5%).

## 111 **Conclusions and Comments**

112 From 1999-2016, 44 states saw significant increases in suicide rates and 25 states experienced substantial  
113 increases in suicide rates of more than 30%. Rates increased significantly among males, in 34 states, and  
114 females, in 43 states. This finding is consistent with prior research showing a decreasing gender gap in male-  
115 female suicide rates between 1999-2014 (3). Additional research into the specific causes of these trends is  
116 necessary. Fortunately, data from the 27 states participating in NVDRS provides important insight into suicide  
117 circumstances and can help states identify prevention priorities.

118 Suicidologists regularly state that suicide is not caused by a single factor; (5) however, suicide prevention  
119 research and practice is heavily weighted towards clinically-oriented activities focused on MHP (6). The current  
120 study found that more than half of suicide decedents in NVDRS did *not* have a known MHP. This group suffered  
121 more relationship problems and life stressors such as criminal-legal matters, eviction/loss of home, and recent  
122 or impending crises. This is particularly noteworthy in light of findings that suggest many suicides and attempts  
123 occur with minimal deliberation (10).



124 Among people with MHP, two-thirds had a history of mental health and/or substance abuse treatment and over  
125 half were in current treatment. This suggests that additional supports for this population are needed to keep  
126 them safe. This includes broader implementation of affordable and effective treatment modalities such as  
127 doctor-patient collaborative care models and cognitive-behavioral therapy. Additionally, greater access to  
128 behavioral health providers in underserved areas is needed, as is expansion of healthcare systems to integrate  
129 physical and behavioral health that better support suicide prevention and patient safety, especially through care  
130 transitions (11).

131 Study findings indicate that people with known MHP also experienced other life stressors such as job/financial,  
132 relationship, and/or physical health problems. These findings point to the need to both prevent the conditions  
133 associated with mental health problems in the first place, and to support people with known MHP to decrease  
134 their risk of poor social, health, and economic outcomes (12).

135 Together, these results underscore the importance of comprehensive statewide suicide prevention activities  
136 that address multiple factors associated with suicide. Prevention strategies may include: strengthening  
137 economic supports (e.g., housing stabilization policies, household financial support); teaching coping and  
138 problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in  
139 life; promoting social connectedness to increase a sense of belongingness and access to informational, tangible,  
140 emotional, and social support; and identifying and better supporting people at risk. Other strategies include  
141 creating protective environments (e.g., reducing access to lethal means among people at risk, creating  
142 organizational and workplace policies to promote help-seeking, easing transitions into and out of work for  
143 people with MHP and other life challenges), supporting family and friends after a suicide, and assuring safe  
144 reporting by the media in order to prevent suicide contagion (11). Some states, such as Colorado, are planning  
145 to implement such a comprehensive approach to suicide prevention (13).

146 These findings have at least three limitations. In the state-level analysis, rankings for four states (MD, MA, RI,  
147 UT) might have been impacted by large proportions of injury deaths of undetermined intent (potentially biasing  
148 reported suicide rates downward), or decreased percentages of such deaths over time (potentially biasing  
149 estimated rate trends upward). Second, NVDRS is not yet nationally representative; the 27 states included  
150 represent 49.6% of the population  
151 (<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml>).

152 Third, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the  
153 extent of informant knowledge can impact data completeness and accuracy. Studies including more in-depth  
154 interviews with next-of-kin often see greater attributions to mental disorders (14), however many  
155 methodological variations across studies exist (15). It is likely that some people without known MHP in the  
156 current study were experiencing mental health challenges that were unknown, and hence underreported by key  
157 informants. However, any lack of awareness of decedent MHP suggests the importance of addressing the broad  
158 range of contributing circumstances.

159 Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are  
160 available. States and communities can use data from NVDRS and resources such as CDC's *Preventing Suicide: a*  
161 *Technical Package of Policies, Programs, and Practices* (11) to better understand their suicide problem, prioritize  
162 evidence-based comprehensive suicide prevention, and save lives.

163

## 164 Acknowledgments



The authors acknowledge Robert Anderson, Holly Hedegaard, and Margaret Warner from the Division of Vital Statistics, National Center for Health Statistics, CDC, for their statistical consultation.

**Conflict of Interest** No conflicts of interest were reported.

**Corresponding author:** Deborah M. Stone, [dstone3@cdc.gov](mailto:dstone3@cdc.gov), 770-488-3942

**Author Affiliations:**

<sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis, Research, and Practice Integration, National Center for Injury Prevention and Control, CDC

**References:**

- Centers for Disease Control and Prevention. Web-based Injury Statistics Query and Reporting System (WISQARS). Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018. In.
- Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide Trends Among and Within Urbanization Levels by Sex, Race/Ethnicity, Age Group, and Mechanism of Death - United States, 2001-2015. *MMWR Surveill Summ* 2017;66(18):1-16.
- Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999-2014. In: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics Hyattsville, MD; 2016.
- Kochanek K, Murphy S, Xu J, Arias E. Mortality in the United States, 2016. *NCHS Data Brief*, no 293. National Center for Health Statistics 2017.
- Office of the Surgeon General, National Action Alliance for Suicide Prevention. 2012 National strategy for suicide prevention: goals and objectives for action: a report of the US Surgeon General and of the National Action Alliance for Suicide Prevention. 2012.
- Zalsman G, Hawton K, Wasserman D, van Heeringen K, Arensman E, Sarchiapone M, et al. Suicide prevention strategies revisited: 10-year systematic review. *The Lancet Psychiatry* 2016;3(7):646-659.
- Torguson K, O'Brien A. Leading Suicide Prevention Efforts Unite to Address Rising National Suicide Rate. In. Washington, D.C.; 2017.
- Crepeau-Hobson F. The Psychological Autopsy and Determination of Child Suicides: A Survey of Medical Examiners. *Archives of Suicide Research* 2010;14(1):24-34.
- American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5®): American Psychiatric Pub; 2013.
- Simon TR, Swann AC, Powell KE, Potter LB, Kresnow Mj, O'Carroll PW. Characteristics of impulsive suicide attempts and attempters. *Suicide and Life-Threatening Behavior* 2002;32(s1):49-59.
- Stone DM, Holland KM, Bartholow BN, Crosby AE, Davis SP, Wilkins N. Preventing suicide: A technical package of policies, programs, and practice. 2017.
- World Health Organization. Risks to mental health: An overview of vulnerabilities and risk factors. Geneva: WHO 2012.
- Caine ED, Reed J, Hindman J, Quinlan K. Comprehensive, integrated approaches to suicide prevention: practical guidance. *Injury prevention* 2017;injuryprev-2017-042366.
- Milner A, Svetcic J, De Leo D. Suicide in the absence of mental disorder? A review of psychological autopsy studies across countries. *Int J Soc Psychiatry* 2013;59(6):545-54.
- Pouliot L, De Leo D. Critical issues in psychological autopsy studies. *Suicide Life Threat Behav* 2006;36(5):491-510.

**Attachments:**

Stone\_Suicide Vital Signs MMWR 4.2.18 (table 1.fig 1)

Stone\_Suicide Vital Signs MMWR 4.2.18 (Tables 2&3)

**Word Count:** 1879/1800



**Short Title:** Vital Signs: Contributing Circumstances to Suicide and Increasing Trends in State Suicide Rates

Deborah M. Stone, ScD;<sup>1</sup> Thomas R. Simon PhD;<sup>1</sup> Katherine A. Fowler, PhD;<sup>1</sup> Scott R. Kegler, PhD;<sup>2</sup> Keming Yuan, MS;<sup>1</sup> Kristin M. Holland, PhD;<sup>1</sup> Asha Z. Ivey-Stephenson, PhD;<sup>1</sup> Alex E. Crosby, MD<sup>1</sup>

**Background:** Suicide rates in the United States have risen nearly 30% since 1999. Mental health problems (MHP) are just one factor contributing to suicide. Examining state-level trends in, and the multiple contributing circumstances to, suicide can inform comprehensive state suicide prevention planning.

**Methods:** Trends in age-adjusted suicide rates among people aged  $\geq 10$  years, by state and sex, across six consecutive three-year periods (1999-2016), were assessed using data from the National Vital Statistics System for 50 states and Washington, D.C. Data from the National Violent Death Reporting System, covering 27 states in 2015, were used to examine contributing circumstances among decedents with and without known mental health problems (MHP).

**Results:** From 1999-2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases of more than 30%. Rates increased significantly among males and females in 34 and 43 states, respectively. In 2015, more than half (54%) of decedents in 27 states did not have a known MHP. Among people with circumstance information, several circumstances, including relationship problems/loss (45.1% vs 39.6%), life stressors (54.2% vs 49.7%), and recent/impending crises (32.9% vs 26.0%) were significantly more likely among those without a known MHP than decedents with MHP, but were common across groups.

**Conclusions:** Suicide rates increased significantly across most states from 1999-2016. Various circumstances contributed to suicides among people with and without known MHP.

**Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach to prevent suicide risk before it occurs, identify and support people at risk, prevent reattempts, and help friends/family after a suicide occurs.

## INTRODUCTION

### BACKGROUND AND PURPOSE

In 2016, nearly 45,000 suicides (15.6/100,000 [age-adjusted]) occurred in the United States (U.S.), among people  $\geq 10$  years old (1). Between 1999 and 2015, suicide rates increased across sexes, racial/ethnic groups, and urbanization levels (2, 3). Suicide is the 10<sup>th</sup> leading cause of death and is one of just three leading causes that are *increasing* (1, 4). Additionally, rates of Emergency Department visits for nonfatal self-harm, a key risk factor for suicide, increased nearly 45% between 2001 and 2015 (1). Together, suicides and self-harm injuries cost the nation more than \$69 billion in direct medical and work loss costs (1).

The *National Strategy for Suicide Prevention (NSSP)* (5) calls for a public health approach to suicide prevention with efforts spanning across multiple levels (i.e., individual, family/relationship, community, and societal). Such an approach underscores that suicide is rarely caused by any single factor, but rather, is multi-determined.

Despite the NSSP guidance, suicide prevention efforts are largely clinically-oriented, focused on treating mental health problems (MHP) and preventing re-attempts (6). Apart from MHP and prior attempts, other contributing circumstances to suicide include social and economic problems, access to lethal means (e.g., substances, firearms, bridges) among people at risk, and poor coping and problem-solving skills (5). Expanded awareness of these additional circumstances contributing to suicide risk and action to address them, can help reach the nation's goal of reducing suicide rates 20% by 2025 (7). To assist states in achieving this goal, this study analyzes



state-specific trends in suicide rates, assesses the multiple contributing factors to suicide, and provides recommendations for multi-level comprehensive suicide prevention.

## METHODS

Suicide rates were analyzed for people aged  $\geq 10$  years only, as [determining suicidal intent in younger children can be difficult](#) (8). Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases 10<sup>th</sup> Revision*, underlying-cause-of death codes X60-X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods spanning 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Characteristics and circumstances of suicide decedents  $\geq 10$  years, with and without known MHP, were compared in the 27 states with complete data participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines MHP as disorders and syndromes listed in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (9), with the exception of alcohol and other substance dependence, which are captured separately in NVDRS. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known MHP were compared using Chi-square tests. Logistic regression analyses estimated adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and race/ethnicity.

## RESULTS (665)

The most recent overall suicide rates (representing 2014-2016) varied four-fold, from 6.9 (D.C.) to 29.2 (Montana) per 100,000 persons per year (Table 1). Across the study period, rates increased in all states, except Nevada (which had a consistently high rate throughout), with absolute increases ranging from +0.8 (Delaware) to +8.1 (Wyoming) per 100,000. Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with increases of more than 30% observed in 25 states (Table 1, Figure 1).

Modeled suicide rate trends indicated significant increases for 44 states, for males (34 states) and females (43 states), as well as for the U.S. overall (Table 1). Nationally, the model-estimated AAPC for the overall suicide rate was +1.5%. By sex, estimated national rate trends further indicated significant increases for males (AAPC +1.1%) and females (AAPC +2.6%).

Suicide decedents without known MHP (N=11,039) were compared to those with MHP (N=9,407) in 27 states. While all decedents were predominately male (Table 2; 76.8%) and non-Hispanic white (83.6%), those without known MHP, relative to those with MHP, were more likely male (83.6% vs. 68.8%; odds ratio (OR)=2.3, 95% CI = 2.2-2.5) and racial/ethnic minorities (OR range: 1.2-2.0). Suicide decedents without known MHP also had significantly greater odds of perpetrating homicide-suicide (adjusted odds ratio aOR = 2.9, 95% CI = 2.2-3.8). Among adult decedents, 20.1% and 15.3% of people without and with MHP, respectively, ever served, or were currently serving, in the U.S. military.

While firearms were the most common method of suicide [used](#) overall (48.5%) and for both groups, decedents without known MHP were more likely to die by firearm (55.3% vs. 40.6%) and less likely to die by



84 hanging/strangulation/suffocation (26.9% vs 31.3%) or poisoning (10.4% vs 19.8%) than those with known MHP.  
85 These differences remained significant in the adjusted models.

86 Decedents without known MHP were less likely to receive toxicology testing. Among those with toxicology  
87 results, decedents without known MHP were less likely to test positive for any substance overall (aOR=0.8, 95%  
88 CI=0.7-0.8) but more likely to test positive for alcohol (aOR=1.2, 95% CI=1.1-1.3).

89 All suicide decedents with MHP (N=9,407) and approximately 85% without known MHP (N=9,357) had available  
90 circumstances information (Table 3). People without known MHP were less likely to have any substance abuse  
91 problems (aOR=0.7, 95% CI=0.7-0.8). While two-thirds of those with known MHP had a history of mental health  
92 or substance abuse treatment (67.2%), just over half (54.0%) were in current treatment.

93 Decedents without ~~known~~ MHP versus those with ~~known~~ MHP had significantly greater likelihood of any  
94 relationship problem/loss (45.1% vs. 39.6%), specifically intimate partner problems (30.2% vs. 24.1%),  
95 arguments/conflicts (17.5% vs. 13.6%), and recently perpetrating interpersonal violence (3.0% vs. 1.4%). They  
96 also were more likely to have experienced any life stressors (54.2% vs 49.7%), such as criminal-legal problems  
97 (10.7% vs. 6.2%), or eviction/loss of home (4.3% vs. 3.4%) and were more likely to have had a crisis within the  
98 preceding or upcoming two weeks (32.9% vs. 26.0%). All of these differences remained significant in the  
99 adjusted models. Among all people with crises, intimate partner problems were the most common types and did  
100 not differ between-them by group. Similarly, among people without versus with MHP, physical health problems  
101 (23.2% and 21.4%) and job/financial problems (15.6% and 16.8%) were commonly experienced and did not  
102 differ by group.

103 Decedents without known MHP had significantly lower odds of recent release from any institution (aOR=0.5,  
104 95% CI=0.4-0.5), but among those who were recently released (5.1%), they were significantly more likely to be  
105 released from a correctional facility (25.7% vs. 8.7%) or hospital (43.7% vs. 33.0%) than those with a known  
106 MHP. Among decedents with known MHP who were recently released from an institution (10.2%), 46.7% of this  
107 group were released from psychiatric facilities.

108 Decedents without known MHP, compared to those with MHP, were significantly less likely to have a history of  
109 suicidal ideation (23.0% vs. 40.8%) and prior suicide attempts (10.3% vs. 29.4%). More than one in five people in  
110 both groups disclosed suicide intent (22.4% vs. 24.5%).

## 111 Conclusions and Comments

112 From 1999-2016, 44 states saw significant increases in suicide rates and 25 states experienced substantial  
113 increases in suicide rates of more than 30%. Rates increased significantly among males, in 34 states, and  
114 females, in 43 states. This finding is consistent with prior research showing a decreasing gender gap in male-  
115 female suicide rates between 1999-2014 (3). Additional research into the specific causes of these trends is  
116 necessary. Fortunately, data from the 27 states participating in NVDRS provides important insight into suicide  
117 circumstances and can help states identify prevention priorities.

118 Suicidologists regularly state that suicide is not caused by a single factor; (5) however, suicide prevention  
119 research and practice is heavily oriented towards downstream treatment of MHP and prevention of reattempts.  
120 Additional focus on non-mental health factors, further upstream, is essential to a public health approach (10), as  
121 the current study found that more than half of suicide decedents in NVDRS did not have a known MHP. This  
122 group suffered more from relationship problems and other life stressors such as criminal-legal matters,  
123 eviction/loss of home, and recent or impending crises.

Comment [zaf9]: I like the upstream and downstream focus. What do you think?



Similarly, people with MHP also experienced other life stressors such as job/financial, relationship, and/or physical health problems. These findings point to the need to both prevent the conditions associated with mental health problems in the first place, and to support people with known MHP to decrease their risk of poor outcomes (11). Two-thirds of this group had a history of any mental health and/or substance abuse treatment, with over half in current treatment when they died. This suggests the need for additional safety supports, including broader implementation of affordable and effective treatment modalities such as doctor-patient collaborative care models and proven cognitive-behavioral therapies. y- Additionally, greater access to behavioral health providers in underserved areas is needed, as is expansion of healthcare systems needed that integrate physical and behavioral health that better support with a priority on suicide prevention and patient safety, especially through care transitions (12).

Comprehensive statewide suicide prevention activities are needed to address the full range of factors contributing to suicide comprehensive statewide suicide prevention activities that address multiple factors associated with suicide. Prevention strategies may Such strategies include: strengthening economic supports (e.g., housing stabilization policies, household financial support); teaching coping and problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in life; promoting social connectedness to increase a sense of belongingness and access to informational, tangible, emotional, and social support; and identifying and better supporting people at risk (e.g., Veterans, people with physical/mental health problems) (12). Other strategies include creating protective environments (e.g., reducing access to lethal means among people at risk, creating organizational and workplace policies to promote help-seeking, easing transitions into and out of work for people with MHP and other life challenges), supporting family and friends after a suicide, and assuring safe reporting by the media in order to prevent suicide contagion (12). Some states, such as Colorado, are planning to implement such a comprehensive approach to suicide prevention (10).

These findings have at least three limitations. In the state-level analysis, rankings for four states (MD, MA, RI, UT) might have been impacted by large proportions of injury deaths of undetermined intent (potentially biasing reported suicide rates downward), or decreased percentages of such deaths over time (potentially biasing estimated rate trends upward). Second, NVDRS is not yet nationally representative; the 27 states included represent 49.6% of the population (<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml>).

Third, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the extent of informant knowledge can impact data completeness and accuracy. Studies including more in-depth interviews with next-of-kin often see greater attributions to mental disorders (13), however many methodological variations across studies exist (14). It is likely that some people without known MHP in the current study were experiencing mental health challenges that were unknown, and hence underreported by key informants. However, any lack of awareness of decedent MHP suggests the importance of addressing the broad range of contributing circumstances.

Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are available. States and communities can use data from NVDRS and resources such as CDC's *Preventing Suicide: a Technical Package of Policies, Programs, and Practices* (12) to better understand their suicide problem, prioritize evidence-based comprehensive suicide prevention, and save lives.

## Acknowledgments



The authors acknowledge Robert Anderson, Holly Hedegaard, and Margaret Warner from the Division of Vital Statistics, National Center for Health Statistics, CDC, for their statistical consultation.

**Conflict of Interest** No conflicts of interest were reported.

**Corresponding author:** Deborah M. Stone, [dstone3@cdc.gov](mailto:dstone3@cdc.gov), 770-488-3942

**Author Affiliations:**

<sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis, Research, and Practice Integration, National Center for Injury Prevention and Control, CDC

**References:**

- Centers for Disease Control and Prevention. Web-based Injury Statistics Query and Reporting System (WISQARS). Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018. In.
- Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide Trends Among and Within Urbanization Levels by Sex, Race/Ethnicity, Age Group, and Mechanism of Death - United States, 2001-2015. *MMWR Surveill Summ* 2017;66(18):1-16.
- Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999-2014. In: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics Hyattsville, MD; 2016.
- Kochanek K, Murphy S, Xu J, Arias E. Mortality in the United States, 2016. *NCHS Data Brief*, no 293. National Center for Health Statistics 2017.
- Office of the Surgeon General, National Action Alliance for Suicide Prevention. 2012 National strategy for suicide prevention: goals and objectives for action: a report of the US Surgeon General and of the National Action Alliance for Suicide Prevention. 2012.
- Zalsman G, Hawton K, Wasserman D, van Heeringen K, Arensman E, Sarchiapone M, et al. Suicide prevention strategies revisited: 10-year systematic review. *The Lancet Psychiatry* 2016;3(7):646-659.
- Torguson K, O'Brien A. Leading Suicide Prevention Efforts Unite to Address Rising National Suicide Rate. In. Washington, D.C.; 2017.
- Crepeau-Hobson F. The Psychological Autopsy and Determination of Child Suicides: A Survey of Medical Examiners. *Archives of Suicide Research* 2010;14(1):24-34.
- American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5®): American Psychiatric Pub; 2013.
- Caine ED, Reed J, Hindman J, Quinlan K. Comprehensive, integrated approaches to suicide prevention: practical guidance. *Injury prevention* 2017;injuryprev-2017-042366.
- World Health Organization. Risks to mental health: An overview of vulnerabilities and risk factors. Geneva: WHO 2012.
- Stone DM, Holland KM, Bartholow BN, Crosby AE, Davis SP, Wilkins N. Preventing suicide: A technical package of policies, programs, and practice. 2017.
- Milner A, Svetlicic J, De Leo D. Suicide in the absence of mental disorder? A review of psychological autopsy studies across countries. *Int J Soc Psychiatry* 2013;59(6):545-54.
- Pouliot L, De Leo D. Critical issues in psychological autopsy studies. *Suicide Life Threat Behav* 2006;36(5):491-510.

**Attachments:**

Stone\_Suicide Vital Signs MMWR 4.3.18 (table 1.fig 1)

Stone\_Suicide Vital Signs MMWR 4.3.18 (Tables 2&3)

**Word Count:** 186741/1800



1 **Short Title:** Vital Signs: Contributing Circumstances to Suicide and Increasing Trends in State Suicide Rates

2 Deborah M. Stone, ScD;<sup>1</sup> Thomas R. Simon PhD;<sup>1</sup> Katherine A. Fowler, PhD;<sup>1</sup> Scott R. Kegler, PhD;<sup>2</sup> Keming Yuan,  
3 MS;<sup>1</sup> Kristin M. Holland, PhD;<sup>1</sup> Asha Z. Ivey-Stephenson, PhD;<sup>1</sup> Alex E. Crosby, MD<sup>1</sup>

4 **Background:** Suicide rates in the United States have risen nearly 30% since 1999. There is no single cause of  
5 suicide. Mental health problems (MHP) are just one factor contributing to suicide. Examining state-level trends  
6 in, and the multiple contributing circumstances to, suicide can inform comprehensive state suicide prevention  
7 planning.

8 **Methods:** Trends in age-adjusted suicide rates among people aged ≥10 years, by state and sex, across six  
9 consecutive three-year periods (1999-2016), were assessed using data from the National Vital Statistics System  
10 for 50 states and Washington, D.C. Data from the National Violent Death Reporting System, covering 27 states  
11 in 2015, were used to examine contributing circumstances among decedents with and without known mental  
12 health problems (MHP).

13 **Results:** From 1999-2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases  
14 of more than 30%. Rates increased significantly among males and females in 34 and 43 states, respectively. In  
15 2015, more than half (54%) of decedents in 27 states did not have a known MHP. Among people with  
16 circumstance information, several circumstances, including relationship problems/loss (45.1% vs 39.6%), life  
17 stressors (54.2% vs 49.7%), and recent/impending crises (32.9% vs 26.0%) were significantly more likely among  
18 those without a known MHP than decedents with MHP, but were common across groups.

19 **Conclusions:** Suicide rates increased significantly across most states from 1999-2016. Various circumstances  
20 contributed to suicides among people with and without known MHP.

21 **Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach  
22 to prevent suicide risk before it occurs, identify and support people at risk, prevent reattempts, and help  
23 friends/family after a suicide occurs.

24 **INTRODUCTION**

25 **BACKGROUND AND PURPOSE**

26 In 2016, nearly 45,000 suicides (15.6/100,000 [age-adjusted]) occurred in the United States (U.S.), among people  
27 ≥10 years old (1). Between 1999 and 2015, suicide rates increased across sexes, racial/ethnic groups, and  
28 urbanization levels (2, 3). Suicide is the 10<sup>th</sup> leading cause of death and is one of just three leading causes that  
29 are *increasing* (1, 4). Additionally, rates of Emergency Department visits for nonfatal self-harm, a key risk factor  
30 for suicide, increased nearly 45% between 2001 and 2015 (1). Together, suicides and self-harm injuries cost the  
31 nation more than \$69 billion in direct medical and work loss costs (1).

32 The *National Strategy for Suicide Prevention*(NSSP) (5) calls for a public health approach to suicide prevention  
33 with efforts spanning across multiple levels (i.e., individual, family/relationship, community, and societal). Such  
34 an approach underscores that suicide is rarely caused by any single factor, but rather, is multi-determined.

35 Despite the NSSP guidance, suicide prevention efforts are largely clinically-oriented, focused on treating mental  
36 health problems (MHP) and preventing re-attempts (6). Apart (including? from) MHP and prior attempts, other  
37 contributing circumstances to suicide include social and economic problems, access to lethal means (e.g.,  
38 substances, firearms, bridges) among people at risk, and poor coping and problem-solving skills (5). Expanded  
39 awareness of these additional circumstances contributing to suicide risk and action to address them, can help  
40 reach the nation's goal of reducing suicide rates 20% by 2025 (7). To assist states in achieving this goal, this

Comment [za19]: Maybe take out 'just'

Comment [za19]: From Jane: Suicide rates in the United States have risen nearly 30% since 1999. There is no single cause of suicidal behavior. Mental health problems (MHP) among suicide decedents are often identified through health care visits, and individuals seeking mental health services are at elevated risk for suicide. However, many other factors can contribute to suicide risk. Examining state-level trends and the multiple contributing circumstances to suicide can inform comprehensive state suicide prevention planning.

Comment [za19]: From Jane: Apart from MHP and prior attempts, other circumstances contributing to suicidal thoughts and behaviors include inadequate coping and problem-solving skills, inadequate support resources, social and economic problems, and access to lethal means (e.g., substances, firearms, bridges) (5). Expanded awareness of these additional circumstances contributing to suicide risk and taking action to address them, can help communities and states reach the nation's goal of reducing suicide deaths 20% by 2025 (7).

Comment [za19]: Richard suggests using this cleared language instead, "Despite the NSSP guidance, The NSSP IAAG was, however, unable to find any state or community implementing the full range of comprehensive, coordinated, and effective suicide prevention efforts across all relevant settings and populations."

He also says this isn't true. The field has

Comment [za19]: Instead of Apart from MHP and prior attempts, other contributing.. we could say in addition to or Including MHP



study analyzes state-specific trends in suicide rates, assesses the multiple contributing factors to suicide, and provides recommendations for multi-level comprehensive suicide prevention.

## METHODS

Suicide rates were analyzed for people aged  $\geq 10$  years only, as determining suicidal intent in younger children can be difficult (8). Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases 10<sup>th</sup> Revision*, underlying-cause-of death codes X60-X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods spanning 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Characteristics and circumstances of suicide decedents  $\geq 10$  years old, with and without known MHP, were compared in the 27 states with complete data participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines MHP as disorders and syndromes listed in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (9), with the exception of alcohol and other substance dependence, which are captured separately in NVDRS. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known MHP were compared using Chi-square tests. Logistic regression analyses estimated adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and race/ethnicity.

## RESULTS (665)

The most recent overall suicide rates (representing 2014-2016) varied four-fold, from 6.9 (D.C.) to 29.2 (Montana) per 100,000 persons per year (Table 1). Across the study period, rates increased in all states, except Nevada (which had a consistently high rate throughout), with absolute increases ranging from +0.8 (Delaware) to +8.1 (Wyoming) per 100,000. Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with increases of more than 30% observed in 25 states (Table 1, Figure 1).

Modeled suicide rate trends indicated significant increases for 44 states, for males (34 states) and females (43 states), as well as for the U.S. overall (Table 1). Nationally, the model-estimated AAPC for the overall suicide rate was +1.5%. By sex, estimated national rate trends further indicated significant increases for males (AAPC +1.1%) and females (AAPC +2.6%).

Suicide decedents without known MHP (N=11,039) were compared to those with MHP (N=9,407) in 27 states. While all decedents were predominately male (Table 2; 76.8%) and non-Hispanic white (83.6%), those without known MHP, relative to those with MHP, were more likely male (83.6% vs. 68.8%; odds ratio (OR)=2.3, 95% CI = 2.2-2.5) and racial/ethnic minorities (OR range: 1.2-2.0). Suicide decedents without known MHP also had significantly greater odds of perpetrating homicide-suicide (adjusted odds ratio aOR = 2.9, 95% CI = 2.2-3.8). Among adult decedents, 20.1% and 15.3% of people without and with MHP, respectively, ever served, or were currently serving, in the U.S. military.

While firearms were the most common method of suicide used overall (48.5%) and for both groups, decedents without known MHP were more likely to die by firearm (55.3% vs. 40.6%) and less likely to die by

85 hanging/strangulation/suffocation (26.9% vs 31.3%) or poisoning (10.4% vs 19.8%) than those with known MHP.  
86 These differences remained significant in the adjusted models.

87 Decedents without known MHP were less likely to receive toxicology testing. Among those with toxicology  
88 results, decedents without known MHP were less likely to test positive for any substance overall (aOR=0.8, 95%  
89 CI=0.7-0.8) but more likely to test positive for alcohol (aOR=1.2, 95% CI=1.1-1.3).

90 All suicide decedents with MHP (N=9,407) and approximately 85% without known MHP (N=9,357) had available  
91 circumstances information (Table 3). People without known MHP were less likely to have any substance abuse  
92 problems (aOR=0.7, 95% CI=0.7-0.8). While two-thirds of those with known MHP had a history of mental health  
93 or substance abuse treatment (67.2%), just over half (54.0%) were in current treatment.

94 Decedents without, versus those with, known MHP, had significantly greater likelihood of any relationship  
95 problem/loss (45.1% vs. 39.6%), specifically intimate partner problems (30.2% vs. 24.1%), arguments/conflicts  
96 (17.5% vs. 13.6%), and recently perpetrating interpersonal violence (3.0% vs. 1.4%). They also were more likely  
97 to have experienced any life stressors (54.2% vs 49.7%), such as criminal-legal problems (10.7% vs. 6.2%), or  
98 eviction/loss of home (4.3% vs. 3.4%) and were more likely to have had a crisis within the preceding or  
99 upcoming two weeks (32.9% vs. 26.0%). All of these differences remained significant in the adjusted models.  
100 Among all people with crises, intimate partner problems were the most common types and did not differ by  
101 group. Similarly, among people without versus with MHP, physical health problems (23.2% and 21.4%) and  
102 job/financial problems (15.6% and 16.8%) were commonly experienced and did not differ by group.

103 Decedents without known MHP had significantly lower odds of recent release from any institution (aOR=0.5,  
104 95% CI=0.4-0.5), but among those who were recently released (5.1%), they were significantly more likely to be  
105 released from a correctional facility (25.7% vs. 8.7%) or hospital (43.7% vs. 33.0%) than those with a known  
106 MHP. Among decedents with known MHP who were recently released from an institution (10.2%), 46.7% of this  
107 group were released from psychiatric facilities.

108 Decedents without known MHP, compared to those with MHP, were significantly less likely to have a history of  
109 suicidal ideation (23.0% vs. 40.8%) and prior suicide attempts (10.3% vs. 29.4%). More than one in five people in  
110 both groups disclosed suicide intent (22.4% vs. 24.5%).

## 111 Conclusions and Comments

112 From 1999-2016, 44 states saw significant increases in suicide rates and 25 states experienced substantial  
113 increases in suicide rates of more than 30%. Rates increased significantly among males, in 34 states, and  
114 females, in 43 states. This finding is consistent with prior research showing a decreasing gender gap in male-  
115 female suicide rates between 1999-2014 (3). Additional research into the specific causes of these trends is  
116 necessary. Fortunately, data from the 27 states participating in NVDRS provides important insight into suicide  
117 circumstances and can help states identify prevention priorities.

118 Suicidologists regularly state that suicide is not caused by a single factor; (5) however, suicide prevention  
119 research and practice is heavily oriented towards downstream treatment of MHP and prevention of reattempts.  
120 Additional focus on non-mental health factors, further upstream, is essential to a public health approach (10), as  
121 the current study found that more than half of suicide decedents in NVDRS did not have a known MHP. This  
122 group suffered more from relationship problems and other life stressors such as criminal-legal matters,  
123 eviction/loss of home, and recent or impending crises.

124 Similarly, people with MHP also experienced other life stressors such as job/financial, relationship, and/or  
125 physical health problems. These findings point to the need to both prevent the conditions associated with

Comment [za19]: More likely to have experienced or anticipated a crisis

Comment [za19]: "much of suicide prevention practice has focused on identifying suicidal people in the community, so increased focus is needed on how to "move upstream" and prevent people from becoming suicidal people in the first place.



mental health problems in the first place, and to support people with known MHP to decrease their risk of poor outcomes (11). Two-thirds of this group had a history of any mental health and/or substance abuse treatment, with over half in treatment when they died. This suggests the need for additional safety supports, including broader implementation of affordable and effective treatment modalities such as doctor-patient collaborative care models and proven cognitive-behavioral therapies. Additionally, greater access to behavioral health providers in underserved areas is needed, as is expansion of healthcare systems needed that integrates physical and behavioral health with a priority on suicide prevention and patient safety, especially through care transitions (12).

Comprehensive statewide suicide prevention activities are needed to address the full range of factors contributing to suicide. Prevention strategies include: strengthening economic supports (e.g., housing stabilization policies, household financial support); teaching coping and problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in life; promoting social connectedness to increase a sense of belongingness and access to informational, tangible, emotional, and social support; and identifying and better supporting people at risk (e.g., Veterans, people with physical/mental health problems) (12). Other strategies include creating protective environments (e.g., reducing access to lethal means among people at risk, creating organizational and workplace policies to promote help-seeking, easing transitions into and out of work for people with MHP and other life challenges), supporting family and friends after a suicide, and assuring safe reporting by the media in order to prevent suicide contagion (12). Some states, such as Colorado, are planning to implement such a comprehensive approach to suicide prevention (10).

These findings have at least three limitations. In the state-level analysis, rankings for four states (MD, MA, RI, UT) might have been impacted by large proportions of injury deaths of undetermined intent (potentially biasing reported suicide rates downward), or decreased percentages of such deaths over time (potentially biasing estimated rate trends upward). Second, NVDRS is not yet nationally representative; the 27 states included represent 49.6% of the population (<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml>).

Third, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the extent of informant knowledge can impact data completeness and accuracy. Studies including more in-depth interviews with next-of-kin often see greater attributions to mental disorders (13), however many methodological variations across studies exist (14). It is likely that some people without known MHP in the current study were experiencing mental health challenges that were unknown, and hence underreported by key informants. However, any lack of awareness of decedent MHP suggests the importance of addressing the broad range of contributing circumstances.

Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are available. States and communities can use data from NVDRS and resources such as CDC's *Preventing Suicide: a Technical Package of Policies, Programs, and Practices* (12) to better understand their suicide problem, prioritize evidence-based comprehensive suicide prevention, and save lives.

## Acknowledgments

The authors acknowledge Robert Anderson, Holly Hedegaard, and Margaret Warner from the Division of Vital Statistics, National Center for Health Statistics, CDC, for their statistical consultation.

**Conflict of Interest** No conflicts of interest were reported.



169 **Corresponding author:** Deborah M. Stone, [dstone3@cdc.gov](mailto:dstone3@cdc.gov), 770-488-3942

170 **Author Affiliations:**

171 <sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis,  
172 Research, and Practice Integration, National Center for Injury Prevention and Control, CDC

173 **References:**

- 174 1. Centers for Disease Control and Prevention. Web-based Injury Statistics Query and Reporting System  
175 (WISQARS). Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018. In.
- 176 2. Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide Trends Among and  
177 Within Urbanization Levels by Sex, Race/Ethnicity, Age Group, and Mechanism of Death - United States,  
178 2001-2015. *MMWR Surveill Summ* 2017;66(18):1-16.
- 179 3. Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999-2014. In: US Department  
180 of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health  
181 Statistics Hyattsville, MD; 2016.
- 182 4. Kochanek K, Murphy S, Xu J, Arias E. Mortality in the United States, 2016. *NCHS Data Brief*, no 293.  
183 National Center for Health Statistics 2017.
- 184 5. Office of the Surgeon General, National Action Alliance for Suicide Prevention. 2012 National strategy for  
185 suicide prevention: Goals and objectives for action: a report of the US Surgeon General and of the National  
186 Action Alliance for Suicide Prevention. 2012.
- 187 6. Zalsman G, Hawton K, Wasserman D, van Heeringen K, Arensman E, Sarchiapone M, et al. Suicide  
188 prevention strategies revisited: 10-year systematic review. *The Lancet Psychiatry* 2016;3(7):646-659.
- 189 7. Torguson K, O'Brien A. Leading Suicide Prevention Efforts Unite to Address Rising National Suicide Rate. In.  
190 Washington, D.C.; 2017.
- 191 8. Crepeau-Hobson F. The Psychological Autopsy and Determination of Child Suicides: A Survey of Medical  
192 Examiners. *Archives of Suicide Research* 2010;14(1):24-34.
- 193 9. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5®):  
194 American Psychiatric Pub; 2013.
- 195 10. Caine ED, Reed J, Hindman J, Quinlan K. Comprehensive, integrated approaches to suicide prevention:  
196 practical guidance. *Injury prevention* 2017;injuryprev-2017-042366.
- 197 11. World Health Organization. Risks to mental health: An overview of vulnerabilities and risk factors. Geneva:  
198 WHO 2012.
- 199 12. Stone DM, Holland KM, Bartholow BN, Crosby AE, Davis SP, Wilkins N. Preventing suicide: A technical  
200 package of policies, programs, and practice. 2017.
- 201 13. Milner A, Svetcic J, De Leo D. Suicide in the absence of mental disorder? A review of psychological autopsy  
202 studies across countries. *Int J Soc Psychiatry* 2013;59(6):545-54.
- 203 14. Pouliot L, De Leo D. Critical issues in psychological autopsy studies. *Suicide Life Threat Behav*  
204 2006;36(5):491-510.

205 **Attachments:**

206 Stone\_Suicide Vital Signs MMWR 3.27.18 (table 1.fig 1)

207 Stone\_Suicide Vital Signs MMWR 4.5.18 (Tables 2&3)

208 **Word Count:** 1868/1800



**Short Title:** Vital Signs: Contributing Circumstances to Suicide and Increasing Trends in State Suicide Rates

Deborah M. Stone, ScD;<sup>1</sup> Thomas R. Simon PhD;<sup>1</sup> Katherine A. Fowler, PhD;<sup>1</sup> Scott R. Kegler, PhD;<sup>2</sup> Keming Yuan, MS;<sup>1</sup> Kristin M. Holland, PhD;<sup>1</sup> Asha Z. Ivey-Stephenson, PhD;<sup>1</sup> Alex E. Crosby, MD<sup>1</sup>

**Background:** Suicide rates in the United States have risen nearly 30% since 1999. Mental health problems (MHP) are just one factor contributing to suicide. Examining state-level trends in, and the multiple contributing circumstances to, suicide can inform comprehensive state suicide prevention planning.

**Methods:** Trends in age-adjusted suicide rates among people aged  $\geq 10$  years, by state and sex, across six consecutive three-year periods (1999-2016), were assessed using data from the National Vital Statistics System for 50 states and Washington, D.C. Data from the National Violent Death Reporting System, covering 27 states in 2015, were used to examine contributing circumstances among decedents with and without known mental health problems (MHP).

**Results:** From 1999-2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases of more than 30%. Rates increased significantly among males and females in 34 and 43 states, respectively. In 2015, more than half (54%) of decedents in 27 states did not have a known MHP. Among people with circumstance information, several circumstances, including relationship problems/loss (45.1% vs 39.6%), life stressors (54.2% vs 49.7%), and recent/impending crises (32.9% vs 26.0%) were significantly more likely among those without a known MHP than decedents with MHP, but were common across groups.

**Conclusions:** Suicide rates increased significantly across most states from 1999-2016. Various circumstances contributed to suicides among people with and without known MHP.

**Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach to prevent suicide risk before it occurs, identify and support people at risk, prevent reattempts, and help friends/family after a suicide occurs.

## INTRODUCTION

### BACKGROUND AND PURPOSE

In 2016, nearly 45,000 suicides (15.6/100,000 [age-adjusted]) occurred in the United States (U.S.), among people  $\geq 10$  years old (1). Between 1999 and 2015, suicide rates increased across sexes, racial/ethnic groups, and urbanization levels (2, 3). Suicide is the 10<sup>th</sup> leading cause of death and is one of just three leading causes that are *increasing* (1, 4). Additionally, rates of Emergency Department visits for nonfatal self-harm, a key risk factor for suicide, increased nearly 45% between 2001 and 2015 (1). Together, suicides and self-harm injuries cost the nation more than \$69 billion in direct medical and work loss costs (1).

The *National Strategy for Suicide Prevention (NSSP)* (5) calls for a public health approach to suicide prevention with efforts spanning across multiple levels (i.e., individual, family/relationship, community, and societal). Such an approach underscores that suicide is rarely caused by any single factor, but rather, is multi-determined. Despite the NSSP guidance, suicide prevention efforts are largely clinically-oriented, focused on treating mental health problems (MHP) and preventing re-attempts (6). Apart from MHP and prior attempts, other contributing circumstances to suicide include social and economic problems, access to lethal means (e.g., substances, firearms, bridges) among people at risk, and poor coping and problem-solving skills (5). Expanded awareness of these additional circumstances contributing to suicide risk and action to address them, can help reach the nation's goal of reducing suicide rates 20% by 2025 (7). To assist states in achieving this goal, this study analyzes

state-specific trends in suicide rates, assesses the multiple contributing factors to suicide, and provides recommendations for multi-level comprehensive suicide prevention.

## METHODS

Suicide rates were analyzed for people aged  $\geq 10$  years only, as determining suicidal intent in younger children can be difficult (8). Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases 10<sup>th</sup> Revision*, underlying-cause-of death codes X60-X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods spanning 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Characteristics and circumstances of suicide decedents  $\geq 10$  years old, with and without known MHP, were compared in the 27 states with complete data participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines MHP as disorders and syndromes listed in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (9), with the exception of alcohol and other substance dependence, which are captured separately in NVDRS. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known MHP were compared using Chi-square tests. Logistic regression analyses estimated adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and race/ethnicity.

## RESULTS (665)

The most recent overall suicide rates (representing 2014-2016) varied four-fold, from 6.9 (D.C.) to 29.2 (Montana) per 100,000 persons per year (Table 1). Across the study period, rates increased in all states, except Nevada (which had a consistently high rate throughout), with absolute increases ranging from +0.8 (Delaware) to +8.1 (Wyoming) per 100,000. Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with increases of more than 30% observed in 25 states (Table 1, Figure 1).

Modeled suicide rate trends indicated significant increases for 44 states, for males (34 states) and females (43 states), as well as for the U.S. overall (Table 1). Nationally, the model-estimated AAPC for the overall suicide rate was +1.5%. By sex, estimated national rate trends further indicated significant increases for males (AAPC +1.1%) and females (AAPC +2.6%).

Suicide decedents without known MHP (N=11,039) were compared to those with MHP (N=9,407) in 27 states. While all decedents were predominately male (Table 2; 76.8%) and non-Hispanic white (83.6%), those without known MHP, relative to those with MHP, were more likely male (83.6% vs. 68.8%; odds ratio (OR)=2.3, 95% CI = 2.2-2.5) and racial/ethnic minorities (OR range: 1.2-2.0). Suicide decedents without known MHP also had significantly greater odds of perpetrating homicide-suicide (adjusted odds ratio aOR = 2.9, 95% CI = 2.2-3.8). Among adult decedents, 20.1% and 15.3% of people without and with MHP, respectively, ever served, or were currently serving, in the U.S. military.

While firearms were the most common method of suicide used overall (48.5%) and for both groups, decedents without known MHP were more likely to die by firearm (55.3% vs. 40.6%) and less likely to die by



84 hanging/strangulation/suffocation (26.9% vs 31.3%) or poisoning (10.4% vs 19.8%) than those with known MHP.  
85 These differences remained significant in the adjusted models.

86 Decedents without known MHP were less likely to receive toxicology testing. Among those with toxicology  
87 results, decedents without known MHP were less likely to test positive for any substance overall (aOR=0.8, 95%  
88 CI=0.7-0.8) but more likely to test positive for alcohol (aOR=1.2, 95% CI=1.1-1.3).

89 All suicide decedents with MHP (N=9,407) and approximately 85% without known MHP (N=9,357) had available  
90 circumstances information (Table 3). People without known MHP were less likely to have any substance abuse  
91 problems (aOR=0.7, 95% CI=0.7-0.8). While two-thirds of those with known MHP had a history of mental health  
92 or substance abuse treatment (67.2%), just over half (54.0%) were in current treatment.

93 Decedents without, versus those with, known MHP, had significantly greater likelihood of any relationship  
94 problem/loss (45.1% vs. 39.6%), specifically intimate partner problems (30.2% vs. 24.1%), arguments/conflicts  
95 (17.5% vs. 13.6%), and recently perpetrating interpersonal violence (3.0% vs. 1.4%). They also were more likely  
96 to have experienced any life stressors (54.2% vs 49.7%), such as criminal-legal problems (10.7% vs. 6.2%), or  
97 eviction/loss of home (4.3% vs. 3.4%) and were more likely to have had a crisis within the preceding or  
98 upcoming two weeks (32.9% vs. 26.0%). All of these differences remained significant in the adjusted models.  
99 Among all people with crises, intimate partner problems were the most common types and did not differ by  
100 group. Similarly, among people without versus with MHP, physical health problems (23.2% and 21.4%) and  
101 job/financial problems (15.6% and 16.8%) were commonly experienced and did not differ by group.

102 Decedents without known MHP had significantly lower odds of recent release from any institution (aOR=0.5,  
103 95% CI=0.4-0.5), but among those who were recently released (5.1%), they were significantly more likely to be  
104 released from a correctional facility (25.7% vs. 8.7%) or hospital (43.7% vs. 33.0%) than those with a known  
105 MHP. Among decedents with known MHP who were recently released from an institution (10.2%), 46.7% of this  
106 group were released from psychiatric facilities.

107 Decedents without known MHP, compared to those with MHP, were significantly less likely to have a history of  
108 suicidal ideation (23.0% vs. 40.8%) and prior suicide attempts (10.3% vs. 29.4%). More than one in five people in  
109 both groups disclosed suicide intent (22.4% vs. 24.5%).

## 110 **Conclusions and Comments**

111 From 1999-2016, 44 states saw significant increases in suicide rates and 25 states experienced substantial  
112 increases in suicide rates of more than 30%. Rates increased significantly among males, in 34 states, and  
113 females, in 43 states. This finding is consistent with prior research showing a decreasing gender gap in male-  
114 female suicide rates between 1999-2014 (3). Additional research into the specific causes of these trends is  
115 necessary. Fortunately, data from the 27 states participating in NVDRS provides important insight into suicide  
116 circumstances and can help states identify prevention priorities.

117 Suicidologists regularly state that suicide is not caused by a single factor; (5) however, suicide prevention  
118 research and practice is heavily oriented towards downstream treatment of MHP and prevention of reattempts.  
119 Additional focus on non-mental health factors, further upstream, is essential to a public health approach (10), as  
120 the current study found that more than half of suicide decedents in NVDRS did *not* have a known MHP. This  
121 group suffered more from relationship problems and other life stressors such as criminal-legal matters,  
122 eviction/loss of home, and recent or impending crises.

123 Similarly, people with MHP also experienced other life stressors such as job/financial, relationship, and/or  
124 physical health problems. These findings point to the need to both prevent the conditions associated with

mental health problems in the first place, and to support people with known MHP to decrease their risk of poor outcomes (11). Two-thirds of this group had a history of any mental health and/or substance abuse treatment, with over half in treatment when they died. This suggests the need for additional safety supports, including broader implementation of affordable and effective treatment modalities such as doctor-patient collaborative care models and proven cognitive-behavioral therapies. Additionally, greater access to behavioral health providers in underserved areas is needed, as is expansion of healthcare systems needed that integrates physical and behavioral health with a priority on suicide prevention and patient safety, especially through care transitions (12).

Comprehensive statewide suicide prevention activities are needed to address the full range of factors contributing to suicide. Prevention strategies include: strengthening economic supports (e.g., housing stabilization policies, household financial support); teaching coping and problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in life; promoting social connectedness to increase a sense of belongingness and access to informational, tangible, emotional, and social support; and identifying and better supporting people at risk (e.g., Veterans, people with physical/mental health problems) (12). Other strategies include creating protective environments (e.g., reducing access to lethal means among people at risk, creating organizational and workplace policies to promote help-seeking, easing transitions into and out of work for people with MHP and other life challenges), supporting family and friends after a suicide, and assuring safe reporting by the media in order to prevent suicide contagion (12). Some states, such as Colorado, are planning to implement such a comprehensive approach to suicide prevention (10).

These findings have at least three limitations. In the state-level analysis, rankings for four states (MD, MA, RI, UT) might have been impacted by large proportions of injury deaths of undetermined intent (potentially biasing reported suicide rates downward), or decreased percentages of such deaths over time (potentially biasing estimated rate trends upward). Second, NVDRS is not yet nationally representative; the 27 states included represent 49.6% of the population (<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml>).

Third, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the extent of informant knowledge can impact data completeness and accuracy. Studies including more in-depth interviews with next-of-kin often see greater attributions to mental disorders (13), however many methodological variations across studies exist (14). It is likely that some people without known MHP in the current study were experiencing mental health challenges that were unknown, and hence underreported by key informants. However, any lack of awareness of decedent MHP suggests the importance of addressing the broad range of contributing circumstances.

Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are available. States and communities can use data from NVDRS and resources such as CDC's *Preventing Suicide: a Technical Package of Policies, Programs, and Practices* (12) to better understand their suicide problem, prioritize evidence-based comprehensive suicide prevention, and save lives.

## Acknowledgments

The authors acknowledge Robert Anderson, Holly Hedegaard, and Margaret Warner from the Division of Vital Statistics, National Center for Health Statistics, CDC, for their statistical consultation.

**Conflict of Interest** No conflicts of interest were reported.



168 **Corresponding author:** Deborah M. Stone, [dstone3@cdc.gov](mailto:dstone3@cdc.gov), 770-488-3942

169 **Author Affiliations:**

170 <sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis,  
171 Research, and Practice Integration, National Center for Injury Prevention and Control, CDC

172 **References:**

- 173 1. Centers for Disease Control and Prevention. Web-based Injury Statistics Query and Reporting System  
174 (WISQARS). Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018. In.
- 175 2. Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide Trends Among and  
176 Within Urbanization Levels by Sex, Race/Ethnicity, Age Group, and Mechanism of Death - United States,  
177 2001-2015. *MMWR Surveill Summ* 2017;66(18):1-16.
- 178 3. Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999-2014. In: US Department  
179 of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health  
180 Statistics Hyattsville, MD; 2016.
- 181 4. Kochanek K, Murphy S, Xu J, Arias E. Mortality in the United States, 2016. *NCHS Data Brief*, no 293.  
182 National Center for Health Statistics 2017.
- 183 5. Office of the Surgeon General, National Action Alliance for Suicide Prevention. 2012 National strategy for  
184 suicide prevention: Goals and objectives for action: a report of the US Surgeon General and of the National  
185 Action Alliance for Suicide Prevention. 2012.
- 186 6. Zalsman G, Hawton K, Wasserman D, van Heeringen K, Arensman E, Sarchiapone M, et al. Suicide  
187 prevention strategies revisited: 10-year systematic review. *The Lancet Psychiatry* 2016;3(7):646-659.
- 188 7. Torguson K, O'Brien A. Leading Suicide Prevention Efforts Unite to Address Rising National Suicide Rate. In.  
189 Washington, D.C.; 2017.
- 190 8. Crepeau-Hobson F. The Psychological Autopsy and Determination of Child Suicides: A Survey of Medical  
191 Examiners. *Archives of Suicide Research* 2010;14(1):24-34.
- 192 9. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5®):  
193 American Psychiatric Pub; 2013.
- 194 10. Caine ED, Reed J, Hindman J, Quinlan K. Comprehensive, integrated approaches to suicide prevention:  
195 practical guidance. *Injury prevention* 2017;injuryprev-2017-042366.
- 196 11. World Health Organization. Risks to mental health: An overview of vulnerabilities and risk factors. Geneva:  
197 WHO 2012.
- 198 12. Stone DM, Holland KM, Bartholow BN, Crosby AE, Davis SP, Wilkins N. Preventing suicide: A technical  
199 package of policies, programs, and practice. 2017.
- 200 13. Milner A, Svetcic J, De Leo D. Suicide in the absence of mental disorder? A review of psychological autopsy  
201 studies across countries. *Int J Soc Psychiatry* 2013;59(6):545-54.
- 202 14. Pouliot L, De Leo D. Critical issues in psychological autopsy studies. *Suicide Life Threat Behav*  
203 2006;36(5):491-510.

204 **Attachments:**

205 Stone\_Suicide Vital Signs MMWR 3.27.18 (table 1.fig 1)

206 Stone\_Suicide Vital Signs MMWR 4.5.18 (Tables 2&3)

207 **Word Count:** 1868/1800



**Short Title:** Vital Signs: Contributing Circumstances to Suicide and Increasing Trends in State Suicide Rates

Deborah M. Stone, ScD;<sup>1</sup> Thomas R. Simon PhD;<sup>1</sup> Katherine A. Fowler, PhD;<sup>1</sup> Scott R. Kegler, PhD;<sup>2</sup> Keming Yuan, MS;<sup>1</sup> Kristin M. Holland, PhD;<sup>1</sup> Asha Z. Ivey-Stephenson, PhD;<sup>1</sup> Alex E. Crosby, MD<sup>1</sup>

**Background:** Suicide rates in the United States have risen nearly 30% since 1999. Mental health problems (MHP) are just one factor contributing to suicide. Examining state-level trends in, and the multiple contributing circumstances to, suicide can inform comprehensive state suicide prevention planning.

**Methods:** Trends in age-adjusted suicide rates among people aged  $\geq 10$  years, by state and sex, across six consecutive three-year periods (1999-2016), were assessed using data from the National Vital Statistics System for 50 states and Washington, D.C. Data from the National Violent Death Reporting System, covering 27 states in 2015, were used to examine contributing circumstances among decedents with and without known mental health problems (MHP).

**Results:** From 1999-2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases of more than 30%. Rates increased significantly among males and females in 34 and 43 states, respectively. In 2015, more than half (54%) of decedents in 27 states did not have a known MHP. Among people with circumstance information, several circumstances, including relationship problems/loss (45.1% vs 39.6%), life stressors (54.2% vs 49.7%), and recent/impending crises (32.9% vs 26.0%) were significantly more likely among those without a known MHP than decedents with MHP, but were common across groups.

**Conclusions:** Suicide rates increased significantly across most states from 1999-2016. Various circumstances contributed to suicides among people with and without known MHP.

**Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach to prevent suicide risk before it occurs, identify and support people at risk, prevent reattempts, and help friends/family after a suicide occurs.

## INTRODUCTION

### BACKGROUND AND PURPOSE

In 2016, nearly 45,000 suicides (15.6/100,000 [age-adjusted]) occurred in the United States (U.S.), among people  $\geq 10$  years old (1). Between 1999 and 2015, suicide rates increased across sexes, racial/ethnic groups, and urbanization levels (2, 3). Suicide is the 10<sup>th</sup> leading cause of death and is one of just three leading causes that are *increasing* (1, 4). Additionally, rates of ~~e~~Emergency ~~d~~Department visits for nonfatal self-harm, a key risk factor for suicide, increased nearly 45% between 2001 and 2015 (1). Together, suicides and self-harm injuries cost the nation more than \$69 billion in direct medical and work loss costs (1).

The *National Strategy for Suicide Prevention* (NSSP) (5) calls for a public health approach to suicide prevention with efforts spanning across multiple levels (i.e., individual, family/relationship, community, and societal). Such a ~~comprehensive~~ approach underscores that suicide is rarely caused by any single factor, but rather, is multi-determined. Despite the NSSP guidance, suicide prevention ~~efforts are largely clinically-oriented, focused~~ on ~~identifying suicidal people, providing treating-treatment for~~ mental health problems (MHP) and preventing re-attempts (6). ~~Apart from~~In addition to MHP and prior attempts, other contributing circumstances to suicide include social and economic problems, access to lethal means (e.g., substances, firearms, ~~bridges~~) among people at risk, and poor coping and problem-solving skills (5). Expanded awareness of these additional circumstances contributing to suicide risk and action to address them, can help reach the nation's goal of reducing suicide rates 20% by 2025 (7). To assist states in achieving this goal, this study analyzes state-specific trends in suicide rates,



assesses the multiple contributing factors to suicide, and provides recommendations options for multi-level comprehensive suicide prevention based on the best available evidence.

## METHODS

Suicide rates were analyzed for people aged  $\geq 10$  years only, as determining suicidal intent in younger children can be difficult (8). Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases 10<sup>th</sup> Revision*, underlying-cause-of death codes X60-X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods spanning 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Characteristics and circumstances of suicide decedents  $\geq 10$  years old, with and without known MHP, were compared in the 27 states with complete data participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines MHP as disorders and syndromes listed in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (9), with the exception of alcohol and other substance dependence, which are captured separately in NVDRS. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known MHP were compared using Chi-square tests. Logistic regression analyses estimated adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and race/ethnicity.

## RESULTS (665)

The most recent overall suicide rates (representing 2014-2016) varied four-fold, from 6.9 (D.C.) to 29.2 (Montana) per 100,000 persons per year (Table 1). Across the study period, rates increased in all states, except Nevada (which had a consistently high rate throughout), with absolute increases ranging from +0.8 (Delaware) to +8.1 (Wyoming) per 100,000. Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with increases of more than 30% observed in 25 states (Table 1, Figure 1).

Modeled suicide rate trends indicated significant increases for 44 states, for males (34 states) and females (43 states), as well as for the U.S. overall (Table 1). Nationally, the model-estimated AAPC for the overall suicide rate was +1.5%. By sex, estimated national rate trends further indicated significant increases for males (AAPC +1.1%) and females (AAPC +2.6%).

Suicide decedents without known MHP (N=11,039) were compared to those with MHP (N=9,407) in 27 states. While all decedents were predominately male (Table 2; 76.8%) and non-Hispanic white (83.6%), those without known MHP, relative to those with MHP, were more likely male (83.6% vs. 68.8%; odds ratio (OR)=2.3, 95% CI = 2.2-2.5) and racial/ethnic minorities (OR range: 1.2-2.0). Suicide decedents without known MHP also had significantly greater odds of perpetrating homicide-suicide (adjusted odds ratio aOR = 2.9, 95% CI = 2.2-3.8). Among adult decedents, 20.1% of those without known MHP and 15.3% of those with MPH people without and with MHP, respectively, ever served, or were currently serving, in the U.S. military.

While firearms were the most common method of suicide used overall (48.5%) and for both groups, decedents without known MHP were more likely to die by firearm (55.3% vs. 40.6%) and less likely to die by



85 hanging/strangulation/suffocation (26.9% vs 31.3%) or poisoning (10.4% vs 19.8%) than those with known MHP.  
86 These differences remained significant in the adjusted models.

87 Decedents without known MHP were less likely to receive toxicology testing. Among those with toxicology  
88 results, decedents without known MHP were less likely to test positive for any substance overall (aOR=0.8, 95%  
89 CI=0.7-0.8), such as opioids (aOR=.90 95% CI=0.81-.99) but more likely to test positive for alcohol (aOR=1.2, 95%  
90 CI=1.1-1.3).

91 All suicide decedents with MHP (N=9,407) and approximately 85% without known MHP (N=9,357) had available  
92 circumstances information (Table 3). People without known MHP were less likely to have any substance abuse  
93 problems (aOR=0.7, 95% CI=0.7-0.8). While two-thirds of those with known MHP had a history of mental health  
94 or substance abuse treatment (67.2%), just over half (54.0%) were in current treatment.

95 Decedents without, versus those with, known MHP, had significantly greater likelihood of any relationship  
96 problem/loss (45.1% vs. 39.6%), specifically intimate partner problems (30.2% vs. 24.1%), arguments/conflicts  
97 (17.5% vs. 13.6%), and recently perpetrating interpersonal violence (3.0% vs. 1.4%). They also were more likely  
98 to have experienced any life stressors (54.2% vs 49.7%), such as criminal-legal problems (10.7% vs. 6.2%), or  
99 eviction/loss of home (4.3% vs. 3.4%) and were more likely to have had a crisis within the preceding or  
100 upcoming two weeks (32.9% vs. 26.0%). All of these differences remained significant in the adjusted models.  
101 Among all people with crises, intimate partner problems were the most common types and did not differ by  
102 group. Similarly, among people without versus with MHP, physical health problems (23.2% and 21.4%) and  
103 job/financial problems (15.6% and 16.8%) were commonly experienced ~~and did not differ by~~ both groups.

104 Decedents without known MHP had significantly lower odds of recent release from any institution (aOR=0.5,  
105 95% CI=0.4-0.5), but among those who were recently released (5.1%), they were significantly more likely to be  
106 released from a correctional facility (25.7% vs. 8.7%), ~~or~~ hospital (43.7% vs. 33.0%) ~~or other facility (e.g.,~~  
107 alcohol/substance treatment) (aOR=2.5 95% CI=1.8-3.3), than those with a known MHP. Among decedents with  
108 known MHP who were recently released from an institution (10.2%), 46.7% of this group were released from  
109 psychiatric facilities.

110 Decedents without known MHP, compared to those with MHP, were significantly less likely to have a history of  
111 suicidal ideation (23.0% vs. 40.8%) and prior suicide attempts (10.3% vs. 29.4%). More than one in five people in  
112 both groups disclosed suicide intent (22.4% vs. 24.5%).

### 113 Conclusions and Comments

114 From 1999-2016, 44 states saw significant increases in suicide rates and 25 states experienced substantial  
115 increases in suicide rates of more than 30%. Rates increased significantly among males, in 34 states, and  
116 females, in 43 states. This finding is consistent with prior research showing a decreasing gender gap in male-  
117 female suicide rates between 1999-2014 (3). Additional research into the specific causes of these trends is  
118 necessary. Fortunately, data from the 27 states participating in NVDRS provides important insight into suicide  
119 circumstances and can help states identify prevention priorities.

120 Suicidologists regularly state that suicide is not caused by a single factor; (5) however, suicide prevention  
121 ~~research and practice is heavily often~~ oriented towards downstream identification of suicidal people, treatment  
122 of MHP and prevention of reattempts. Additional focus on non-mental health factors, further upstream, is  
123 essential to a public health approach (10), as the current study found that more than half of suicide decedents in  
124 NVDRS did not have a known MHP. This group suffered more from relationship problems and other life stressors  
125 such as criminal-legal matters, eviction/loss of home, and recent or impending crises.

Comment [HDE()]: I would add in the %  
for opioids as it is timely and relevant



Similarly, people with MHP ~~also often~~ experienced relationship problems and other life stressors such as job/financial, ~~relationship,~~ and/or physical health problems. These findings point to the need to both help people manage prevent the conditions associated with mental health problems in the first place, and to support people with known MHP to decrease their risk of poor outcomes (11). Two-thirds of this group had a history of any mental health and/or substance abuse treatment, with over half in treatment when they died. This suggests the need for additional safety supports, including broader implementation of affordable and effective treatment modalities such as doctor-patient collaborative care models and proven cognitive-behavioral therapies. Additionally, greater access to behavioral health providers in underserved areas is needed, as is expansion of healthcare systems needed that integrates physical and behavioral health with a priority on suicide prevention and patient safety, especially through care transitions (12).

Comprehensive statewide suicide prevention activities are needed to address the full range of factors contributing to suicide. Prevention strategies include: strengthening economic supports (e.g., housing stabilization policies, household financial support); teaching coping and problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in life; promoting social connectedness to increase a sense of belongingness and access to informational, tangible, emotional, and social support; and identifying and better supporting people at risk (e.g., Veterans, people with physical/mental health problems) (12). Other strategies include creating protective environments (e.g., reducing access to lethal means among people at risk, creating organizational and workplace policies to promote help-seeking, easing transitions into and out of work for people with MHP and other life challenges), supporting family and friends after a suicide, and assuring safe reporting by the media in order to prevent suicide contagion (12). Some states, such as Colorado, are planning to implement such a comprehensive approach to suicide prevention (10).

These findings have at least three limitations. In the state-level analysis, rankings for four states (MD, MA, RI, UT) might have been impacted by large proportions of injury deaths of undetermined intent (potentially biasing reported suicide rates downward), or decreased percentages of such deaths over time (potentially biasing estimated rate trends upward). Second, NVDRS is not yet nationally representative; the 27 states included represent 49.6% of the population (<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml>).

Third, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the extent of informant knowledge can impact data completeness and accuracy. Studies including more in-depth interviews with next-of-kin often see greater attributions to mental disorders (13), however many methodological variations across studies exist (14). It is likely that some people without known MHP in the current study were experiencing mental health challenges that were unknown, and hence underreported by key informants. Nonetheless, the high prevalence of diverse contributing circumstances among those with and without known MHP suggests the importance of addressing the broad range of factors that contribute to suicide.

Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are available. States and communities can use data from NVDRS and resources such as CDC's *Preventing Suicide: a Technical Package of Policies, Programs, and Practices* (12) to better understand their suicide problem, prioritize evidence-based comprehensive suicide prevention, and save lives.

## Acknowledgments



The authors acknowledge Robert Anderson, Holly Hedegaard, and Margaret Warner from the Division of Vital Statistics, National Center for Health Statistics, CDC, for their statistical consultation.

**Conflict of Interest** No conflicts of interest were reported.

**Corresponding author:** Deborah M. Stone, [dstone3@cdc.gov](mailto:dstone3@cdc.gov), 770-488-3942

**Author Affiliations:**

<sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis, Research, and Practice Integration, National Center for Injury Prevention and Control, CDC

**References:**

- Centers for Disease Control and Prevention. Web-based Injury Statistics Query and Reporting System (WISQARS). Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018. In.
- Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide Trends Among and Within Urbanization Levels by Sex, Race/Ethnicity, Age Group, and Mechanism of Death - United States, 2001-2015. *MMWR Surveill Summ* 2017;66(18):1-16.
- Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999-2014. In: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics Hyattsville, MD; 2016.
- Kochanek K, Murphy S, Xu J, Arias E. Mortality in the United States, 2016. *NCHS Data Brief*, no 293. National Center for Health Statistics 2017.
- Office of the Surgeon General, National Action Alliance for Suicide Prevention. 2012 National strategy for suicide prevention: Goals and objectives for action: a report of the US Surgeon General and of the National Action Alliance for Suicide Prevention. 2012.
- Zalsman G, Hawton K, Wasserman D, van Heeringen K, Arensman E, Sarchiapone M, et al. Suicide prevention strategies revisited: 10-year systematic review. *The Lancet Psychiatry* 2016;3(7):646-659.
- Torguson K, O'Brien A. Leading Suicide Prevention Efforts Unite to Address Rising National Suicide Rate. In: Washington, D.C.; 2017.
- Crepeau-Hobson F. The Psychological Autopsy and Determination of Child Suicides: A Survey of Medical Examiners. *Archives of Suicide Research* 2010;14(1):24-34.
- American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5®): American Psychiatric Pub; 2013.
- Caine ED, Reed J, Hindman J, Quinlan K. Comprehensive, integrated approaches to suicide prevention: practical guidance. *Injury prevention* 2017;injuryprev-2017-042366.
- World Health Organization. Risks to mental health: An overview of vulnerabilities and risk factors. Geneva: WHO 2012.
- Stone DM, Holland KM, Bartholow BN, Crosby AE, Davis SP, Wilkins N. Preventing suicide: A technical package of policies, programs, and practice. 2017.
- Milner A, Svetcic J, De Leo D. Suicide in the absence of mental disorder? A review of psychological autopsy studies across countries. *Int J Soc Psychiatry* 2013;59(6):545-54.
- Pouliot L, De Leo D. Critical issues in psychological autopsy studies. *Suicide Life Threat Behav* 2006;36(5):491-510.

**Attachments:**

[MMWR Tables V1 4.10.18 3pm DS](#)

[Stone\\_Suicide Vital Signs MMWR 3.27.18 \(table 1,fig 1\)](#)

[Stone\\_Suicide Vital Signs MMWR 4.5.18 \(Tables 2&3\)](#)

**Word Count:** 1903868/1800



**Short Title:** Vital Signs: Contributing Circumstances to Suicide and Increasing Trends in State Suicide Rates

Deborah M. Stone, ScD;<sup>1</sup> Thomas R. Simon PhD;<sup>1</sup> Katherine A. Fowler, PhD;<sup>1</sup> Scott R. Kegler, PhD;<sup>2</sup> Keming Yuan, MS;<sup>1</sup> Kristin M. Holland, PhD;<sup>1</sup> Asha Z. Ivey-Stephenson, PhD;<sup>1</sup> Alex E. Crosby, MD<sup>1</sup>

**Background:** Suicide rates in the United States have risen nearly 30% since 1999. Mental health problems (MHP) are just one factor contributing to suicide. Examining state-level trends in, and the multiple contributing circumstances to, suicide can inform comprehensive state suicide prevention planning.

**Methods:** Trends in age-adjusted suicide rates among people aged ≥10 years, by state and sex, across six consecutive three-year periods (1999-2016), were assessed using data from the National Vital Statistics System for 50 states and Washington, D.C. Data from the National Violent Death Reporting System, covering 27 states in 2015, were used to examine contributing circumstances among decedents with and without known mental health problems (MHP).

**Results:** From 1999-2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases of more than 30%. Rates increased significantly among males and females in 34 and 43 states, respectively. In 2015, more than half (54%) of decedents in 27 states did not have a known MHP. Among people with circumstance information, several circumstances, including relationship problems/loss (45.1% vs 39.6%), life stressors (54.2% vs 49.7%), and recent/impending crises (32.9% vs 26.0%) were significantly more likely among those without a known MHP than decedents with MHP, but were common across groups.

**Conclusions:** Suicide rates increased significantly across most states from 1999-2016. Various circumstances contributed to suicides among people with and without known MHP.

**Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach to prevent suicide risk before it occurs, identify and support people at risk, prevent reattempts, and help friends/family after a suicide occurs.

## INTRODUCTION

### BACKGROUND AND PURPOSE

In 2016, nearly 45,000 suicides (15.6/100,000 [age-adjusted]) occurred in the United States (U.S.), among people ≥10 years old (1). Between 1999 and 2015, suicide rates increased across sexes, racial/ethnic groups, and urbanization levels (2, 3). Suicide is the 10<sup>th</sup> leading cause of death and is one of just three leading causes that are *increasing* (1, 4). Additionally, rates of emergency department visits for nonfatal self-harm, a key risk factor for suicide, increased nearly 45% between 2001 and 2015 (1). Together, suicides and self-harm injuries cost the nation more than \$69 billion in direct medical and work loss costs (1).

The *National Strategy for Suicide Prevention (NSSP)* (5) calls for a public health approach to suicide prevention with efforts spanning across multiple levels (i.e., individual, family/relationship, community, and societal). Such a comprehensive approach underscores that suicide is rarely caused by any single factor, but rather, is multi-determined. Despite the NSSP guidance, suicide prevention largely focuses on identifying suicidal people, providing treatment for mental health problems (MHP) and preventing re-attempts (6). In addition to MHP and prior attempts, other contributing circumstances to suicide include social and economic problems, access to lethal means (e.g., substances, firearms) among people at risk, and poor coping and problem-solving skills (5). Expanded awareness of these additional circumstances contributing to suicide risk and action to address them, can help reach the nation's goal of reducing suicide rates 20% by 2025 (7). To assist states in achieving this goal,

this study analyzes state-specific trends in suicide rates, assesses the multiple contributing factors to suicide, and provides options for multi-level comprehensive suicide prevention based on the best available evidence.

## METHODS

Suicide rates were analyzed for people aged  $\geq 10$  years only, as determining suicidal intent in younger children can be difficult (8). Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases 10<sup>th</sup> Revision*, underlying-cause-of death codes X60-X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods spanning 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Characteristics and circumstances of suicide decedents  $\geq 10$  years old, with and without known MHP, were compared in the 27 states with complete data participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines MHP as disorders and syndromes listed in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (9), with the exception of alcohol and other substance dependence, which are captured separately in NVDRS. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known MHP were compared using Chi-square tests. Logistic regression analyses estimated adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and race/ethnicity.

## RESULTS

The most recent overall suicide rates (representing 2014-2016) varied four-fold, from 6.9 (D.C.) to 29.2 (Montana) per 100,000 persons per year (Table 1). Across the study period, rates increased in all states, except Nevada (which had a consistently high rate throughout), with absolute increases ranging from +0.8 (Delaware) to +8.1 (Wyoming) per 100,000. Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with increases of more than 30% observed in 25 states (Table 1, Figure 1).

Modeled suicide rate trends indicated significant increases for 44 states, for males (34 states) and females (43 states), as well as for the U.S. overall (Table 1). Nationally, the model-estimated AAPC for the overall suicide rate was +1.5%. By sex, estimated national rate trends further indicated significant increases for males (AAPC +1.1%) and females (AAPC +2.6%).

Suicide decedents without known MHP (N=11,039) were compared to those with MHP (N=9,407) in 27 states. While all decedents were predominately male (Table 2; 76.8%) and non-Hispanic white (83.6%), those without known MHP, relative to those with MHP, were more likely male (83.6% vs. 68.8%; odds ratio (OR)=2.3, 95% CI = 2.2-2.5) and racial/ethnic minorities (OR range: 1.2-2.0). Suicide decedents without known MHP also had significantly greater odds of perpetrating homicide-suicide (adjusted odds ratio aOR = 2.9, 95% CI = 2.2-3.8). Among adult decedents, 20.1% of those without known MHP and 15.3% of those with MPH ever served, or were currently serving, in the U.S. military.

While firearms were the most common method of suicide used overall (48.5%) and for both groups, decedents without known MHP were more likely to die by firearm (55.3% vs. 40.6%) and less likely to die by



84 hanging/strangulation/suffocation (26.9% vs 31.3%) or poisoning (10.4% vs 19.8%) than those with known MHP.  
85 These differences remained significant in the adjusted models.

86 Decedents without known MHP were less likely to receive toxicology testing. Among those with toxicology  
87 results, decedents without known MHP were less likely to test positive for any substance overall (aOR=0.8, 95%  
88 CI=0.7-0.8), such as opioids (aOR=.90 95% CI=0.81-.99) but more likely to test positive for alcohol (aOR=1.2, 95%  
89 CI=1.1-1.3).

90 All suicide decedents with MHP (N=9,407) and approximately 85% without known MHP (N=9,357) had available  
91 circumstances information (Table 3). People without known MHP were less likely to have any substance abuse  
92 problems (aOR=0.7, 95% CI=0.7-0.8). While two-thirds of those with known MHP had a history of mental health  
93 or substance abuse treatment (67.2%), just over half (54.0%) were in current treatment.

94 Decedents without, versus those with, known MHP, had significantly greater likelihood of any relationship  
95 problem/loss (45.1% vs. 39.6%), specifically intimate partner problems (30.2% vs. 24.1%), arguments/conflicts  
96 (17.5% vs. 13.6%), and recently perpetrating interpersonal violence (3.0% vs. 1.4%). They also were more likely  
97 to have experienced any life stressors (54.2% vs 49.7%), such as criminal-legal problems (10.7% vs. 6.2%), or  
98 eviction/loss of home (4.3% vs. 3.4%) and were more likely to have had a crisis within the preceding or  
99 upcoming two weeks (32.9% vs. 26.0%). All of these differences remained significant in the adjusted models.  
100 Among all people with crises, intimate partner problems were the most common types and did not differ by  
101 group. Similarly, among people without versus with MHP, physical health problems (23.2% and 21.4%) and  
102 job/financial problems (15.6% and 16.8%) were commonly experienced by both groups.

103 Decedents without known MHP had significantly lower odds of recent release from any institution (aOR=0.5,  
104 95% CI=0.4-0.5), but among those who were recently released (5.1%), they were significantly more likely to be  
105 released from a correctional facility (25.7% vs. 8.7%), hospital (43.7% vs. 33.0%), or other facility (e.g.,  
106 alcohol/substance treatment) (aOR=2.5 95% CI=1.8-3.3), than those with a known MHP. Among decedents with  
107 known MHP who were recently released from an institution (10.2%), 46.7% of this group were released from  
108 psychiatric facilities.

109 Decedents without known MHP, compared to those with MHP, were significantly less likely to have a history of  
110 suicidal ideation (23.0% vs. 40.8%) and prior suicide attempts (10.3% vs. 29.4%). More than one in five people in  
111 both groups disclosed suicide intent (22.4% vs. 24.5%).

## 112 **Conclusions and Comments**

113 From 1999-2016, 44 states saw significant increases in suicide rates and 25 states experienced substantial  
114 increases in suicide rates of more than 30%. Rates increased significantly among males, in 34 states, and  
115 females, in 43 states. This finding is consistent with prior research showing a decreasing gender gap in male-  
116 female suicide rates between 1999-2014 (3). Additional research into the specific causes of these trends is  
117 necessary. Fortunately, data from the 27 states participating in NVDRS provides important insight into suicide  
118 circumstances and can help states identify prevention priorities.

119 Suicidologists regularly state that suicide is not caused by a single factor; (5) however, suicide prevention is often  
120 oriented towards downstream identification of suicidal people, treatment of MHP and prevention of reattempts.  
121 Additional focus on non-mental health factors, further upstream, is essential to a public health approach (10), as  
122 the current study found that more than half of suicide decedents in NVDRS did *not* have a known MHP. This  
123 group suffered more from relationship problems and other life stressors such as criminal-legal matters,  
124 eviction/loss of home, and recent or impending crises.

Similarly, people with MHP often experienced relationship problems and other life stressors such as job/financial and/or physical health problems. These findings point to the need to both help people manage the conditions associated with mental health problems in the first place, and to support people with known MHP to decrease their risk of poor outcomes (11). Two-thirds of this group had a history of any mental health and/or substance abuse treatment, with over half in treatment when they died. This suggests the need for additional safety supports, including broader implementation of affordable and effective treatment modalities such as doctor-patient collaborative care models and proven cognitive-behavioral therapies. Additionally, greater access to behavioral health providers in underserved areas is needed, as is expansion of healthcare systems needed that integrates physical and behavioral health with a priority on suicide prevention and patient safety, especially through care transitions (12).

Comprehensive statewide suicide prevention activities are needed to address the full range of factors contributing to suicide. Prevention strategies include: strengthening economic supports (e.g., housing stabilization policies, household financial support); teaching coping and problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in life; promoting social connectedness to increase a sense of belongingness and access to informational, tangible, emotional, and social support; and identifying and better supporting people at risk (e.g., Veterans, people with physical/mental health problems) (12). Other strategies include creating protective environments (e.g., reducing access to lethal means among people at risk, creating organizational and workplace policies to promote help-seeking, easing transitions into and out of work for people with MHP and other life challenges), supporting family and friends after a suicide, and assuring safe reporting by the media in order to prevent suicide contagion (12). Some states, such as Colorado, are planning to implement such a comprehensive approach to suicide prevention (10).

These findings have at least three limitations. In the state-level analysis, rankings for four states (MD, MA, RI, UT) might have been impacted by large proportions of injury deaths of undetermined intent (potentially biasing reported suicide rates downward), or decreased percentages of such deaths over time (potentially biasing estimated rate trends upward). Second, NVDRS is not yet nationally representative; the 27 states included represent 49.6% of the population

(<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml>).

Third, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the extent of informant knowledge can impact data completeness and accuracy. Studies including more in-depth interviews with next-of-kin often see greater attributions to mental disorders (13), however many methodological variations across studies exist (14). It is likely that some people without known MHP in the current study were experiencing mental health challenges that were unknown, and hence underreported by key informants. Nonetheless, the high prevalence of diverse contributing circumstances among those with and without known MHP suggests the importance of addressing the broad range of factors that contribute to suicide.

Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are available. States and communities can use data from NVDRS and resources such as CDC's *Preventing Suicide: a Technical Package of Policies, Programs, and Practices* (12) to better understand their suicide problem, prioritize evidence-based comprehensive suicide prevention, and save lives.

## Acknowledgments



166 The authors acknowledge Robert Anderson, Holly Hedegaard, and Margaret Warner from the Division of Vital  
167 Statistics, National Center for Health Statistics, CDC, for their statistical consultation.

168  
169 **Conflict of Interest** No conflicts of interest were reported.

170  
171 **Corresponding author:** Deborah M. Stone, [dstone3@cdc.gov](mailto:dstone3@cdc.gov), 770-488-3942

172 **Author Affiliations:**

173 <sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis,  
174 Research, and Practice Integration, National Center for Injury Prevention and Control, CDC

175 **References:**

- 176 1. Centers for Disease Control and Prevention. Web-based Injury Statistics Query and Reporting System  
177 (WISQARS). Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018. In.
- 178 2. Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide Trends Among and  
179 Within Urbanization Levels by Sex, Race/Ethnicity, Age Group, and Mechanism of Death - United States,  
180 2001-2015. *MMWR Surveill Summ* 2017;66(18):1-16.
- 181 3. Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999-2014. In: US Department  
182 of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health  
183 Statistics Hyattsville, MD; 2016.
- 184 4. Kochanek K, Murphy S, Xu J, Arias E. Mortality in the United States, 2016. *NCHS Data Brief*, no 293.  
185 National Center for Health Statistics 2017.
- 186 5. Office of the Surgeon General, National Action Alliance for Suicide Prevention. 2012 National strategy for  
187 suicide prevention: Goals and objectives for action: a report of the US Surgeon General and of the National  
188 Action Alliance for Suicide Prevention. 2012.
- 189 6. Zalsman G, Hawton K, Wasserman D, van Heeringen K, Arensman E, Sarchiapone M, et al. Suicide  
190 prevention strategies revisited: 10-year systematic review. *The Lancet Psychiatry* 2016;3(7):646-659.
- 191 7. Torguson K, O'Brien A. Leading Suicide Prevention Efforts Unite to Address Rising National Suicide Rate. In.  
192 Washington, D.C.; 2017.
- 193 8. Crepeau-Hobson F. The Psychological Autopsy and Determination of Child Suicides: A Survey of Medical  
194 Examiners. *Archives of Suicide Research* 2010;14(1):24-34.
- 195 9. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5®):  
196 American Psychiatric Pub; 2013.
- 197 10. Caine ED, Reed J, Hindman J, Quinlan K. Comprehensive, integrated approaches to suicide prevention:  
198 practical guidance. *Injury prevention* 2017;injuryprev-2017-042366.
- 199 11. World Health Organization. Risks to mental health: An overview of vulnerabilities and risk factors. Geneva:  
200 WHO 2012.
- 201 12. Stone DM, Holland KM, Bartholow BN, Crosby AE, Davis SP, Wilkins N. Preventing suicide: A technical  
202 package of policies, programs, and practice. 2017.
- 203 13. Milner A, Svetcic J, De Leo D. Suicide in the absence of mental disorder? A review of psychological autopsy  
204 studies across countries. *Int J Soc Psychiatry* 2013;59(6):545-54.
- 205 14. Pouliot L, De Leo D. Critical issues in psychological autopsy studies. *Suicide Life Threat Behav*  
206 2006;36(5):491-510.

207 **Attachments:**

208 MMWR Tables\_V1\_4.10.18\_4.30pm\_DS

209 **Word Count:** 1903/1800

1 **Short title:** Vital Signs: Increasing Trends in State Suicide Rates and Contributing Circumstances

2 Deborah M. Stone, ScD;<sup>1</sup> Thomas R. Simon PhD;<sup>1</sup> Katherine A. Fowler, PhD;<sup>1</sup> Scott R. Kegler, PhD;<sup>2</sup> Keming Yuan,  
3 MS;<sup>1</sup> Kristin M. Holland, PhD;<sup>1</sup> Asha Z. Ivey-Stephenson, PhD;<sup>1</sup> Alex E. Crosby, MD<sup>1</sup>

4 **Structured abstract (256/250 words—this word count is not included in the 1800 max for the remainder)**

5 **Background:** Overall suicide rates have been rising in the United States. Examining state-level trends in suicide  
6 and its multiple contributing circumstances, can inform comprehensive state suicide prevention planning.

7 **Methods:** Trends in age-adjusted suicide rates, by state and sex, among people aged  $\geq 10$  years, were assessed  
8 using data from the National Vital Statistics System. Changes in rates were examined across six consecutive  
9 three-year periods from 1999-2016. The National Violent Death Reporting System (2015), covering 27 states,  
10 was used to examine the precipitating circumstances among suicide decedents with and without known mental  
11 health problems (MHP).

12 **Results:** Forty-four states saw statistically significant suicide rate increases from 1999-2016. In 25 states, rates  
13 increased by 30% or more. Male suicide rates increased significantly in 34 states while female rates increased  
14 significantly in 43 states. People with (46%) and without (54%) known MHP had both differing and similar  
15 circumstances precipitating suicide. Several circumstance, such as any relationship problems/loss (39.6 and  
16 45.1%,  $p \leq .01$ ), any life stressors/loss (49.7 and 54.2%,  $p \leq .01$ ), and recent crises (26.0 and 32.9%,  $p \leq .01$ ),  
17 respectively, were more likely among those without known MHP, but were common across groups.

18 **Conclusions:** Suicide rates rose significantly across most states from 1999-2016. Varied circumstances beyond  
19 MHP alone contributed to suicides among people with and without known MHP.

20 **Implications for Public Health Practice:** States can use a comprehensive public health approach based on the  
21 best available evidence to prevent suicide risks before they occur, identify and support people already at risk,  
22 prevent-re-attempts, and help friends/family after a suicide occurs.

## 23 INTRODUCTION

### 24 BACKGROUND AND PURPOSE (259 words)

25 In 2016, nearly 45,000 suicides (15.6/100,000) occurred in the United States (U.S.), among people  $\geq 10$  years [1].  
26 Between 1999 and 2016, suicide rates increased across sexes, racial/ethnic groups, and urbanization levels [2,  
27 3]. Suicide is the 10<sup>th</sup> leading cause of death and is among the only leading causes to be *increasing* [1, 4].  
28 Additionally, rates of Emergency Department visits for nonfatal self-harm injury, a key risk factor for suicide,  
29 increased more than 40% between 2001 and 2015 [1]. Together, suicides and self-harm injuries cost the nation  
30 more than \$69 billion in direct medical and work loss costs [1].

31 The *National Strategy for Suicide Prevention (NSSP)* [5] calls for a public health approach to suicide with  
32 prevention efforts spanning across multiple levels (i.e., individual, family/relationship, community, and societal),  
33 of the social ecology. Such an approach underscores that suicide is rarely caused by any single factor alone, but  
34 rather, is multi-determined. Despite the NSSP guidance, suicide prevention efforts largely focus on identifying  
35 and treating individuals with mental health problems (MHP) [6]. Other associated risk factors include social and  
36 economic problems, access to lethal means (e.g. substances, firearms, bridges) among people at risk, poor  
37 coping and problem-solving skills, and prior suicide attempts, among others [5]. Expanded awareness of the  
38 additional circumstances that contribute to suicide risk apart from MHP, can help reach the nation's goal of  
39 reducing suicide rates 20% by 2025 [7]. To assist states in achieving this goal, this study analyzes state-specific



40 trends in suicide rates, assesses the multiple factors associated with suicide, and provides recommendations for  
41 multi-level comprehensive suicide prevention.

## 42 **METHODS (260 words)**

43 Suicide rate estimates and trend analyses were calculated for those aged 10 years and older (because of variability  
44 in attributions of suicidal intent, younger children are excluded) [8]. Age-specific suicide counts were tabulated  
45 based on National Vital Statistics System coded death certificate records (*International Classification of Diseases*  
46 *10<sup>th</sup> Revision* [ICD-10] underlying-cause-of death codes X60-X84, Y87.0, U03). Age-specific population estimates  
47 were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data  
48 releases.

50 National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods  
51 from 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per  
52 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data  
53 aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends  
54 are reported in terms of average annual percentage changes (AAPCs).

56 Data from 2015 from the 27 states with complete data participating in the National Violent Death Reporting  
57 System (NVDRS) were used to compare the characteristics among suicide decedents with and without known  
58 current mental health problems (MHP). MHP are defined in NVDRS as disorders and syndromes listed in the  
59 Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) [9], except alcohol and other  
60 substance use disorders (captured separately). NVDRS aggregates data from three primary data sources: death  
61 certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents  
62 with and without known MHP were compared using Chi-square tests; logistic regression was used to estimate  
63 adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and race/ethnicity.

## 64 **RESULTS (595 words)**

65 The most recent overall suicide rates (representing 2014-2016) ranged from 6.9 (District of Columbia) to 29.2  
66 (Montana) per 100,000 persons per year, a four-fold difference (Table 1). Across the entire study period, rates  
67 increased in all but one state (Nevada), with absolute increases ranging from +0.2 (Delaware) to +8.1 (Wyoming)  
68 per 100,000. Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with  
69 percentage increases of at least 30% observed in half of all states.

71 Modeled suicide rate trends indicated significant increases for 44 states, as well as for the U.S. overall (Table 1).  
72 By sex, modeled rate trends indicated significant increases in 34 states for males and in 43 states for females.  
73 Nationally, the model-estimated AAPC for the overall suicide rate was +1.5%. By sex, the national AAPC was  
74 +1.1% for males and +2.6% for females.

76 Suicide decedents with (N=9,407) and without (N=11,039) known MHP were compared. While both groups were  
77 predominately male and non-Hispanic white, suicide decedents without known MHP were more likely to be  
78 male (83.6% vs. 68.8%;  $p \leq .01$ ), and racial/ethnic minorities (odds ratio [OR] range: 1.2-2.1; 95% CI range [1.0-  
79 1.3] – [1.6-2.0]). They also had significantly greater odds of perpetrating homicide-suicide (adjusted odds ratio  
80 [aOR] = 2.9, 95% CI = 2.2-3.8), of firearm suicide (aOR = 1.6, 95% CI = 1.5-1.7), and of positive toxicology results  
81 for alcohol (aOR = 1.2, 95% CI = 1.1-1.3). Fifteen percent of those with known MHP and 20% without ever served  
82 in the U.S. military.

83 Although firearms were used most often in both groups, decedents with known MHP died by poisoning more  
84 than those without MHP (19.8% vs. 10.4%;  $p \leq .01$ ), most frequently by over-the-counter/otherwise unclassified  
85 drugs (35.8%), opioids (32.7%), antidepressants (34.6%) or benzodiazepines (25.1%).

86 All suicide decedents with known MHP (N=9,407) and approximately 85% without (N=9,357) had precipitating  
87 circumstances information. People with MHP were more likely to have any substance abuse problems (31.6% vs.  
88 25%,  $p \leq .01$ ). While two-thirds of those with known MHP had a history of MH or substance abuse treatment  
89 (67.2%), just over half (54.0%) were in current mental health treatment at the time of their deaths.

90 Decedents without known MHP, versus those with MHP had a greater likelihood of any relationship  
91 problem/loss (45.1 and 39.6%,  $p \leq .01$ ), specifically intimate partner problems (30.2 and 24.1%,  $p \leq .01$ ),  
92 arguments/conflicts (17.5 and 13.6%,  $p \leq .01$ ), and recently perpetrating interpersonal violence (3.0 and 1.4%,  $p$   
93  $\leq .01$ ). They were also more likely to have experienced other life stressors, such as criminal legal problems (10.7  
94 and 6.2%,  $p \leq .01$ ) or eviction/loss of home (4.3 and 3.4%,  $p \leq .01$ ), and they were more likely to have had a crisis  
95 within the preceding or upcoming two weeks (32.9 and 26.0%,  $p < .01$ ). Among both groups, the most common  
96 crises were intimate partner (35.6%) and physical health (13.4%) problems.

97 Decedents without known MHP had significantly lower odds of recent release from any institution, but among  
98 those who were recently released, those without a known MHP were more likely to be released from a  
99 correctional facility (25.7% vs. 8.7%,  $p \leq .01$ ) or hospital (43.7% vs. 33.0%,  $p \leq .01$ ) than those with a known MHP.  
100 Among decedents with known MHP recently released from an institution (10.2%), 42.8% were released from  
101 psychiatric facilities.

102 Suicide decedents without known MHP were more likely to leave a suicide note (35.1 and 31.8%,  $p \leq .01$ ), while  
103 decedents with known MHP, compared to those without MHP, were more likely to have a history of suicidal  
104 ideation (40.8% vs. 23.0%,  $p \leq .01$ ) and attempts (29.4% vs. 10.3%,  $p \leq .01$ ).

## 105 **Conclusions and Comments (715 words)**

106 From 1999-2016, 44 states saw significant suicide rate increases. Half of the states experienced increases of 30%  
107 or more. Rates increased significantly in 34 states among males and 43 states among females. More research  
108 into the causes of these trends is necessary [10].

109 One important factor associated with suicide is MHP. Nearly half of suicide decedents in NVDRS had a known  
110 MHP. This group was challenged by comorbid substance abuse problems (31.6%) and histories of suicidal  
111 ideation (40.8%) and attempts (29.4%). While two-thirds of people with MHP had a history of MH and/or  
112 substance abuse treatment and over half were in treatment at the time of their deaths, additional support could  
113 help address the needs of this vulnerable population. This includes broader implementation of affordable and  
114 evidence-based treatments, such as doctor-patient collaborative care models and cognitive-behavioral therapy.  
115 Additionally, greater access to behavioral health providers, especially in underserved areas is important, as is  
116 healthcare systems change that supports suicide prevention and patient safety through care transitions [11].

117 While mental health problems are a significant contributor to suicide, 54% of suicide decedents in this study did  
118 *not* have a known MHP. This group suffered more relationship problems and life stressors such as criminal-legal  
119 matters, eviction/loss of home, and recent or impending crises. This is noteworthy in light of findings that  
120 suggest many suicides and attempts occur with minimal deliberation time, particularly among people without  
121 mental health disorders and who faced impending life crises [12]. People with known MHP also experienced  
122 other life stressors such as job and/or financial problems, relationship problems, and physical health problems.  
123 These findings point to the need to both prevent the conditions associated with mental health problems in the



124 first place and the need to support people with MHP to decrease their vulnerability to poor social, health, and  
125 economic outcomes [13].

126 These results underscore the importance of comprehensive state suicide prevention activities that go beyond a  
127 focus on MH treatment alone. Prevention strategies may include: strengthening economic supports (e.g.  
128 housing stabilization policies, household financial support), teaching coping and problem-solving skills, especially  
129 early in life to manage everyday stressors and prevent future relationship problems; and promoting social  
130 connectedness to increase a sense of belongingness and access to informational, tangible, emotional, and social  
131 support, as needed. Other strategies indicated by these results include creating protective environments (e.g.,  
132 reducing access to lethal means among people at risk, creating organizational and workplace policies to promote  
133 help-seeking and positive social norms), supporting family and friends after a suicide has taken place, and  
134 assuring safe reporting by the media in order to prevent suicide contagion [11]. Some states, such as Colorado,  
135 are planning and implementing a comprehensive approach to suicide prevention [14].

136 The study findings have at least three limitations. Related to state trend analyses, four states (MD, MA, RI, UT),  
137 rankings might have been impacted by large proportions of injury deaths of undetermined intent, or by  
138 decreased percentages of such deaths over time, which likely include some unrecognized suicides. Second,  
139 NVDRS is not yet nationally representative. This study used the most current data available which includes 27  
140 states that represent half (49.6%) of the U.S. population. Third, abstractors of NVDRS data are limited to data  
141 included in investigative reports. For example, medical and MH information are not captured directly from  
142 medical records but from key informants (e.g., family, friends) via coroner/medical examiner reports. Therefore,  
143 informant knowledge impacts the completeness and accuracy of the information reported, and studies including  
144 in-depth interviews with family members often see greater attributions to MH and substance abuse disorders,  
145 however methodological variation across studies exists [15]. It is likely that some people without known MHP in  
146 the current study were experiencing mental health challenges at the time of death that were either not known  
147 or reported by informants, or were not captured in NVDRS's primary data sources. The lack of awareness of a  
148 mental health problem suggests the importance of addressing the range of contributing circumstances.

149 Suicide is a growing public health problem. Mental illness is an important risk factor for suicide, and is one of  
150 many requiring preventive action. Data from NVDRS and resources such as CDC's *Preventing Suicide: a Technical*  
151 *Package of Policies, Programs, and Practices* [11] can help states and communities better understand their  
152 suicide problem and prioritize comprehensive suicide prevention.

### 153 **Acknowledgments**

154 The authors acknowledge Robert Anderson, Holly Hedegaard, and Margaret Warner from the Division of Vital  
155 Statistics, National Center for Health Statistics, CDC, for their statistical consultation.

156  
157 **Conflict of Interest** No conflicts of interest were reported.

158  
159 **Corresponding author:** Deborah M. Stone, [dstone3@cdc.gov](mailto:dstone3@cdc.gov), 770-488-3942

### 160 161 **Author Affiliations:**

162 <sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis,  
163 Research, and Practice Integration, National Center for Injury Prevention and Control, CDC

### 164 **References:**

- 165 1. Centers for Disease Control and Prevention, *Web-based Injury Statistics Query and Reporting System*  
166 *(WISQARS)*. Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018.  
167 2016.
- 168 2. Ivey-Stephenson, A.Z., et al., *Suicide Trends Among and Within Urbanization Levels by Sex,*  
169 *Race/Ethnicity, Age Group, and Mechanism of Death - United States, 2001-2015*. MMWR Surveill Summ,  
170 2017. **66**(18): p. 1-16.
- 171 3. Kegler, S.R., D.M. Stone, and K.M. Holland, *Trends in suicide by level of urbanization—United States,*  
172 *1999–2015*. MMWR. Morbidity and mortality weekly report, 2017. **66**(10): p. 270.
- 173 4. Kochanek, K., et al., *Mortality in the United States, 2016*. NCHS Data Brief, no 293. National Center for  
174 Health Statistics, 2017.
- 175 5. Office of the Surgeon General and National Action Alliance for Suicide Prevention, *2012 National*  
176 *strategy for suicide prevention: goals and objectives for action: a report of the US Surgeon General and*  
177 *of the National Action Alliance for Suicide Prevention*. 2012.
- 178 6. Rosenman, S.J., *Preventing suicide: what will work and what will not*. The Medical Journal of Australia,  
179 1998. **169**(2): p. 100-102.
- 180 7. Torguson, K. and A. O'Brien, *Leading Suicide Prevention Efforts Unite to Address Rising National Suicide*  
181 *Rate*. 2017: Washington, D.C.
- 182 8. Crepeau-Hobson, F., *The Psychological Autopsy and Determination of Child Suicides: A Survey of Medical*  
183 *Examiners*. Archives of Suicide Research, 2010. **14**(1): p. 24-34.
- 184 9. American Psychiatric Association, *Diagnostic and statistical manual of mental disorders (DSM-5®)*. 2013:  
185 American Psychiatric Pub.
- 186 10. Li, Z., et al., *Attributable risk of psychiatric and socio-economic factors for suicide from individual-level,*  
187 *population-based studies: A systematic review*. Social Science & Medicine, 2011. **72**(4): p. 608-616.
- 188 11. Stone, D.M., et al., *Preventing suicide: A technical package of policies, programs, and practice*. 2017.
- 189 12. Simon, T.R., et al., *Characteristics of impulsive suicide attempts and attempters*. Suicide and Life-  
190 Threatening Behavior, 2002. **32**(s1): p. 49-59.
- 191 13. World Health Organization, *Risks to mental health: An overview of vulnerabilities and risk factors*.  
192 Geneva: WHO, 2012.
- 193 14. Caine, E.D., et al., *Comprehensive, integrated approaches to suicide prevention: practical guidance*.  
194 Injury prevention, 2017: p. injuryprev-2017-042366.
- 195 15. Hawton, K., et al., *The psychological autopsy approach to studying suicide: a review of methodological*  
196 *issues*. J Affect Disord, 1998. **50**(2-3): p. 269-76.

197 **Tables and Figures (attachments)**

198 Table 1 and Figure 1.doc

199 Tables 2 and 3.pdf

200 **Word Count:** 1829/1800

201



1 **Short title:** Vital Signs: Increasing Trends in State Suicide Rates and Contributing Circumstances

2 Deborah M. Stone, ScD;<sup>1</sup> Thomas R. Simon PhD;<sup>1</sup> Katherine A. Fowler, PhD;<sup>1</sup> Scott R. Kegler, PhD;<sup>2</sup> Keming Yuan,  
3 MS;<sup>1</sup> Kristin M. Holland, PhD;<sup>1</sup> Asha Z. Ivey-Stephenson, PhD;<sup>1</sup> Alex E. Crosby, MD<sup>1</sup>

4 **Structured abstract** (256/252/250 words—this word count is not included in the 1800 max for the remainder)

5 **Background:** Overall suicide rates have been rising in the United States since 1999. Examining state-level trends  
6 in suicide and its multiple contributing circumstances, can inform comprehensive state suicide prevention  
7 planning.

8 **Methods:** Trends in age-adjusted suicide rates, by state and sex, among people aged ≥10 years, were assessed  
9 using data from the National Vital Statistics System. Changes in rates were examined across six consecutive  
10 three-year periods from 1999–2016. The CDC's National Violent Death Reporting System (2015), covering 27  
11 states, was used to examine the precipitating circumstances among suicide decedents with and without known  
12 mental health problems (MHP).

13 **Results:** Forty-four states saw statistically significant increases in suicide rates from 1999–  
14 2016 in 44 states. In 25 states, rates increased by 30% or more. Male suicide rates increased significantly in 34  
15 states, while female rates increased significantly in 43 states. People with (46%) and without (54%) known MHP  
16 had both differing and similar circumstances precipitating suicide. Several circumstances, such as any  
17 relationship problems/loss (39.6 and 45.1%,  $p \leq .01$ ), any life stressors/loss (49.7 and 54.2%,  $p \leq .01$ ), and recent  
18 crises (26.0 and 32.9%,  $p \leq .01$ ), respectively, were more likely among those without known MHP, but were  
19 common across groups.

20 **Conclusions:** Suicide rates rose significantly across most states from 1999–2016. Varied circumstances beyond  
21 MHP alone contributed to suicides among people with and without known MHP.

22 **Implications for Public Health Practice:** States can use a comprehensive public health approach based on the  
23 best available evidence to prevent suicide risks before they occur, identify and support people already at risk,  
24 prevent re-attempts, and help friends/family after a suicide occurs.

25 **INTRODUCTION**

26 **BACKGROUND AND PURPOSE** (255/260 words)

27 In 2016, nearly 45,000 suicides (15.6/100,000) occurred in the United States (U.S.), among people ≥10 years old  
28 [1]. Between 1999 and 2016, suicide rates increased across sexes, racial/ethnic groups, and urbanization levels  
29 [2, 3]. Suicide is the 10<sup>th</sup> leading cause of death and is among the only leading causes to be increasing [1, 4].  
30 Additionally, rates of Emergency Department visits for nonfatal self-harm injury, a key risk factor for suicide,  
31 increased more than 40% between 2001 and 2015 [1]. Together, suicides and self-harm injuries cost the nation  
32 more than \$69 billion in direct medical and work loss costs [1].

33 The National Strategy for Suicide Prevention (NSSP) [5] calls for a public health approach to suicide with  
34 prevention with efforts spanning across multiple levels (i.e., individual, family/relationship, community, and  
35 societal), of the social ecology. Such an approach underscores that suicide is rarely caused by any single factor  
36 alone, but rather, is multi-determined. Despite the NSSP guidance, suicide prevention efforts largely focus on  
37 identifying and treating individuals with mental health problems (MHP) [6]. Other associated contributing risk  
38 factors include social and economic problems, access to lethal means (e.g., substances, firearms, bridges) among  
39 people at risk, poor coping and problem-solving skills, and prior suicide attempts, among others [5]. Expanded

**Comment [BE():]** Sometimes it is referred to as a 'contributing circumstance' and sometimes its referred to as a 'contributing factor'. I wonder if its

**Comment [FC():]** Can a couple of words be added here to reflect a date since rates have been rising. I see word count is an issue and I think a couple of words can

**Comment [FC():]** Style consideration. Since focus on suicide and states is clear may not these words twice in sentence which would reduce word count. A few

**Comment [FC():]** The transition from reading NVDRS covers 27 states to methods to the first line in the results referring to 44 states made me pause and

**Comment [FC():]** Unclear if this was supposed to be a reference or can come out.

**Comment [JRV8]:** Just a suggestion and may not be feasible, but would suggest not using MHP through the document. Mental health problems doesn't seem

**Comment [BE():]** I think this is a significant finding should we say more about it the fact that it is increasing more in women?

**Comment [FC():]** I think edits are needed here for a few reasons. I am finding the statements that there are differences and similarities vague and hard to follow

**Comment [FC():]** Please double check. I am getting 15.9 from WISQARS

**Comment [BE():]** Can we be more specific – is it the only or is it one of only X leading causes increasing – 'among the only' is vague?

**Comment [FC():]** Please double check. Wonder if this might have been calculated for all ages and not limited to ≥10 years.

**Comment [JRV8]:** Suggest identifying this as a US Surgeon General report.

**Comment [BE():]** Is it better to say social ecology (which I think many think of social, environmental and economic) versus I think what is used most often the



awareness of the additional circumstances that contribute to suicide risk apart from MHP, can help reach the nation's goal of reducing suicide rates 20% by 2025 [7]. To assist states in achieving this goal, this study analyzes state-specific trends in suicide rates, assesses the multiple contributing factors associated with suicide, and provides recommendations for multi-level comprehensive suicide prevention.

#### METHODS (257/260 words)

Suicide rates were analyzed for those aged 10 years and older (because of variability in attributions of suicidal intent, younger children are excluded) [8]. Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases 10<sup>th</sup> Revision* [ICD-10] underlying-cause-of death codes X60-X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods from 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Data from 2015 from the 27 states with complete data participating in the CDC's National Violent Death Reporting System (NVDRS), ages 10 and older, were used to compare the characteristics among suicide decedents with and without known current mental health problems (MHP). MHP are defined in NVDRS as disorders and syndromes listed in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) [9], except alcohol and other substance use disorders (captured separately). NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known MHP were compared using Chi-square tests; logistic regression was used to estimate adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and race/ethnicity.

#### RESULTS (612/591 words)

The most recent overall suicide rates (representing 2014-2016) ranged from 6.9 (District of Columbia) to 29.2 (Montana) per 100,000 persons per year, a four-fold difference (Table 1). Across the entire study period, rates increased in all but one state (Nevada), with absolute increases ranging from +0.2 (Delaware) to +8.1 (Wyoming) per 100,000. Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with percentage increases of at least 30% observed in 25 states.

Modeled suicide rate trends indicated significant increases for 44 states, as well as for the U.S. overall (Table 1). By sex, modeled rate trends indicated significant increases in 34 states for males and in 43 states for females. Nationally, the model-estimated AAPC for the overall suicide rate was +1.5%. By sex, the national AAPC was +1.1% for males and +2.6% for females.

Suicide decedents with (N=9,407) and without (N=11,039) known MHP were compared. While both groups were predominately male and non-Hispanic white, suicide decedents without known MHP relative to those with known MHP were more likely to be male (83.6% vs. 68.8%;  $p \leq .01$ ), and racial/ethnic minorities (odds ratio [OR] range: 1.2-2.1; 95% CI range [1.0-1.3] – [1.6-2.0]). Suicide decedents without known MHP also had significantly greater odds of perpetrating homicide-suicide (adjusted odds ratio [aOR] = 2.9, 95% CI = 2.2-3.8), of firearm suicide (aOR = 1.6, 95% CI = 1.5-1.7), and of positive toxicology results for alcohol (aOR = 1.2, 95% CI = 1.1-1.3). Fifteen percent of these adult decedents with known MHP, and 20% without, ever had served or were serving in the U.S. military.

**Comment [BE():]** Is it really the 'nation's goal' – versus the goal set by the American Foundation for Suicide Prevention.

**Comment [JRV8]:** Sentence has a lot of different points. It may be easier to read if it were two sentences. Suggestion:

Data from the National Violent Death Reporting System (NVDRS) were used to compare characteristics among suicide decedents with and without known current mental health programs. Complete data from 27 states participating in NVDRS in 2015 were used for this analyses.

**Comment [FC():]** I am confused by how the alcohol and substance use disorder exception is described. DSM-5 does have an alcohol use disorder diagnosis and a substance use disorder dx.

**Comment [FC():]** Some labeling of the tables and how reflected in the text need some modification. There are current two "Table 1" in attachments (i.e., state trends; select demographics). The two NVDRS tables and figure 1 don't appear to

**Comment [BE():]** Per our discussion in our last VS group meeting, should we add a note that despite NV not increases, they still have a significantly high rate of suicide?

**Comment [FC():]** Please double check. Table reflects +0.8

**Comment [FC():]** Suggest revising in order to allow in the next sentence the comparison group to be clear and the order the %'s should be considered clearer. Tracked is an idea.

**Comment [FC():]** Wonder if need to be clear here this is limited to 18+. Tracked might be a simple approach to consider.

I have seen MMWR want to present %'s to first decimal place consistently. Here is

**Comment [JRV8]:** I realize this adds words so you may not be able to do this but the "ever" in the original sentence was confusing/stumbling block to me as I read. Not sure if the additional language is correct – past and active duty or just



86 Although firearms were used most often in both groups, decedents with known MHP died by poisoning more  
 87 than those without known MHP (19.8% vs. 10.4%;  $p \leq .01$ ), most frequently by over-the-counter/otherwise  
 88 unclassified drugs (35.8%), opioids (32.7%), antidepressants (34.6%) or benzodiazepines (25.1%).

89 All suicide decedents with known MHP (N=9,407) and approximately 85% without (N=9,357) had precipitating  
 90 circumstances information (Table 2 or 3??). People with known MHP were more likely to have any substance  
 91 abuse problems (31.6% vs. 25%,  $p \leq .01$ ). While two-thirds of those with known MHP had a history of MH or  
 92 substance abuse treatment (67.2%), just over half (54.0%) were in current treatment at the time of their deaths.

93 Decedents without known MHP, versus those with known MHP had a greater likelihood of any relationship  
 94 problem/loss (45.1% andvs. 39.6%,  $p \leq .01$ ), specifically intimate partner problems (30.2% andvs. 24.1%,  $p \leq .01$ ),  
 95 arguments/conflicts (17.5% andvs. 13.6%,  $p \leq .01$ ), and recently perpetrating interpersonal violence (3.0% andvs.  
 96 1.4%,  $p \leq .01$ ). They were also more likely to have experienced other life stressors, such as criminal-legal  
 97 problems (10.7% andvs. 6.2%,  $p \leq .01$ ) or eviction/loss of home (4.3% andvs. 3.4%,  $p \leq .01$ ), and they were more  
 98 likely to have had a crisis within the preceding or upcoming two weeks (32.9% andvs. 26.0%,  $p < .01$ ). Among  
 99 both groups, the most common crises were intimate partner (35.6%) and physical health (13.4%) problems.

100 Decedents without known MHP had significantly lower odds of recent release from any institution, but among  
 101 those who were recently released, those without a known MHP were more likely to be released from a  
 102 correctional facility (25.7% vs. 8.7%,  $p \leq .01$ ) or hospital (43.7% vs. 33.0%,  $p \leq .01$ ) than those with a known MHP.  
 103 Among decedents with known MHP recently released from an institution (10.2%), 42.8% were released from  
 104 psychiatric facilities.

105 Suicide decedents without known MHP were more likely than those without known MHP to leave a suicide note  
 106 (35.1% andvs. 31.8%,  $p \leq .01$ ), while dDecedents with known MHP, compared to those without known MHP,  
 107 were more likely to have a history of suicidal ideation (40.8% vs. 23.0%,  $p \leq .01$ ) and attempts (29.4% vs. 10.3%,  
 108  $p \leq .01$ ).

#### 109 **Conclusions and Comments (655/715 words)**

110 From 1999-2016, 44 states saw significant suicide rate increases. Half of the states experienced increases of 30%  
 111 or more. Rates increased significantly in 34 states among males and 43 states among females. More research  
 112 into the causes of these trends is necessary [10].

113 One important factor associated with suicide is MHP. Nearly half of suicide decedents in NVDRS had a known  
 114 MHP. This group was challenged by comorbid substance abuse problems (31.6%) and histories of suicidal  
 115 ideation (40.8%) and attempts (29.4%). While two-thirds of people with known MHP had a history of MH and/or  
 116 substance abuse treatment and over half were in treatment at the time of their deaths, additional support could  
 117 may help address the needs of this vulnerable population. This includes broader implementation of affordable  
 118 and evidence-based treatments, such as doctor-patient collaborative care models and cognitive-behavioral  
 119 therapy. Additionally, greater access to behavioral health providers, especially in underserved areas is  
 120 important, as is healthcare systems change that supports suicide prevention and patient safety through care  
 121 transitions [11].

122 While mental health problems are a significant contributor to suicide, 54% of suicide decedents in this study did  
 123 not have a known MHP. This group suffered more relationship problems and life stressors such as criminal-legal  
 124 matters, eviction/loss of home, and recent or impending crises. This is noteworthy in light of findings that  
 125 suggest many suicides and attempts occur with minimal deliberation time, particularly among people without  
 126 mental health disorders and who faced impending life crises [12].

**Comment [FC():** I think the comparison group %'s are needed. For instance, drugs (35.8% vs. 35.8%).

I think the presentation of the %'s would be easier here and later on in the results if the p's came out and the text could simply reflect "significant differences" or some variation of indicating in the groups were different.

**Comment [BE():** Sometimes criminal-legal is hyphenated and sometimes it's not.

**Comment [FC():** The % reported in this sentence appear to be only for the group with MHPs. Based on the sentence wording, the % for both groups need to be reported.

**Comment [FC():** Please double check number. Table reflects 33.8%

**Comment [FC():** My two cents: I think we should do more to raise attention to the fact that almost a quarter of both groups disclosed suicide intent. This is a true prevention opportunity so I think this is a common risk to highlight. Knowing space constraints, I think this is more important to highlight than the presence of a suicide note which often doesn't inform prevention. I suggest adding into results and into discussion.

**Comment [FC():** I feel that MMWRs typically don't do a lot of repeat of the specific data findings in the discussion. I think the numbers could come out here. I think it would be helpful to put this into a larger context, indicating whether this is consistent with other research. I also

**Comment [BE():** I would add the percentage in parenthesis (X%).



127

128 People with known MHP also experienced other life stressors such as job and/or financial ~~problems~~,  
 129 relationship ~~problems~~, and/or physical health problems. These findings point to the need to both prevent the  
 130 conditions associated with mental health problems in the first place and the need to support people with known  
 131 MHP to decrease their ~~vulnerability~~ to poor social, health, and economic outcomes [13].

132 These results underscore the importance of comprehensive statewide suicide prevention activities that go  
 133 beyond a focus on ~~MHmental health~~ treatment alone. Prevention strategies may include: strengthening  
 134 economic supports (e.g., housing stabilization policies, household financial support); teaching coping and  
 135 problem-solving skills, especially early in life to manage everyday stressors and prevent future relationship  
 136 problems; and promoting social connectedness to increase a sense of belongingness and access to  
 137 informational, tangible, emotional, and social support, ~~as needed~~. Other strategies ~~indicated by these results~~  
 138 include creating protective environments (e.g., reducing access to lethal means among people at risk, creating  
 139 organizational and workplace policies to promote help-seeking and positive social norms), supporting family and  
 140 friends after a suicide ~~has taken place~~, and assuring safe reporting by the media in order to prevent suicide  
 141 contagion [11]. Some states, such as Colorado, are planning and implementing a comprehensive statewide  
 142 approach to suicide prevention [14].

143 The ~~study~~ findings have at least three limitations. In the state-level analysis, rankings for four states (MD, MA, RI,  
 144 UT) might have been impacted by large proportions of injury deaths of undetermined intent, ~~or by decreased~~  
 145 ~~percentages of such deaths over time~~, which likely include some unrecognized suicides. Second, NVDRS is not  
 146 yet nationally representative, ~~and this study's~~. This study used the most current data available which data  
 147 includes 27 states that represent half (49.6%) of the U.S. population. Third, abstractors of NVDRS data are  
 148 limited to data included in investigative reports. ~~For example, mMedical and MHmental health information are~~  
 149 ~~not captured directly from medical records but come~~ from key informants (e.g., family, friends) via  
 150 coroner/medical examiner reports and can. Therefore, informant knowledge impacts the data completeness and  
 151 accuracy of the information reported, and Some studies including in-depth interviews with family members  
 152 show often see greater attributions to ~~MHmental health~~ and substance abuse disorders than medical records,  
 153 however methodological variation across studies exists [15]. It is likely that some people without known MHP in  
 154 the current study were experiencing mental health challenges at the time of death that were either not known  
 155 or ~~reported by informants~~ or were not captured in NVDRS's primary data sources. The lack of awareness of a  
 156 mental health problem suggests the importance of addressing the range of contributing circumstances.

157 Suicide is a growing public health problem. Mental illness is an important risk factor for suicide, and is one of  
 158 many requiring preventive action. Data from NVDRS and resources such as CDC's *Preventing Suicide: a Technical*  
 159 *Package of Policies, Programs, and Practices* [11] can help states and communities better understand their  
 160 suicide problem and prioritize comprehensive suicide prevention.

#### 161 Acknowledgments

162 The authors acknowledge Robert Anderson, Holly Hedegaard, and Margaret Warner from the Division of Vital  
 163 Statistics, National Center for Health Statistics, CDC, for their statistical consultation.

164 **Conflict of Interest** No conflicts of interest were reported.

165 **Corresponding author:** Deborah M. Stone, [dstone3@cdc.gov](mailto:dstone3@cdc.gov), 770-488-3942

166 **Author Affiliations:**

**Comment [FC():]** I suggest pulling this out into a separate paragraph. If contained in the above, it seems to undercut the main point that many suicides don't have MPH. A new paragraph might need a lead-in sentence or maybe start with the current last sentence to frame points about common risks.

**Comment [BE():]** Should this be 'and', 'or' or 'and/or'?

**Comment [JRV8]:** Suggest using "risk of" rather than "vulnerability to", as vulnerability sometimes can have negative connotations aligned with weakness.

**Comment [FC():]** I think it is fine that the TP strategies are presented in different areas of the discussion. I don't easily see "identify and support people at-risk". I think that can go in the proposed paragraph immediately above when talking about common risk factors. In adding that, suggest adding some examples of approaches (e.g., crisis intervention, gatekeeper training).

**Comment [FC():]** I am not easily following this point. Can this be stated more simply such as "...impacted by variations of undetermined injury deaths, which likely....

To help w/word count, offer a couple of suggestions in next few sentences to streamline. Certainly take/leave what you like and check for accuracy.

**Comment [BE():]** Do you mean 'NOT' reported by informants?

**Comment [FC():]** To me, this sentence puts the spotlight back on mental illness and makes it likely it will be the take home message of media reporting. If that isn't the goal of this VS, suggest framing broadly. Ideas: *Effective approaches are available to prevent or ameliorate many*



170 <sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis,  
171 Research, and Practice Integration, National Center for Injury Prevention and Control, CDC

172 **References:**

- 173 1. Centers for Disease Control and Prevention, *Web-based Injury Statistics Query and Reporting System*  
174 *(WISQARS)*. Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018.  
175 2016.
- 176 2. Ivey-Stephenson, A.Z., et al., *Suicide Trends Among and Within Urbanization Levels by Sex,*  
177 *Race/Ethnicity, Age Group, and Mechanism of Death - United States, 2001-2015*. MMWR Surveill Summ,  
178 2017. **66**(18): p. 1-16.
- 179 3. Kegler, S.R., D.M. Stone, and K.M. Holland, *Trends in suicide by level of urbanization—United States,*  
180 *1999–2015*. MMWR. Morbidity and mortality weekly report, 2017. **66**(10): p. 270.
- 181 4. Kochanek, K., et al., *Mortality in the United States, 2016*. NCHS Data Brief, no 293. National Center for  
182 Health Statistics, 2017.
- 183 5. Office of the Surgeon General and National Action Alliance for Suicide Prevention, *2012 National*  
184 *strategy for suicide prevention: goals and objectives for action: a report of the US Surgeon General and*  
185 *of the National Action Alliance for Suicide Prevention*. 2012.
- 186 6. Rosenman, S.J., *Preventing suicide: what will work and what will not*. The Medical Journal of Australia,  
187 1998. **169**(2): p. 100-102.
- 188 7. Torguson, K. and A. O'Brien, *Leading Suicide Prevention Efforts Unite to Address Rising National Suicide*  
189 *Rate*. 2017: Washington, D.C.
- 190 8. Crepeau-Hobson, F., *The Psychological Autopsy and Determination of Child Suicides: A Survey of Medical*  
191 *Examiners*. Archives of Suicide Research, 2010. **14**(1): p. 24-34.
- 192 9. American Psychiatric Association, *Diagnostic and statistical manual of mental disorders (DSM-5®)*. 2013:  
193 American Psychiatric Pub.
- 194 10. Li, Z., et al., *Attributable risk of psychiatric and socio-economic factors for suicide from individual-level,*  
195 *population-based studies: A systematic review*. Social Science & Medicine, 2011. **72**(4): p. 608-616.
- 196 11. Stone, D.M., et al., *Preventing suicide: A technical package of policies, programs, and practice*. 2017.
- 197 12. Simon, T.R., et al., *Characteristics of impulsive suicide attempts and attempters*. Suicide and Life-  
198 Threatening Behavior, 2002. **32**(s1): p. 49-59.
- 199 13. World Health Organization, *Risks to mental health: An overview of vulnerabilities and risk factors*.  
200 Geneva: WHO, 2012.
- 201 14. Caine, E.D., et al., *Comprehensive, integrated approaches to suicide prevention: practical guidance*.  
202 Injury prevention, 2017: p. injuryprev-2017-042366.
- 203 15. Hawton, K., et al., *The psychological autopsy approach to studying suicide: a review of methodological*  
204 *issues*. J Affect Disord, 1998. **50**(2-3): p. 269-76.

205 **Tables and Figures (attachments)**

206 Table 1 and Figure 1.doc

207 Tables 2 and 3.pdf

208 **Word Count:** 1826/1800

209

1 **Short title:** Vital Signs: Increasing Trends in State Suicide Rates and Contributing Circumstances among people  
2 ≥10 years

3 Deborah M. Stone, ScD;<sup>1</sup> Thomas R. Simon PhD;<sup>1</sup> Katherine A. Fowler, PhD;<sup>1</sup> Scott R. Kegler, PhD;<sup>2</sup> Keming Yuan,  
4 MS;<sup>1</sup> Kristin M. Holland, PhD;<sup>1</sup> Asha Z. Ivey-Stephenson, PhD;<sup>1</sup> Alex E. Crosby, MD<sup>1</sup>

5 **Structured abstract (250/250 words—this word count is not included in the 1800 max for the remainder)**

6 **Background:** Suicide rates among people ~~aged~~ ≥10 years have risen nearly 30% since 1999. Mental health  
7 problems (MHP) are just one factor contributing to suicide. Examining state-level trends in suicide and other  
8 contributing circumstances can inform comprehensive state suicide prevention planning.

9 **Methods:** Trends in age-adjusted suicide rates among people ~~aged~~ ≥10 years, by state and sex, across six  
10 consecutive three-year periods (1999-2016), were assessed using ~~data from~~ the National Vital Statistics System  
11 ~~infor~~ 50 states and Washington, D.C (D.C.). Data from the National Violent Death Reporting System, covering 27  
12 states in 2015, ~~examined (were used to examine)~~ precipitating circumstances among decedents ~~with and without~~  
13 ~~known MHP~~.

14 **Results:** From 1999-2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases  
15 of ~~more than 30% or more~~. Rates increased significantly among males and females, in 34 and 43 states,  
16 respectively. Over half (54.0%) of people did *not* have a known MHP; 46.0% did. Groups experienced similar and  
17 differing circumstances and some circumstances were common to both. Among people ~~without known MHP,~~  
18 ~~compared to those with MHP~~, 45.1% and 39.6% ( $p<.01$ ) had any relationship problems/loss, 54.2% and 49.7%  
19 ( $p<.01$ ) had any life stressors/loss and 32.9% and 26.0% ( $p<.01$ ) had any recent/impending crises, respectively.

20 **Conclusions:** Suicide rates increased significantly across most states from 1999-2016. Various circumstances  
21 contributed to suicides among people ~~with and without known MHP~~.

22 **Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach  
23 to prevent suicide risk before it occurs, identify and support people at risk, prevent reattempts, and help  
24 friends/family after a suicide occurs.

## 25 INTRODUCTION

### 26 BACKGROUND AND PURPOSE (250/250 words)

27 In 2016, nearly 45,000 suicides (15.6/100,000 ~~age-adjusted~~) occurred in the United States (U.S.), among people  
28 ≥10 years old [1]. Between 1999 and 2016, suicide rates increased across sexes, racial/ethnic groups, and  
29 urbanization levels [2, 3]. Suicide is the 10<sup>th</sup> leading cause of death and is one of just three leading causes to be  
30 *increasing* [1, 4]. Additionally, rates of Emergency Department visits for nonfatal self-harm, a key risk factor for  
31 suicide, increased nearly 45% between 2001 and 2015 [1]. Together, suicides and self-harm injuries cost the  
32 nation more than \$69 billion in direct medical and work loss costs [1].

33 The *National Strategy for Suicide Prevention*(NSSP) [5] calls for a public health approach to suicide prevention  
34 with efforts spanning across multiple levels (i.e., individual, family/relationship, community, and societal). Such  
35 an approach underscores that suicide is rarely caused by any single factor alone, but rather, is multi-determined.  
36 Despite the NSSP guidance, suicide prevention efforts largely focus on identifying and treating individuals with  
37 mental health problems (MHP) [6]. Other contributing factors include social and economic problems, access to  
38 lethal means (e.g., substances, firearms, bridges) among people at risk, poor coping and problem-solving skills,  
39 and prior suicide attempts [5]. Expanded awareness of the additional circumstances that contribute to suicide

#### Comment [snk6]:

I've never seen the MMWR office strictly enforce the stated limit of 250 words for the Abstract. Here, I think we need to either say "aged ≥10 years" or "≥10 years old".

Another option would be to drop the phrase "among people aged ≥10 years" altogether right here, as this is a general lead-in statement, and just say "suicide rates", since the specific age range is documented in the Methods section just below.

#### Comment [snk6]:

Without this, it sounds like the National Vital Statistics System can be used like a query application.

#### Comment [snk6]:

Being fussy here, as I anticipate the MMWR editors will be as well.

#### Comment [snk6]:

The state ranked 25<sup>th</sup> (IN) had an increase of ~32%. The state ranked 26<sup>th</sup> (LA) had an increase of ~29%.

#### Comment [snk6]:

Consider adding.



risk apart from MHP, can help reach the nation's goal of reducing suicide rates 20% by 2025 [7]. To assist states in achieving this goal, this study analyzes state-specific trends in suicide rates, assesses the multiple contributing factors, and provides recommendations for multi-level comprehensive suicide prevention.

## METHODS (255/250 words)

Suicide rates were analyzed for people aged  $\geq 10$  years only, as attributions of suicidal intent in younger children are variable [8]. Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases 10<sup>th</sup> Revision*, underlying-cause-of death codes X60-X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods ~~from~~spanning 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Characteristics (Table 2) and circumstances (Table 3) of suicide decedents  $\geq 10$  years, with and without known MHP, were compared in the 27 states with complete data participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines MHP as disorders listed in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition [9]. For this study, alcohol and other substance use disorders were not defined as MHP, and were examined in both groups. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known MHP were compared using Chi-square tests. Logistic regression analyses estimated adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and race/ethnicity.

## RESULTS (584/600 words)

The most recent overall suicide rates (representing 2014-2016) varied four-fold, from 6.9 (D.C.) to 29.2 (Montana) per 100,000 persons per year (Table 1). Across the study period, rates increased in all states, except Nevada (with the 9<sup>th</sup> highest current suicide rate), with absolute increases ranging from +0.8 (Delaware) to +8.1 (Wyoming) per 100,000. Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with increases of at least more than 30% observed in 25 states.

Modeled suicide rate trends indicated significant increases for 44 states, as well as for the U.S. overall (Table 1). By sex, modeled rate trends indicated significant increases in 34 states for males and in 43 states for females. Nationally, the model-estimated AAPC for the overall suicide rate was +1.5%. By sex, the national AAPC was +1.1% for males and +2.6% for females.

Suicide decedents without known MHP (N=11,039) were compared to those with MHP (N=9,407). While all decedents were predominately male (Table 2; 76.8%) and non-Hispanic white (83.6%), those without known MHP, relative to those with MHP, were more likely male (83.6% vs. 68.8%; adjusted odds ratio (aOR)=2.3, 95% CI = 2.2-2.5) and racial/ethnic minorities (odds ratio [OR] range: 1.2-2.1; 95% CI range [1.0-1.3] – [1.6-2.0]). Suicide decedents without known MHP also had significantly greater odds of perpetrating homicide-suicide (aOR = 2.9, 95% CI = 2.2-3.8), of firearm suicide (aOR = 1.6, 95% CI = 1.5-1.7), and of testing positive for alcohol (aOR = 1.2, 95% CI = 1.1-1.3). Among adult decedents, 20.1% and 15.3% of people without and with MHP, respectively, ever served in the U.S. military.

**Comment [zaf9]:** Scott we had this as 0.2 before?? Can you confirm 0.8 is correct?

**Comment [snk6]:**

Thank you. It (+0.8) is correct. Just cross-checked against the actual SAS output and against Table 1 (where it is correct).



85 Although firearms were used most often, overall (48.5%), decedents with known MHP died by poisoning  
 86 significantly more than those without known MHP (19.8% vs. 10.4%), most frequently by over-the-  
 87 counter/otherwise unclassified drugs (35.8%), opioids (32.7%), antidepressants (34.6%) or benzodiazepines  
 88 (25.1%).

89 All suicide decedents with known MHP (N=9,407) and approximately 85% without MHP (N=9,357) had available  
 90 circumstances information (Table 3). People without known MHP were 30% less likely to have any substance  
 91 abuse problems (aOR=0.7, 95% CI=0.7-0.8). While two-thirds of those with known MHP had a history of mental  
 92 health or substance abuse treatment (67.2%), just over half (54.0%) were in current treatment.

93 Decedents without known MHP, versus those with known MHP had a significantly greater likelihood of any  
 94 relationship problem/loss (45.1% vs. 39.6%), specifically intimate partner problems (30.2% vs. 24.1%),  
 95 arguments/conflicts (17.5% vs. 13.6%), and recently perpetrating interpersonal violence (3.0% vs. 1.4%). They  
 96 were also significantly more likely to have experienced other life stressors, such as criminal-legal problems  
 97 (10.7% vs. 6.2%) or eviction/loss of home (4.3% vs. 3.4%), and they were more likely to have had a crisis within  
 98 the preceding or upcoming two weeks (32.9% vs. 26.0%). Among both groups, the most common crises were  
 99 intimate partner (36.2% vs. 34.9%) and physical health problems (13.8% vs. 12.9%), respectively.

100 Decedents without known MHP had significantly lower odds of recent release from any institution, but among  
 101 those who were recently released, those without a known MHP were significantly more likely to be released  
 102 from a correctional facility (25.7% vs. 8.7%) or hospital (43.7% vs. 33.0%) than those with a known MHP. Among  
 103 decedents with known MHP recently released from an institution (10.2%), 42.8% were released from psychiatric  
 104 facilities.

105 Decedents without known MHP, compared to those with known MHP, were 60% less likely to have a history of  
 106 suicidal ideation (aOR=0.4, 95% CI=0.4-0.5) and 70% less likely to have an attempt history (aOR=0.3, 95% CI=0.3-  
 107 0.3). Both groups disclosed suicide intent frequently, (22.4% vs. 24.5%), respectively.

#### 108 **Conclusions and Comments (680/700 words)**

109 The rise in suicide rates in the overall U.S. has been observed for many years [10]. Reporting of state-specific  
 110 trends ~~overall and by sex is much~~ less common. Similarly, while geographic patterning in suicide rates have  
 111 frequently been reported [10], the current findings point to a disturbing pattern of increases nationwide.  
 112 Understanding the contributing circumstances of suicide is obligatory for prevention practice and decision-  
 113 making.

114 Research and prevention practitioners regularly state that suicide is not caused by a single factor, however, the  
 115 focus of suicide research and prevention practices almost solely focus on MHP. The current study found that  
 116 more than half of suicide decedents in NVDRS did *not* have a known MHP. This group suffered more relationship  
 117 problems and life stressors such as criminal-legal matters, eviction/loss of home, and recent or impending crises.  
 118 This is particularly noteworthy in light of findings that suggest many suicides and attempts occur with minimal  
 119 deliberation [12].

120 Among people with MHP, two-thirds had a history of mental health and/or substance abuse treatment and over  
 121 half were in current treatment. This suggests that additional supports for this population are needed to keep  
 122 them safe. This includes broader implementation of affordable and effective treatment modalities such as  
 123 doctor-patient collaborative care models and cognitive-behavioral therapy. Additionally, greater access to  
 124 behavioral health providers, especially in underserved areas is needed, as is expansion of healthcare systems

#### **Comment [snk6]:**

Maybe we can drop this phrase without taking away from the intended message, and save a few words?

#### **Comment [snk6]:**

Much less common or somewhat less common?



needed that integrate physical and behavioral health and that better support suicide prevention and patient safety, especially through care transitions [11].

Study findings indicate that people with known MHP also experienced other life stressors such as job/financial, relationship, and/or physical health problems. These findings point to the need to both prevent the conditions associated with mental health problems in the first place and the need to support people with known MHP to decrease their risk of poor social, health, and economic outcomes [13].

These results, together, underscore the importance of comprehensive statewide suicide prevention activities that address multiple factors associated with suicide. Prevention strategies may include: strengthening economic supports (e.g., housing stabilization policies, household financial support); teaching coping and problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in life; promoting social connectedness to increase a sense of belongingness and access to informational, tangible, emotional, and social support, and identifying and better supporting people at risk. Other strategies include creating protective environments (e.g., reducing access to lethal means among people at risk, creating organizational and workplace policies to promote help-seeking, easing transitions into and out of work for people with MHP and other life challenges), supporting family and friends after a suicide, and assuring safe reporting by the media in order to prevent suicide contagion [11]. Some states, such as Colorado, are planning and implementing such a comprehensive approach to suicide prevention [14].

These findings have at least three limitations. In the state-level analysis, rankings for four states (MD, MA, RI, UT) might have been impacted by large proportions of injury deaths of undetermined intent (i.e. decreasing suicide-ratespotentially biasing reported suicide rates downward), or decreased percentages of such deaths over time (i.e. increasing suicide-ratespotentially biasing estimated rate trends upward). Second, NVDRS is not yet nationally representative, the 27 states included in the current study represent 49.6% of the U.S. population. Third, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the extent of informant knowledge can impact data completeness and accuracy. Studies including in-depth interviews with next-of-kin often see greater attributions to MHP and substance abuse disorders, however many methodological variations across studies exist [15]. It is likely that some people without known MHP in the current study were experiencing mental health challenges that were unknown, and hence unreported by key informants. However, any lack of awareness of decedent MHP suggests, even further, the importance of addressing the range of contributing circumstances.

Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are available. States and communities can use data from NVDRS and resources such as CDC's *Preventing Suicide: a Technical Package of Policies, Programs, and Practices* [11] to better understand their suicide problem and prioritize evidence-based comprehensive suicide prevention.

**Comment [snk6]:**

More precise explanation of the *potential* influences, at the expense of just a few added words.

**Acknowledgments**

The authors acknowledge Robert Anderson, Holly Hedegaard, and Margaret Warner from the Division of Vital Statistics, National Center for Health Statistics, CDC, for their statistical consultation.

**Conflict of Interest** No conflicts of interest were reported.

**Corresponding author:** Deborah M. Stone, [dstone3@cdc.gov](mailto:dstone3@cdc.gov), 770-488-3942

**Author Affiliations:**

<sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis, Research, and Practice Integration, National Center for Injury Prevention and Control, CDC

## References:

1. Centers for Disease Control and Prevention, *Web-based Injury Statistics Query and Reporting System (WISQARS)*. Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018. 2016.
2. Ivey-Stephenson, A.Z., et al., *Suicide Trends Among and Within Urbanization Levels by Sex, Race/Ethnicity, Age Group, and Mechanism of Death - United States, 2001-2015*. MMWR Surveill Summ, 2017. **66**(18): p. 1-16.
3. Kegler, S.R., D.M. Stone, and K.M. Holland, *Trends in suicide by level of urbanization—United States, 1999–2015*. MMWR. Morbidity and mortality weekly report, 2017. **66**(10): p. 270.
4. Kochanek, K., et al., *Mortality in the United States, 2016*. NCHS Data Brief, no 293. National Center for Health Statistics, 2017.
5. Office of the Surgeon General and National Action Alliance for Suicide Prevention, *2012 National strategy for suicide prevention: goals and objectives for action: a report of the US Surgeon General and of the National Action Alliance for Suicide Prevention*. 2012.
6. Rosenman, S.J., *Preventing suicide: what will work and what will not*. The Medical Journal of Australia, 1998. **169**(2): p. 100-102.
7. Torguson, K. and A. O'Brien, *Leading Suicide Prevention Efforts Unite to Address Rising National Suicide Rate*. 2017: Washington, D.C.
8. Crepeau-Hobson, F., *The Psychological Autopsy and Determination of Child Suicides: A Survey of Medical Examiners*. Archives of Suicide Research, 2010. **14**(1): p. 24-34.
9. American Psychiatric Association, *Diagnostic and statistical manual of mental disorders (DSM-5®)*. 2013: American Psychiatric Pub.
10. Li, Z., et al., *Attributable risk of psychiatric and socio-economic factors for suicide from individual-level, population-based studies: A systematic review*. Social Science & Medicine, 2011. **72**(4): p. 608-616.
11. Stone, D.M., et al., *Preventing suicide: A technical package of policies, programs, and practice*. 2017.
12. Simon, T.R., et al., *Characteristics of impulsive suicide attempts and attempters*. Suicide and Life-Threatening Behavior, 2002. **32**(s1): p. 49-59.
13. World Health Organization, *Risks to mental health: An overview of vulnerabilities and risk factors*. Geneva: WHO, 2012.
14. Caine, E.D., et al., *Comprehensive, integrated approaches to suicide prevention: practical guidance*. Injury prevention, 2017: p. injuryprev-2017-042366.
15. Hawton, K., et al., *The psychological autopsy approach to studying suicide: a review of methodological issues*. J Affect Disord, 1998. **50**(2-3): p. 269-76.

## Tables and Figures (attachments)

Table 1 and Figure 1.doc

Tables 2 and 3.pdf

**Word Count:** 1762/1800



1 **Short title:** Vital Signs: Increasing Trends in State Suicide Rates and Contributing Circumstances among people  
2 ≥10 years

3 Deborah M. Stone, ScD;<sup>1</sup> Thomas R. Simon PhD;<sup>1</sup> Katherine A. Fowler, PhD;<sup>1</sup> Scott R. Kegler, PhD;<sup>2</sup> Keming Yuan,  
4 MS;<sup>1</sup> Kristin M. Holland, PhD;<sup>1</sup> Asha Z. Ivey-Stephenson, PhD;<sup>1</sup> Alex E. Crosby, MD<sup>1</sup>

5 **Structured abstract (250/250 words—this word count is not included in the 1800 max for the remainder)**

6 **Background:** Suicide rates among people ≥10 years have risen nearly 30% since 1999. Mental health problems  
7 (MHP) are just one factor contributing to suicide. Examining state-level trends in suicide and other contributing  
8 circumstances can inform comprehensive state suicide prevention planning.

9 **Methods:** Trends in age-adjusted suicide rates among people ≥10 years, by state and sex, across six consecutive  
10 three-year periods (1999–2016), were assessed using the National Vital Statistics System in 50 states and  
11 Washington, D.C. (D.C.). Data from the National Violent Death Reporting System, covering 27 states in 2015, was  
12 used to examine contributing precipitating circumstances among decedents with and without known MHP.

13 **Results:** From 1999–2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases  
14 of 30% or more. Rates increased significantly among males and females, in 34 and 43 states, respectively. Over  
15 half (54.0%) of decedents people did not have a known MHP; 46.0% did. Among decedents with circumstance  
16 information, those without known MHP were more likely (all  $p < .01$ ) than those with a MHP to have relationship  
17 problems/loss (Groups experienced similar and differing circumstances and some circumstances were common  
18 to both. Among people without known MHP, compared to those with MHP), 45.1% vs and 39.6%), life  
19 stressors/loss ( $p < .01$ ) had any relationship problems/loss, 54.2% vs and 49.7% ( $p < .01$ ) and  
20 recent/impending crises (32.9% vs 26.0%), but these circumstances were common across groups. ad any life  
21 stressors/loss and 32.9% and 26.0% ( $p < .01$ ) had any recent/impending crises, respectively.

22 **Conclusions:** Suicide rates increased significantly across most states from 1999–2016. Various circumstances  
23 contributed to suicides among people with and without known MHP.

24 **Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach  
25 to prevent suicide risk before it occurs, identify and support people at risk, prevent reattempts, and help  
26 friends/family after a suicide occurs.

## 27 INTRODUCTION

### 28 BACKGROUND AND PURPOSE (250/250 words)

29 In 2016, nearly 45,000 suicides (15.6/100,000) occurred in the United States (U.S.), among people ≥10 years old  
30 [1]. Between 1999 and 2016, suicide rates increased across sexes, racial/ethnic groups, and urbanization levels  
31 [2, 3]. Suicide is the 10<sup>th</sup> leading cause of death and is one of just three leading causes that are to be increasing  
32 [1, 4]. Additionally, rates of Emergency Department visits for nonfatal self-harm, a key risk factor for suicide,  
33 increased nearly 45% between 2001 and 2015 [1]. Together, suicides and self-harm injuries cost the nation more  
34 than \$69 billion in direct medical and work loss costs [1].

35 The *National Strategy for Suicide Prevention* (NSSP) [5] calls for a public health approach to suicide prevention  
36 with efforts spanning across multiple levels (i.e., individual, family/relationship, community, and societal). Such  
37 an approach underscores that suicide is rarely caused by any single factor alone, but rather, is multi-determined.  
38 Despite the NSSP guidance, suicide prevention efforts largely focus on identifying and treating individuals with  
39 mental health problems (MHP) [6]. Other contributing factors/circumstances include social and economic

**Comment [BE()]:** Sometimes it is referred to as a 'contributing circumstance' and sometimes its referred to as a 'contributing factor'. I wonder if its best to be consistent so as not to confuse the reader that the two are different. From a plain language perspective, I prefer contributing factors ☺. Also, sometimes it is referred to a just 'contributing factor' while other times it is referred to as 'contributing risk factor'. Also, sometime it is referred to as 'contributing' and sometimes as 'associated'. Should we be consistent?

**I FOUND:**  
CONTRIBUTING CIRCUMSTANCES=3  
PRECIPITATING CIRCUMSTANCES=1  
CIRCUMSTANCES (ALONE)=6  
CONTRIBUTING FACTORS=3  
FACTORS (ALONE)=3  
RISK FACTORS=2

**Comment [tgs9]:** I think we can say contributing circumstances a few times in the text and then just use circumstances.

**Comment [za19]:** Is this still accurate?

**Comment [tgs9]:** Some editing is needed because this read like the data examined circumstances.

**Comment [za19]:** Switched the order here

**Comment [tgs9]:** I saw that Cory made a good suggestion to say among those with circumstance information. If we make one point about the p-value we can save words. The edits I suggested allow us that there are differences but these are common for both.



problems, access to lethal means (e.g., substances, firearms, bridges) among people at risk, poor coping and problem-solving skills, and prior suicide attempts [5]. Expanded awareness of the additional circumstances that contribute to suicide risk apart from MHP, can help reach the nation's goal of reducing suicide rates 20% by 2025 [7]. To assist states in achieving this goal, this study analyzes state-specific trends in suicide rates, assesses the multiple contributing factors, and provides recommendations for multi-level comprehensive suicide prevention.

## **METHODS (255/250 words)**

Suicide rates were analyzed for people  $\geq 10$  years only, as attributions of suicidal intent in younger children are variable [8]. Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases 10<sup>th</sup> Revision*, underlying-cause-of death codes X60-X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods from 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Characteristics (Table 2) and circumstances (Table 3) of suicide decedents  $\geq 10$  years, with and without known MHP, were compared in the 27 states with complete data participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines MHP as disorders listed in the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* [9]. For this study, alcohol and other substance use disorders were not defined as MHP, and were examined in both groups. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known MHP were compared using Chi-square tests. Logistic regression analyses estimated adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and race/ethnicity.

## **RESULTS (584/600 words)**

The most recent overall suicide rates (representing 2014-2016) varied four-fold, from 6.9 (D.C.) to 29.2 (Montana) per 100,000 persons per year (Table 1). Across the study period, rates increased in all states, except Nevada (with the 9<sup>th</sup> highest current suicide rate), with absolute increases ranging from +0.8 (Delaware) to +8.1 (Wyoming) per 100,000. Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with increases of at least 30% observed in 25 states.

Modeled suicide rate trends indicated significant increases for 44 states, as well as for the U.S. overall (Table 1). By sex, modeled rate trends indicated significant increases in 34 states for males and in 43 states for females. Nationally, the model-estimated AAPC for the overall suicide rate was +1.5%. By sex, the national AAPC was +1.1% for males and +2.6% for females.

Suicide decedents without known MHP (N=11,039) were compared to those with MHP (N=9,407). While all decedents were predominately male (Table 2; 76.8%) and non-Hispanic white (83.6%), those without known MHP, relative to those with MHP, were more likely male (83.6% vs. 68.8%; adjusted odds ratio (aOR)=2.3, 95% CI = 2.2-2.5) and racial/ethnic minorities (odds ratio [OR] range: 1.2-2.1; 95% CI range [1.0-1.3] – [1.6-2.0]). Suicide decedents without known MHP also had significantly greater odds of perpetrating homicide-suicide (aOR = 2.9, 95% CI = 2.2-3.8), of firearm suicide (aOR = 1.6, 95% CI = 1.5-1.7), and of testing positive for alcohol (aOR = 1.2,

**Comment [zaf9]:** The comment made was that it wasn't clear how we defined MHP since substance use disorders are a diagnosis in DSM-V. Changed this to be more straightforward.

**Comment [za19]:** Scott we had this as 0.2 before?? Can you confirm 0.8 is correct?



86 95% CI = 1.1-1.3). Among adult decedents, 20.1% and 15.3% of people without and with MHP, respectively, ever  
 87 served in the U.S. ~~military~~.

88 Although firearms were used most often, overall (48.5%), decedents with known MHP ~~were more likely to die~~  
 89 ~~by suffocation (31.3 vs. 26.9%) and poisoning (19.8% vs. 10.4%) significantly more than those without known~~  
 90 ~~MHP (19.8% vs. 10.4%), most frequently by over-the-counter/otherwise-unclassified (drugs (35.8%), opioids~~  
 91 ~~(32.7%), antidepressants (34.6%) or benzodiazepines (25.1%).~~

92 All suicide decedents with known MHP (N=9,407) and approximately 85% without MHP (N=9,357) had available  
 93 circumstances information (Table 3). People without known MHP were ~~30%~~ less likely to have any substance  
 94 abuse problems (aOR=0.7, 95% CI=0.7-0.8). While two-thirds of those with known MHP had a history of mental  
 95 health or substance abuse treatment (67.2%), just over half (54.0%) were in current treatment.

96 ~~Decedents without known MHP, versus those with known MHP had a significantly greater likelihood of any~~  
 97 ~~relationship problem/loss (45.1% vs. 39.6%), specifically intimate partner problems (30.2% vs. 24.1%),~~  
 98 ~~arguments/conflicts (17.5% vs. 13.6%), and recently perpetrating interpersonal violence (3.0% vs. 1.4%). They~~  
 99 ~~were also significantly more likely to have experienced other life stressors, such as criminal-legal problems~~  
 100 ~~(10.7% vs. 6.2%) or eviction/loss of home (4.3% vs. 3.4%), and they were more likely to have had a crisis within~~  
 101 ~~the preceding or upcoming two weeks (32.9% vs. 26.0%). Among both groups, the most common crises were~~  
 102 ~~intimate partner (36.2% vs. 34.9%) and physical health problems (13.8% vs. 12.9%), respectively.~~

103 Decedents without known MHP had significantly lower odds of recent release from any institution, but among  
 104 those who were recently released (~~5.1%~~), those without a known MHP were significantly more likely to be  
 105 released from a correctional facility (25.7% vs. 8.7%) or hospital (43.7% vs. 33.0%) than those with a known  
 106 MHP. Among decedents with known MHP recently released from an institution (10.2%), 42.8% were released  
 107 from psychiatric facilities.

108 ~~Decedents without known MHP, compared to those with known MHP, were 60% less likely to have a history of~~  
 109 ~~suicidal ideation (aOR=0.4, 95% CI=0.4-0.5) and 70% less likely to have an prior suicide attempt history~~  
 110 ~~(aOR=0.3, 95% CI=0.3-0.3). Both groups disclosed suicide intent frequently, (22.4% vs. 24.5%), respectively.~~

# 111 Conclusions and Comments (680/700 words)

112 The rise in suicide rates in the overall U.S. has been observed for many years [10]. ~~Reporting of state-specific~~  
 113 ~~trends overall and by sex is much less common.~~ Similarly, while geographic patterning in suicide rates have  
 114 frequently been reported [10], the current findings point to a disturbing pattern of increases nationwide.  
 115 Understanding the contributing circumstances of suicide is obligatory for prevention practice and decision-  
 116 making.

117 Researchers and ~~prevention~~-practitioners regularly state that suicide is not caused by a single factor, however,  
 118 the focus of suicide research and prevention practices almost solely focus on MHP. The current study found that  
 119 more than half of suicide decedents in NVDRS did *not* have a known MHP. This group suffered more relationship  
 120 problems and life stressors such as criminal-legal matters, eviction/loss of home, and recent or impending crises.  
 121 This is particularly noteworthy in light of findings that suggest many suicides and attempts occur with minimal  
 122 deliberation [12].

123 Among people with MHP, two-thirds had a history of mental health and/or substance abuse treatment and over  
 124 half were in current treatment. This suggests that additional supports for this population are needed to keep  
 125 them safe. This includes broader implementation of affordable and effective treatment modalities such as  
 126 doctor-patient collaborative care models and cognitive-behavioral therapy. Additionally, greater access to

Comment [za9]: Malia wanted to know if we could say "had served or were serving" in the U.S. Military.

Comment [tgs9]: I think that is fine.

Comment [FC]: I think the comparison group %'s are needed. For instance, drugs (35.8% vs. 35.8%).

I think the presentation of the %'s would be easier here and later on in the results if the p's came out and the text could simply reflect "significant differences" or some variation of indicating in the groups were different.

I DIDN'T CHANGE THIS B/C IT OPENS UP THE ISSUE OF PEOPLE W/O MHP TAKING ANTIDEP ETC

Do we even need to give this distribution? We don't talk about the types in the discussion

Comment [za9]: I kept this paragraph confined to percentages but did add some additional aOR's in other places.

Comment [tgs9]: We should be consistent and add this if we have the 10.2% below.

Comment [za9]: We were asked to include disclosure of suicide intent. Also, changed the formatting here a bit.

Comment [tgs9]: Why did you add this? It sounds like others have done it already. I think the last version of the start of the conclusion was more compelling.



behavioral health providers, especially in underserved areas is needed, as is expansion of healthcare systems needed that integrate physical and behavioral health and that better support suicide prevention and patient safety, especially through care transitions [11].

Study findings indicate that people with known MHP also experienced other life stressors such as job/financial, relationship, and/or physical health problems. These findings point to the need to both prevent the conditions associated with mental health problems in the first place and the need to support people with known MHP to decrease their risk of poor social, health, and economic outcomes [13].

These results, together, underscore the importance of comprehensive statewide suicide prevention activities that address multiple factors associated with suicide. Prevention strategies may include: strengthening economic supports (e.g., housing stabilization policies, household financial support); teaching coping and problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in life; promoting social connectedness to increase a sense of belongingness and access to informational, tangible, emotional, and social support, and identifying and better supporting people at risk. Other strategies include creating protective environments (e.g., reducing access to lethal means among people at risk, creating organizational and workplace policies to promote help-seeking, easing transitions into and out of work for people with MHP and other life challenges), supporting family and friends after a suicide, and assuring safe reporting by the media in order to prevent suicide contagion [11]. Some states, such as Colorado, are planning and implementing such a comprehensive approach to suicide prevention [14].

These findings have at least three limitations. In the state-level analysis, rankings for four states (MD, MA, RI, UT) might have been impacted by large proportions of injury deaths of undetermined intent (i.e. decreasing suicide rates), or decreased percentages of such deaths over time (i.e. increasing suicide rates). Second, NVDRS is not yet nationally representative, the 27 states included in the current study represent 49.6% of the U.S. population. Third, abstractors of NVDRS data are limited to information contained in investigative reports.

Therefore, the extent of informant knowledge can impact data completeness and accuracy. Studies including in-depth interviews with next-of-kin often see greater attributions to MHP and substance abuse disorders, however many methodological variations across studies exist [15]. It is likely that some people without known MHP in the current study were experiencing mental health challenges that were unknown, and hence unreported by key informants. However, any lack of awareness of decedent MHP suggests, even further, the importance of addressing the range of contributing circumstances.

Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are available. States and communities can use data from NVDRS and resources such as CDC's *Preventing Suicide: a Technical Package of Policies, Programs, and Practices* [11] to better understand their suicide problem and prioritize evidence-based comprehensive suicide prevention.

#### Acknowledgments

The authors acknowledge Robert Anderson, Holly Hedegaard, and Margaret Warner from the Division of Vital Statistics, National Center for Health Statistics, CDC, for their statistical consultation.

**Conflict of Interest** No conflicts of interest were reported.

**Corresponding author:** Deborah M. Stone, [dstone3@cdc.gov](mailto:dstone3@cdc.gov), 770-488-3942

**Author Affiliations:**

**Comment [za19]:** Is this confirmed, Tom?

**Comment [tgs9]:** This is from the 2015 NVDRS SS

**Comment [za19]:** Need to consider this part further.

**Comment [za19]:** Is this still ok?

**Comment [za19]:** Cory had a great idea here so took out, Mental illness is an important risk factor for suicide, and is one of many requiring preventive action. She said the media would probably just take away Mental illness is an important risk factor, period.



<sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis, Research, and Practice Integration, National Center for Injury Prevention and Control, CDC

## References:

1. Centers for Disease Control and Prevention, *Web-based Injury Statistics Query and Reporting System (WISQARS)*. Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018. 2016.
2. Ivey-Stephenson, A.Z., et al., *Suicide Trends Among and Within Urbanization Levels by Sex, Race/Ethnicity, Age Group, and Mechanism of Death - United States, 2001-2015*. MMWR Surveill Summ, 2017. **66**(18): p. 1-16.
3. Kegler, S.R., D.M. Stone, and K.M. Holland, *Trends in suicide by level of urbanization—United States, 1999–2015*. MMWR. Morbidity and mortality weekly report, 2017. **66**(10): p. 270.
4. Kochanek, K., et al., *Mortality in the United States, 2016*. NCHS Data Brief, no 293. National Center for Health Statistics, 2017.
5. Office of the Surgeon General and National Action Alliance for Suicide Prevention, *2012 National strategy for suicide prevention: goals and objectives for action: a report of the US Surgeon General and of the National Action Alliance for Suicide Prevention*. 2012.
6. Rosenman, S.J., *Preventing suicide: what will work and what will not*. The Medical Journal of Australia, 1998. **169**(2): p. 100-102.
7. Torguson, K. and A. O'Brien, *Leading Suicide Prevention Efforts Unite to Address Rising National Suicide Rate*. 2017: Washington, D.C.
8. Crepeau-Hobson, F., *The Psychological Autopsy and Determination of Child Suicides: A Survey of Medical Examiners*. Archives of Suicide Research, 2010. **14**(1): p. 24-34.
9. American Psychiatric Association, *Diagnostic and statistical manual of mental disorders (DSM-5®)*. 2013: American Psychiatric Pub.
10. Li, Z., et al., *Attributable risk of psychiatric and socio-economic factors for suicide from individual-level, population-based studies: A systematic review*. Social Science & Medicine, 2011. **72**(4): p. 608-616.
11. Stone, D.M., et al., *Preventing suicide: A technical package of policies, programs, and practice*. 2017.
12. Simon, T.R., et al., *Characteristics of impulsive suicide attempts and attempters*. Suicide and Life-Threatening Behavior, 2002. **32**(s1): p. 49-59.
13. World Health Organization, *Risks to mental health: An overview of vulnerabilities and risk factors*. Geneva: WHO, 2012.
14. Caine, E.D., et al., *Comprehensive, integrated approaches to suicide prevention: practical guidance*. Injury prevention, 2017: p. injuryprev-2017-042366.
15. Hawton, K., et al., *The psychological autopsy approach to studying suicide: a review of methodological issues*. J Affect Disord, 1998. **50**(2-3): p. 269-76.

## Tables and Figures (attachments)

Table 1 and Figure 1.doc

Tables 2 and 3.pdf

**Word Count:** 1762/1800

**Comment [zaf9]:** Need to replace ref 10 and fix 11-15



1 **Short title:** Vital Signs: Increasing Trends in State Suicide Rates and Contributing Circumstances among people  
2 ≥10 years

3 Deborah M. Stone, ScD;<sup>1</sup> Thomas R. Simon PhD;<sup>1</sup> Katherine A. Fowler, PhD;<sup>1</sup> Scott R. Kegler, PhD;<sup>2</sup> Keming Yuan,  
4 MS;<sup>1</sup> Kristin M. Holland, PhD;<sup>1</sup> Asha Z. Ivey-Stephenson, PhD;<sup>1</sup> Alex E. Crosby, MD<sup>1</sup>

5 **Structured abstract (250/250 words—this word count is not included in the 1800 max for the remainder)**

6 **Background:** Suicide rates among people ≥10 years have risen nearly 30% since 1999. Mental health problems  
7 (MHP) are just one factor contributing to suicide. Examining state-level trends in suicide and other contributing  
8 circumstances can inform comprehensive state suicide prevention planning.

9 **Methods:** Trends in age-adjusted suicide rates among people ≥10 years, by state and sex, across six consecutive  
10 three-year periods (1999-2016), were assessed using the National Vital Statistics System in 50 states and  
11 Washington, D.C (D.C.). Data from the National Violent Death Reporting System, covering 27 states in 2015, was  
12 used to examine contributing circumstances among decedents with and without known MHP.

13 **Results:** From 1999-2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases  
14 of 30% or more. Rates increased significantly among males and females, in 34 and 43 states, respectively. Over  
15 half (54.0%) of decedents did not have a known MHP. Among decedents with circumstance information, those  
16 without known MHP were more likely (all  $p \leq .01$ ) than those with a MHP to have relationship problems/loss  
17 (45.1% vs 39.6%), life stressors/loss (54.2% vs 49.7%) and recent/impending crises (32.9% vs 26.0%), but these  
18 circumstances were common across groups.

19 **Conclusions:** Suicide rates increased significantly across most states from 1999-2016. Various circumstances  
20 contributed to suicides among people with and without known MHP.

21 **Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach  
22 to prevent suicide risk before it occurs, identify and support people at risk, prevent reattempts, and help  
23 friends/family after a suicide occurs.

## 24 INTRODUCTION

### 25 BACKGROUND AND PURPOSE (250/250 words)

26 In 2016, nearly 45,000 suicides (15.6/100,000) occurred in the United States (U.S.), among people ≥10 years old  
27 [1]. Between 1999 and 2016, suicide rates increased across sexes, racial/ethnic groups, and urbanization levels  
28 [2, 3]. Suicide is the 10<sup>th</sup> leading cause of death and is one of just three leading causes that are increasing [1, 4].  
29 Additionally, rates of Emergency Department visits for nonfatal self-harm, a key risk factor for suicide, increased  
30 nearly 45% between 2001 and 2015 [1]. Together, suicides and self-harm injuries cost the nation more than \$69  
31 billion in direct medical and work loss costs [1].

32 The *National Strategy for Suicide Prevention (NSSP)* [5] calls for a public health approach to suicide prevention  
33 with efforts spanning across multiple levels (i.e., individual, family/relationship, community, and societal). Such  
34 an approach underscores that suicide is rarely caused by any single factor, but rather, is multi-determined.  
35 Despite the NSSP guidance, suicide prevention efforts largely focus on identifying and treating individuals with  
36 mental health problems (MHP) [6]. Other contributing circumstances include social and economic problems,  
37 access to lethal means (e.g., substances, firearms, bridges) among people at risk, poor coping and problem-  
38 solving skills, and prior suicide attempts [5]. Expanded awareness of the additional circumstances that  
39 contribute to suicide risk apart from MHP, can help reach the nation's goal of reducing suicide rates 20% by

**Comment [BE():]** Sometimes it is referred to as a 'contributing circumstance' and sometimes its referred to as a 'contributing factor'. I wonder if its best to be consistent so as not to confuse the reader that the two are different. From a plain language perspective, I prefer contributing factors ☺. Also, sometimes it is referred to a just 'contributing factor' while other times it is referred to as 'contributing risk factor'. Also, sometime it is referred to as 'contributing' and sometimes as 'associated'. Should we be consistent?

**I FOUND:**  
CONTRIBUTING CIRCUMSTANCES=3  
PRECIPITATING CIRCUMSTANCES=1  
CIRCUMSTANCES (ALONE)=6  
CONTRIBUTING FACTORS=3  
FACTORS (ALONE)=3  
RISK FACTORS=2

**Comment [tgs9]:** I think we can say contributing circumstances a few times in the text and then just use circumstances.

**Comment [za19]:** Is this still accurate?

**Comment [tgs9]:** Some editing is needed because this read like the data examined circumstances.

**Comment [za19]:** Switched the order here

**Comment [tgs9]:** I saw that Cory made a good suggestion to say among those with circumstance information. If we make one point about the p-value we can save words. The edits I suggested allow us that there are differences but these are common for both.



2025 [7]. To assist states in achieving this goal, this study analyzes state-specific trends in suicide rates, assesses the multiple contributing factors, and provides recommendations for multi-level comprehensive suicide prevention.

## METHODS (255/250 words)

Suicide rates were analyzed for people  $\geq 10$  years only, as attributions of suicidal intent in younger children are variable [8]. Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases 10<sup>th</sup> Revision*, underlying-cause-of death codes X60-X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods from 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Characteristics (Table 2) and circumstances (Table 3) of suicide decedents  $\geq 10$  years, with and without known MHP, were compared in the 27 states with complete data participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines MHP as disorders listed in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition [9]. For this study, alcohol and other substance use disorders were not defined as MHP, and were examined in both groups. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known MHP were compared using Chi-square tests. Logistic regression analyses estimated adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and race/ethnicity.

## RESULTS (584/600 words)

The most recent overall suicide rates (representing 2014-2016) varied four-fold, from 6.9 (D.C.) to 29.2 (Montana) per 100,000 persons per year (Table 1). Across the study period, rates increased in all states, except Nevada (with the 9<sup>th</sup> highest current suicide rate), with absolute increases ranging from +0.8 (Delaware) to +8.1 (Wyoming) per 100,000. Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with increases of at least 30% observed in 25 states.

Modeled suicide rate trends indicated significant increases for 44 states, as well as for the U.S. overall (Table 1). By sex, modeled rate trends indicated significant increases in 34 states for males and in 43 states for females. Nationally, the model-estimated AAPC for the overall suicide rate was +1.5%. By sex, the national AAPC was +1.1% for males and +2.6% for females.

Suicide decedents without known MHP (N=11,039) were compared to those with MHP (N=9,407). While all decedents were predominately male (Table 2; 76.8%) and non-Hispanic white (83.6%), those without known MHP, relative to those with MHP, were more likely male (83.6% vs. 68.8%; adjusted odds ratio (aOR)=2.3, 95% CI = 2.2-2.5) and racial/ethnic minorities (odds ratio [OR] range: 1.2-2.1; 95% CI range [1.0-1.3] – [1.6-2.0]). Suicide decedents without known MHP also had significantly greater odds of perpetrating homicide-suicide (aOR = 2.9, 95% CI = 2.2-3.8), of firearm suicide (aOR = 1.6, 95% CI = 1.5-1.7), and of testing positive for alcohol (aOR = 1.2, 95% CI = 1.1-1.3). Among adult decedents, 20.1% and 15.3% of people without and with MHP, respectively, ever served in the U.S. military.

**Comment [zaf9]:** The comment made was that it wasn't clear how we defined MHP since substance use disorders are a diagnosis in DSM-V. Changed this to be more straightforward.

**Comment [zaf9]:** Scott we had this as 0.2 before?? Can you confirm 0.8 is correct?

**Comment [zaf9]:** Malia wanted to know if we could say "had served or were serving" in the U.S. Military.

**Comment [tgs9]:** I think that is fine.



85 Although firearms were used most often, overall (48.5%), decedents with known MHP were more likely to die by  
86 suffocation (31.3 vs. 26.9%) and poisoning (19.8% vs. 10.4%) than those without known MHP.

87 All suicide decedents with known MHP (N=9,407) and approximately 85% without MHP (N=9,357) had available  
88 circumstances information (Table 3). People without known MHP were less likely to have any substance abuse  
89 problems (aOR=0.7, 95% CI=0.7-0.8). While two-thirds of those with known MHP had a history of mental health  
90 or substance abuse treatment (67.2%), just over half (54.0%) were in current treatment.

91 Decedents without known MHP, versus those with known MHP had a significantly greater likelihood of any  
92 relationship problem/loss (45.1% vs. 39.6%), specifically intimate partner problems (30.2% vs. 24.1%),  
93 arguments/conflicts (17.5% vs. 13.6%), and recently perpetrating interpersonal violence (3.0% vs. 1.4%). They  
94 were also significantly more likely to have experienced other life stressors, such as criminal-legal problems  
95 (10.7% vs. 6.2%) or eviction/loss of home (4.3% vs. 3.4%), and they were more likely to have had a crisis within  
96 the preceding or upcoming two weeks (32.9% vs. 26.0%). Among both groups, the most common crises were  
97 intimate partner (36.2% vs. 34.9%) and physical health problems (13.8% vs. 12.9%), respectively.

98 Decedents without known MHP had significantly lower odds of recent release from any institution, but among  
99 those who were recently released (5.1%), those without a known MHP were significantly more likely to be  
100 released from a correctional facility (25.7% vs. 8.7%) or hospital (43.7% vs. 33.0%) than those with a known  
101 MHP. Among decedents with known MHP recently released from an institution (10.2%), 42.8% were released  
102 from psychiatric facilities.

103 Decedents without known MHP, compared to those with MHP, were less likely to have a history of suicidal  
104 ideation (aOR=0.4, 95% CI=0.4-0.5) and prior suicide attempt (aOR=0.3, 95% CI=0.3-0.3). Both groups disclosed  
105 suicide intent frequently, (22.4% vs. 24.5%), respectively.

#### 106 Conclusions and Comments (680/700 words)

107 The rise in suicide rates in the overall U.S. has been observed for many years [10]. Reporting of state-specific  
108 trends overall and by sex is much less common. Similarly, while geographic patterning in suicide rates have  
109 frequently been reported [10], the current findings point to a disturbing pattern of increases nationwide.  
110 Understanding the contributing circumstances of suicide is obligatory for prevention practice and decision-  
111 making.

112 Researchers and practitioners regularly state that suicide is not caused by a single factor, however, the focus of  
113 suicide research and prevention practices almost solely focus on MHP. The current study found that more than  
114 half of suicide decedents in NVDRS did not have a known MHP. This group suffered more relationship problems  
115 and life stressors such as criminal-legal matters, eviction/loss of home, and recent or impending crises. This is  
116 particularly noteworthy in light of findings that suggest many suicides and attempts occur with minimal  
117 deliberation [12].

118 Among people with MHP, two-thirds had a history of mental health and/or substance abuse treatment and over  
119 half were in current treatment. This suggests that additional supports for this population are needed to keep  
120 them safe. This includes broader implementation of affordable and effective treatment modalities such as  
121 doctor-patient collaborative care models and cognitive-behavioral therapy. Additionally, greater access to  
122 behavioral health providers, especially in underserved areas is needed, as is expansion of healthcare systems  
123 needed that integrate physical and behavioral health and that better support suicide prevention and patient  
124 safety, especially through care transitions [11].

**Comment [FC]:** I think the comparison group %'s are needed. For instance, drugs (35.8% vs. 35.8%).

I think the presentation of the %'s would be easier here and later on in the results if the p's came out and the text could simply reflect "significant differences" or some variation of indicating in the groups were different.

**I DIDN'T CHANGE THIS B/C IT OPENS UP THE ISSUE OF PEOPLE W/O MHP TAKING ANTIDEP ETC**

Do we even need to give this distribution? We don't talk about the types in the discussion

**Comment [za19]:** I kept this paragraph confined to percentages but did add some additional aOR's in other places.

**Comment [tgs9]:** We should be consistent and add this if we have the 10.2% below.

**Comment [za19]:** We were asked to include disclosure of suicide intent. Also, changed the formatting here a bit.

**Comment [tgs9]:** Why did you add this? It sounds like others have done it already. I think the last version of the start of the conclusion was more compelling.



Study findings indicate that people with known MHP also experienced other life stressors such as job/financial, relationship, and/or physical health problems. These findings point to the need to both prevent the conditions associated with mental health problems in the first place and the need to support people with known MHP to decrease their risk of poor social, health, and economic outcomes [13].

These results, together, underscore the importance of comprehensive statewide suicide prevention activities that address multiple factors associated with suicide. Prevention strategies may include: strengthening economic supports (e.g., housing stabilization policies, household financial support); teaching coping and problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in life; promoting social connectedness to increase a sense of belongingness and access to informational, tangible, emotional, and social support, and identifying and better supporting people at risk. Other strategies include creating protective environments (e.g., reducing access to lethal means among people at risk, creating organizational and workplace policies to promote help-seeking, easing transitions into and out of work for people with MHP and other life challenges), supporting family and friends after a suicide, and assuring safe reporting by the media in order to prevent suicide contagion [11]. Some states, such as Colorado, are planning and implementing such a comprehensive approach to suicide prevention [14].

These findings have at least three limitations. In the state-level analysis, rankings for four states (MD, MA, RI, UT) might have been impacted by large proportions of injury deaths of undetermined intent (i.e. decreasing suicide rates), or decreased percentages of such deaths over time (i.e. increasing suicide rates). Second, NVDRS is not yet nationally representative, the 27 states included in the current study represent 49.6% of the U.S. population. Third, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the extent of informant knowledge can impact data completeness and accuracy. Studies including in-depth interviews with next-of-kin often see greater attributions to MHP (and substance abuse disorders), however many methodological variations across studies exist [15]. It is likely that some people without known MHP in the current study were experiencing mental health challenges that were unknown, and hence unreported by key informants. However, any lack of awareness of decedent MHP suggests, even further, the importance of addressing the range of contributing circumstances.

Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are available. States and communities can use data from NVDRS and resources such as CDC's *Preventing Suicide: a Technical Package of Policies, Programs, and Practices* [11] to better understand their suicide problem and prioritize evidence-based comprehensive suicide prevention.

#### Acknowledgments

The authors acknowledge Robert Anderson, Holly Hedegaard, and Margaret Warner from the Division of Vital Statistics, National Center for Health Statistics, CDC, for their statistical consultation.

**Conflict of Interest** No conflicts of interest were reported.

**Corresponding author:** Deborah M. Stone, [dstone3@cdc.gov](mailto:dstone3@cdc.gov), 770-488-3942

#### Author Affiliations:

<sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis, Research, and Practice Integration, National Center for Injury Prevention and Control, CDC

#### References:

Comment [za19]: Is this confirmed, Tom?

Comment [tgs9]: This is from the 2015 NVDRS SS

Comment [za19]: Need to consider this part further.

Comment [za19]: Is this still ok?

Comment [za19]: Cory had a great idea here so took out, Mental illness is an important risk factor for suicide, and is one of many requiring preventive action. She said the media would probably just take away Mental illness is an important risk factor, period.



- 167 1. Centers for Disease Control and Prevention, *Web-based Injury Statistics Query and Reporting System*  
 168 *(WISQARS)*. Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018.  
 169 2016.
- 170 2. Ivey-Stephenson, A.Z., et al., *Suicide Trends Among and Within Urbanization Levels by Sex,*  
 171 *Race/Ethnicity, Age Group, and Mechanism of Death - United States, 2001-2015*. MMWR Surveill Summ,  
 172 2017. **66**(18): p. 1-16.
- 173 3. Kegler, S.R., D.M. Stone, and K.M. Holland, *Trends in suicide by level of urbanization—United States,*  
 174 *1999–2015*. MMWR. Morbidity and mortality weekly report, 2017. **66**(10): p. 270.
- 175 4. Kochanek, K., et al., *Mortality in the United States, 2016*. NCHS Data Brief, no 293. National Center for  
 176 Health Statistics, 2017.
- 177 5. Office of the Surgeon General and National Action Alliance for Suicide Prevention, *2012 National*  
 178 *strategy for suicide prevention: goals and objectives for action: a report of the US Surgeon General and*  
 179 *of the National Action Alliance for Suicide Prevention*. 2012.
- 180 6. Rosenman, S.J., *Preventing suicide: what will work and what will not*. The Medical Journal of Australia,  
 181 1998. **169**(2): p. 100-102.
- 182 7. Torguson, K. and A. O'Brien, *Leading Suicide Prevention Efforts Unite to Address Rising National Suicide*  
 183 *Rate*. 2017: Washington, D.C.
- 184 8. Crepeau-Hobson, F., *The Psychological Autopsy and Determination of Child Suicides: A Survey of Medical*  
 185 *Examiners*. Archives of Suicide Research, 2010. **14**(1): p. 24-34.
- 186 9. American Psychiatric Association, *Diagnostic and statistical manual of mental disorders (DSM-5®)*. 2013:  
 187 American Psychiatric Pub.
- 188 10. Li, Z., et al., *Attributable risk of psychiatric and socio-economic factors for suicide from individual-level,*  
 189 *population-based studies: A systematic review*. Social Science & Medicine, 2011. **72**(4): p. 608-616.
- 190 11. Stone, D.M., et al., *Preventing suicide: A technical package of policies, programs, and practice*. 2017.
- 191 12. Simon, T.R., et al., *Characteristics of impulsive suicide attempts and attempters*. Suicide and Life-  
 192 Threatening Behavior, 2002. **32**(s1): p. 49-59.
- 193 13. World Health Organization, *Risks to mental health: An overview of vulnerabilities and risk factors*.  
 194 Geneva: WHO, 2012.
- 195 14. Caine, E.D., et al., *Comprehensive, integrated approaches to suicide prevention: practical guidance*.  
 196 Injury prevention, 2017: p. injuryprev-2017-042366.
- 197 15. Hawton, K., et al., *The psychological autopsy approach to studying suicide: a review of methodological*  
 198 *issues*. J Affect Disord, 1998. **50**(2-3): p. 269-76.

#### 199 Tables and Figures (attachments)

200 Table 1 and Figure 1.doc

201 Tables 2 and 3.pdf

202 Word Count: 1762/1800

Comment [zaf9]: Need to replace ref 10  
and fix 11-15



1 **Short title:** Vital Signs: Increasing Trends in State Suicide Rates and Contributing Circumstances of Suicide among  
2 people ≥10 years

3 Deborah M. Stone, ScD;<sup>1</sup> Thomas R. Simon PhD;<sup>1</sup> Katherine A. Fowler, PhD;<sup>1</sup> Scott R. Kegler, PhD;<sup>2</sup> Keming Yuan,  
4 MS;<sup>1</sup> Kristin M. Holland, PhD;<sup>1</sup> Asha Z. Ivey-Stephenson, PhD;<sup>1</sup> Alex E. Crosby, MD<sup>1</sup>

5 **Structured abstract (250/250 words—this word count is not included in the 1800 max for the remainder)**

6 **Background:** Suicide rates among people ≥10 years have risen nearly 30% since 1999. Mental health problems  
7 (MHP) are just one factor contributing to suicide. Examining state-level trends in suicide and other contributing  
8 circumstances can inform comprehensive state suicide prevention planning.

9 **Methods:** Trends in age-adjusted suicide rates among people ≥10 years, by state and sex, across six consecutive  
10 three-year periods (1999-2016), were assessed using the National Vital Statistics System in 50 states and  
11 Washington, D.C (D.C.). Data from the National Violent Death Reporting System, covering 27 states in 2015,  
12 examined precipitating circumstances among decedents with and without known MHP.

13 **Results:** From 1999-2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases  
14 of 30% or more. Rates increased significantly among males and females, in 34 and 43 states, respectively. Over  
15 half (54.0%) of people did not have a known MHP; 46.0% did. Groups experienced similar and differing  
16 circumstances and some circumstances were common to both. Among people without known MHP, compared  
17 to those with MHP, 45.1% and 39.6% ( $p<.01$ ) had any relationship problems/loss, 54.2% and 49.7% ( $p\leq.01$ ) had  
18 any life stressors/loss and 32.9% and 26.0% ( $p\leq.01$ ) had any recent/impending crises, respectively.

19 **Conclusions:** Suicide rates increased significantly across most states from 1999-2016. Various circumstances  
20 contributed to suicides among people with and without known MHP.

21 **Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach  
22 to prevent suicide risk before it occurs, identify and support people at risk, prevent reattempts, and help  
23 friends/family after a suicide occurs.

## 24 INTRODUCTION

### 25 BACKGROUND AND PURPOSE (250/250 words)

26 In 2016, nearly 45,000 suicides (15.6/100,000) occurred in the United States (U.S.), among people aged ≥10  
27 years old [1]. Between 1999 and 2016, suicide rates increased across sexes, racial/ethnic groups, and  
28 urbanization levels [2, 3]. Suicide is the 10<sup>th</sup> leading cause of death and is one of just three leading causes to be  
29 increasing [1, 4]. Additionally, rates of Emergency Department visits for nonfatal self-harm, a key risk factor for  
30 suicide, increased nearly 45% between 2001 and 2015 [1]. Together, suicides and self-harm injuries cost the  
31 nation more than \$69 billion in direct medical and work loss costs [1].

32 The *National Strategy for Suicide Prevention* (NSSP) [5] calls for a public health approach to suicide prevention  
33 with efforts spanning across multiple levels (i.e., individual, family/relationship, community, and societal). Such  
34 an approach underscores that suicide is rarely caused by any single factor alone, but rather, is multi-determined.  
35 Despite the NSSP guidance, suicide prevention efforts largely focus on identifying and treating individuals with  
36 mental health problems (MHP) [6]. Other contributing factors include social and economic problems, access to  
37 lethal means (e.g., substances, firearms, bridges) among people at risk, poor coping and problem-solving skills,  
38 and prior suicide attempts [5]. Expanded awareness of the additional circumstances that contribute to suicide  
39 risk apart from MHP, and preventive action can help reach the nation's goal of reducing suicide rates 20% by

**Comment [BE()]:** Sometimes it is referred to as a 'contributing circumstance' and sometimes its referred to as a 'contributing factor'. I wonder if its best to be consistent so as not to confuse the reader that the two are different. From a plain language perspective, I prefer contributing factors ☺. Also, sometimes it is referred to a just 'contributing factor' while other times it is referred to as 'contributing risk factor'. Also, sometime it is referred to as 'contributing' and sometimes as 'associated'. Should we be consistent?

**I FOUND:**  
CONTRIBUTING CIRCUMSTANCES=3  
PRECIPITATING CIRCUMSTANCES=1  
CIRCUMSTANCES (ALONE)=6  
CONTRIBUTING FACTORS=3  
FACTORS (ALONE)=3  
RISK FACTORS=2

**Comment [za19]:** Is this still accurate?

**Comment [za19]:** Switched the order here



40 2025 [7]. To assist states in achieving this goal, this study analyzes state-specific trends in suicide rates, assesses  
 41 the multiple contributing factors, and provides recommendations for multi-level comprehensive suicide  
 42 prevention.

#### 43 **METHODS (255/250 words)**

44 Suicide rates were analyzed for people  $\geq 10$  years only, as attributions of suicidal intent in younger children are  
 45 variable [8]. Age-specific suicide counts were tabulated based on National Vital Statistics System coded death  
 46 certificate records (*International Classification of Diseases 10<sup>th</sup> Revision*, underlying-cause-of death codes X60-  
 47 X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for  
 48 Health Statistics bridged-race population data releases.

49 National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods  
 50 from 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per  
 51 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data  
 52 aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends  
 53 are reported in terms of average annual percentage changes (AAPCs).

54 Characteristics (Table 2) and circumstances (Table 3) of suicide decedents  $\geq 10$  years, with and without known  
 55 MHP, were compared in the 27 states with complete data participating in CDC's National Violent Death  
 56 Reporting System (NVDRS) in 2015. NVDRS defines MHP as disorders listed in the Diagnostic and Statistical  
 57 Manual of Mental Disorders, Fifth Edition [9]. For this study, alcohol and other substance use disorders were not  
 58 defined as MHP, and were examined in both groups. NVDRS aggregates data from three primary data sources:  
 59 death certificates, coroner/medical examiner reports (including toxicology), and law enforcement  
 60 reports. Decedents with and without known MHP were compared using Chi-square tests. Logistic regression  
 61 analyses estimated adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and  
 62 race/ethnicity.

#### 63 **RESULTS (584/600 words)**

64 The most recent overall suicide rates (representing 2014-2016) varied four-fold, from 6.9 (D.C.) to 29.2  
 65 (Montana) per 100,000 persons per year (Table 1). Across the study period, rates increased in all states, except  
 66 Nevada (with the 9<sup>th</sup> highest current suicide rate), with absolute increases ranging from +0.8 (Delaware) to +8.1  
 67 (Wyoming) per 100,000. Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota),  
 68 with increases of at least 30% observed in 25 states.

69 Modeled suicide rate trends indicated significant increases for 44 states, as well as for the U.S. overall (Table 1).  
 70 By sex, modeled rate trends indicated significant increases in 34 states for males and in 43 states for females.  
 71 Nationally, the model-estimated AAPC for the overall suicide rate was +1.5%. By sex, the national AAPC was  
 72 +1.1% for males and +2.6% for females.

73 Suicide decedents without known MHP (N=11,039) were compared to those with MHP (N=9,407). While all  
 74 decedents were predominately male (Table 2; 76.8%) and non-Hispanic white (83.6%), those without known  
 75 MHP, relative to those with MHP, were more likely male (83.6% vs. 68.8%; adjusted odds ratio (aOR)=2.3, 95% CI  
 76 = 2.2-2.5) and racial/ethnic minorities (odds ratio [OR] range: 1.2-2.1; 95% CI range [1.0-1.3] – [1.6-2.0]). Suicide  
 77 decedents without known MHP also had significantly greater odds of perpetrating homicide-suicide (aOR = 2.9,  
 78 95% CI = 2.2-3.8), of firearm suicide (aOR = 1.6, 95% CI = 1.5-1.7), and of testing positive for alcohol (aOR = 1.2,  
 79 95% CI = 1.1-1.3). Among adult decedents, 20.1% and 15.3% of people without and with MHP, respectively, ever  
 80 served in the U.S. military.

**Comment [za19]:** The comment made was that it wasn't clear how we defined MHP since substance use disorders are a diagnosis in DSM-V. Changed this to be more straightforward.

**Comment [za19]:** Scott we had this as 0.2 before?? Can you confirm 0.8 is correct?

**Comment [za19]:** Malia wanted to know if we could say "had served or were serving" in the U.S. Military.



85 Although firearms were used most often, overall (48.5%), decedents with known MHP died by poisoning  
 86 significantly more than those without known MHP (19.8% vs. 10.4%), most frequently by over-the-  
 87 counter/otherwise unclassified (drugs (35.8%), opioids (32.7%), antidepressants (34.6%) or benzodiazepines  
 88 (25.1%).

89 All suicide decedents with known MHP (N=9,407) and approximately 85% without MHP (N=9,357) had available  
 90 circumstances information (Table 3). People without known MHP were 30% less likely to have any substance  
 91 abuse problems (aOR=0.7, 95% CI=0.7-0.8). While two-thirds of those with known MHP had a history of mental  
 92 health or substance abuse treatment (67.2%), just over half (54.0%) were in current treatment.

93 Decedents without known MHP, versus those with known MHP had a significantly greater likelihood of any  
 94 relationship problem/loss (45.1% vs. 39.6%), specifically intimate partner problems (30.2% vs. 24.1%),  
 95 arguments/conflicts (17.5% vs. 13.6%), and recently perpetrating interpersonal violence (3.0% vs. 1.4%). They  
 96 were also significantly more likely to have experienced other life stressors, such as criminal-legal problems  
 97 (10.7% vs. 6.2%) or eviction/loss of home (4.3% vs. 3.4%), and they were more likely to have had a crisis within  
 98 the preceding or upcoming two weeks (32.9% vs. 26.0%). Among both groups, the most common crises were  
 99 intimate partner (36.2% vs. 34.9%) and physical health problems (13.8% vs. 12.9%), respectively.

100 Decedents without known MHP had significantly lower odds of recent release from any institution, but among  
 101 those who were recently released, those without a known MHP were significantly more likely to be released  
 102 from a correctional facility (25.7% vs. 8.7%) or hospital (43.7% vs. 33.0%) than those with a known MHP. Among  
 103 decedents with known MHP recently released from an institution (10.2%), 42.8% were released from psychiatric  
 104 facilities.

105 Decedents without known MHP, compared to those with known MHP, were 60% less likely to have a history of  
 106 suicidal ideation (aOR=0.4, 95% CI=0.4-0.5) and 70% less likely to have an attempt history (aOR=0.3, 95% CI=0.3-  
 107 0.3). Both groups disclosed suicide intent frequently, (22.4% vs. 24.5%), respectively.

#### 108 Conclusions and Comments (680/700 words)

109 The rise in suicide rates in the overall U.S. has been observed for many years [10]. Reporting of state-specific  
 110 trends overall and by sex is much less common. Similarly, while geographic patterning in suicide rates have  
 111 frequently been reported [10], the current findings point to a disturbing pattern of increases nationwide.  
 112 Understanding the contributing circumstances of suicide is obligatory for prevention practice and decision-  
 113 making.

114 Research and prevention practitioners regularly state that suicide is not caused by a single factor, however, the  
 115 focus of suicide research and prevention practices almost solely focus on MHP. The current study found that  
 116 more than half of suicide decedents in NVDRS did *not* have a known MHP. This group suffered more relationship  
 117 problems and life stressors such as criminal-legal matters, eviction/loss of home, and recent or impending crises.  
 118 This is particularly noteworthy in light of findings that suggest many suicides and attempts occur with minimal  
 119 deliberation [12].

120 Among people with MHP, two-thirds had a history of mental health and/or substance abuse treatment and over  
 121 half were in current treatment. This suggests that additional supports for this population are needed to keep  
 122 them safe. This includes broader implementation of affordable and effective treatment modalities such as  
 123 doctor-patient collaborative care models and cognitive-behavioral therapy. Additionally, greater access to  
 124 behavioral health providers, especially in underserved areas is needed, as is expansion of healthcare systems

**Comment [FC]:** I think the comparison group %'s are needed. For instance, drugs (35.8% vs. 35.8%).

I think the presentation of the %'s would be easier here and later on in the results if the p's came out and the text could simply reflect "significant differences" or some variation of indicating in the groups were different.

I DIDN'T CHANGE THIS B/C IT OPENS UP THE ISSUE OF PEOPLE W/O MHP TAKING ANTIDEP ETC

**Comment [zaf9]:** I kept this paragraph confined to percentages but did add some additional aOR's in other places.

**Comment [zaf9]:** We were asked to include disclosure of suicide intent. Also, changed the formatting here a bit.

**Comment [zaf9]:** wisqars

**Comment [zaf9]:** national strategy



needed that integrate physical and behavioral health and that better support suicide prevention and patient safety, especially through care transitions [11].

Study findings indicate that people with known MHP also experienced other life stressors such as job/financial, relationship, and/or physical health problems. These findings point to the need to both prevent the conditions associated with mental health problems in the first place and the need to support people with known MHP to decrease their risk of poor social, health, and economic outcomes [13].

These results, together, underscore the importance of comprehensive statewide suicide prevention activities that address multiple factors associated with suicide. Prevention strategies may include: strengthening economic supports (e.g., housing stabilization policies, household financial support); teaching coping and problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in life; promoting social connectedness to increase a sense of belongingness and access to informational, tangible, emotional, and social support, and identifying and better supporting people at risk. Other strategies include creating protective environments (e.g., reducing access to lethal means among people at risk, creating organizational and workplace policies to promote help-seeking, easing transitions into and out of work for people with MHP and other life challenges), supporting family and friends after a suicide, and assuring safe reporting by the media in order to prevent suicide contagion [11]. Some states, such as Colorado, are planning and implementing such a comprehensive approach to suicide prevention [14].

These findings have at least three limitations. In the state-level analysis, rankings for four states (MD, MA, RI, UT) might have been impacted by large proportions of injury deaths of undetermined intent (i.e. decreasing suicide rates), or decreased percentages of such deaths over time (i.e. increasing suicide rates). Second, NVDRS is not yet nationally representative, the 27 states included in the current study represent 49.6% of the U.S. population. Third, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the extent of informant knowledge can impact data completeness and accuracy. Studies including in-depth interviews with next-of-kin often see greater attributions to MHP and substance abuse disorders, however many methodological variations across studies exist [15]. It is likely that some people without known MHP in the current study were experiencing mental health challenges that were unknown, and hence unreported by key informants. However, any lack of awareness of decedent MHP suggests, even further, the importance of addressing the range of contributing circumstances.

Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are available. States and communities can use data from NVDRS and resources such as CDC's *Preventing Suicide: a Technical Package of Policies, Programs, and Practices* [11] to better understand their suicide problem and prioritize evidence-based comprehensive suicide prevention.

#### Acknowledgments

The authors acknowledge Robert Anderson, Holly Hedegaard, and Margaret Warner from the Division of Vital Statistics, National Center for Health Statistics, CDC, for their statistical consultation.

**Conflict of Interest** No conflicts of interest were reported.

**Corresponding author:** Deborah M. Stone, [dstone3@cdc.gov](mailto:dstone3@cdc.gov), 770-488-3942

#### Author Affiliations:

<sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis, Research, and Practice Integration, National Center for Injury Prevention and Control, CDC

Comment [za19]: Is this confirmed, Tom?

Comment [za19]: Need to consider this part further.

Comment [za19]: Is this still ok?

Comment [za19]: Cory had a great idea here so took out, Mental illness is an important risk factor for suicide, and is one of many requiring preventive action. She said the media would probably just take away Mental illness is an important risk factor, period.



References:

1. Centers for Disease Control and Prevention, *Web-based Injury Statistics Query and Reporting System (WISQARS)*. Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018. 2016.
2. Ivey-Stephenson, A.Z., et al., *Suicide Trends Among and Within Urbanization Levels by Sex, Race/Ethnicity, Age Group, and Mechanism of Death - United States, 2001-2015*. MMWR Surveill Summ, 2017. **66**(18): p. 1-16.
3. Kegler, S.R., D.M. Stone, and K.M. Holland, *Trends in suicide by level of urbanization—United States, 1999–2015*. MMWR. Morbidity and mortality weekly report, 2017. **66**(10): p. 270.
4. Kochanek, K., et al., *Mortality in the United States, 2016*. NCHS Data Brief, no 293. National Center for Health Statistics, 2017.
5. Office of the Surgeon General and National Action Alliance for Suicide Prevention, *2012 National strategy for suicide prevention: goals and objectives for action: a report of the US Surgeon General and of the National Action Alliance for Suicide Prevention*. 2012.
6. Rosenman, S.J., *Preventing suicide: what will work and what will not*. The Medical Journal of Australia, 1998. **169**(2): p. 100-102.
7. Torguson, K. and A. O'Brien, *Leading Suicide Prevention Efforts Unite to Address Rising National Suicide Rate*. 2017: Washington, D.C.
8. Crepeau-Hobson, F., *The Psychological Autopsy and Determination of Child Suicides: A Survey of Medical Examiners*. Archives of Suicide Research, 2010. **14**(1): p. 24-34.
9. American Psychiatric Association, *Diagnostic and statistical manual of mental disorders (DSM-5®)*. 2013: American Psychiatric Pub.
10. Li, Z., et al., *Attributable risk of psychiatric and socio-economic factors for suicide from individual-level, population-based studies: A systematic review*. Social Science & Medicine, 2011. **72**(4): p. 608-616.
11. Stone, D.M., et al., *Preventing suicide: A technical package of policies, programs, and practice*. 2017.
12. Simon, T.R., et al., *Characteristics of impulsive suicide attempts and attempters*. Suicide and Life-Threatening Behavior, 2002. **32**(s1): p. 49-59.
13. World Health Organization, *Risks to mental health: An overview of vulnerabilities and risk factors*. Geneva: WHO, 2012.
14. Caine, E.D., et al., *Comprehensive, integrated approaches to suicide prevention: practical guidance*. Injury prevention, 2017: p. injuryprev-2017-042366.
15. Hawton, K., et al., *The psychological autopsy approach to studying suicide: a review of methodological issues*. J Affect Disord, 1998. **50**(2-3): p. 269-76.

Tables and Figures (attachments)

- Table 1 and Figure 1.doc
- Tables 2 and 3.pdf

Word Count: 1762/1800

Comment [zaf9]: Need to replace ref 10 and fix 11-15



1 **Short title:** Vital Signs: Increasing Trends in State Suicide Rates and Contributing Circumstances among people  
2 ≥10 years

3 Deborah M. Stone, ScD;<sup>1</sup> Thomas R. Simon PhD;<sup>1</sup> Katherine A. Fowler, PhD;<sup>1</sup> Scott R. Kegler, PhD;<sup>2</sup> Keming Yuan,  
4 MS;<sup>1</sup> Kristin M. Holland, PhD;<sup>1</sup> Asha Z. Ivey-Stephenson, PhD;<sup>1</sup> Alex E. Crosby, MD<sup>1</sup>

5 **Structured abstract (250/250 words—this word count is not included in the 1800 max for the remainder)**

6 **Background:** Suicide rates among people ≥10 years have risen nearly 30% since 1999. Mental health problems  
7 (MHP) are just one factor contributing to suicide. Examining state-level trends in suicide and other contributing  
8 circumstances can inform comprehensive state suicide prevention planning.

9 **Methods:** Trends in age-adjusted suicide rates among people ≥10 years, by state and sex, across six consecutive  
10 three-year periods (1999-2016), were assessed using the National Vital Statistics System in 50 states and  
11 Washington, D.C (D.C.). Data from the National Violent Death Reporting System, covering 27 states in 2015,  
12 examined precipitating circumstances among decedents with and without known MHP.

13 **Results:** From 1999-2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases  
14 of 30% or more. Rates increased significantly among males and females, in 34 and 43 states, respectively. Over  
15 half (54.0%) of people did not have a known MHP; 46.0% did. Groups experienced similar and differing  
16 circumstances and some circumstances were common to both. Among people without known MHP, compared  
17 to those with MHP, 45.1% and 39.6% ( $p<.01$ ) had any relationship problems/loss, 54.2% and 49.7% ( $p\leq.01$ ) had  
18 any life stressors/loss and 32.9% and 26.0% ( $p\leq.01$ ) had any recent/impending crises, respectively.

19 **Conclusions:** Suicide rates increased significantly across most states from 1999-2016. Various circumstances  
20 contributed to suicides among people with and without known MHP.

21 **Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach  
22 to prevent suicide risk before it occurs, identify and support people at risk, prevent reattempts, and help  
23 friends/family after a suicide occurs.

## 24 INTRODUCTION

### 25 BACKGROUND AND PURPOSE (250/250 words)

26 In 2016, nearly 45,000 suicides (15.6/100,000) occurred in the United States (U.S.), among people ≥10 years old  
27 [1]. Between 1999 and 2016, suicide rates increased across sexes, racial/ethnic groups, and urbanization levels  
28 [2, 3]. Suicide is the 10<sup>th</sup> leading cause of death and is one of just three leading causes to be increasing [1, 4].  
29 Additionally, rates of Emergency Department visits for nonfatal self-harm, a key risk factor for suicide, increased  
30 nearly 45% between 2001 and 2015 [1]. Together, suicides and self-harm injuries cost the nation more than \$69  
31 billion in direct medical and work loss costs [1].

32 The *National Strategy for Suicide Prevention*(NSSP) [5] calls for a public health approach to suicide prevention  
33 with efforts spanning across multiple levels (i.e., individual, family/relationship, community, and societal). Such  
34 an approach underscores that suicide is rarely caused by any single factor alone, but rather, is multi-determined.  
35 Despite the NSSP guidance, suicide prevention efforts largely focus on identifying and treating individuals with  
36 mental health problems (MHP) [6]. Other contributing factors include social and economic problems, access to  
37 lethal means (e.g., substances, firearms, bridges) among people at risk, poor coping and problem-solving skills,  
38 and prior suicide attempts [5]. Expanded awareness of the additional circumstances that contribute to suicide  
39 risk apart from MHP, can help reach the nation's goal of reducing suicide rates 20% by 2025 [7]. To assist states

**Comment [BE()]:** Sometimes it is referred to as a 'contributing circumstance' and sometimes its referred to as a 'contributing factor'. I wonder if its best to be consistent so as not to confuse the reader that the two are different. From a plain language perspective, I prefer contributing factors ☺. Also, sometimes it is referred to a just 'contributing factor' while other times it is referred to as 'contributing risk factor'. Also, sometime it is referred to as 'contributing' and sometimes as 'associated'. Should we be consistent?

**I FOUND:**  
CONTRIBUTING CIRCUMSTANCES=3  
PRECIPITATING CIRCUMSTANCES=1  
CIRCUMSTANCES (ALONE)=6  
CONTRIBUTING FACTORS=3  
FACTORS (ALONE)=3  
RISK FACTORS=2

**Comment [za19]:** Is this still accurate?

**Comment [za19]:** Switched the order here



40 in achieving this goal, this study analyzes state-specific trends in suicide rates, assesses the multiple contributing  
41 factors, and provides recommendations for multi-level comprehensive suicide prevention.

## 42 **METHODS (255/250 words)**

43 Suicide rates were analyzed for people  $\geq 10$  years only, as attributions of suicidal intent in younger children are  
44 variable [8]. Age-specific suicide counts were tabulated based on National Vital Statistics System coded death  
45 certificate records (*International Classification of Diseases 10<sup>th</sup> Revision*, underlying-cause-of death codes X60-  
46 X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for  
47 Health Statistics bridged-race population data releases.

48  
49 National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods  
50 from 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per  
51 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data  
52 aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends  
53 are reported in terms of average annual percentage changes (AAPCs).

54  
55 Characteristics (Table 2) and circumstances (Table 3) of suicide decedents  $\geq 10$  years, with and without known  
56 MHP, were compared in the 27 states with complete data participating in CDC's National Violent Death  
57 Reporting System (NVDRS) in 2015. NVDRS defines MHP as disorders listed in the Diagnostic and Statistical  
58 Manual of Mental Disorders, Fifth Edition [9]. For this study, alcohol and other substance use disorders were not  
59 defined as MHP, and were examined in both groups. NVDRS aggregates data from three primary data sources:  
60 death certificates, coroner/medical examiner reports (including toxicology), and law enforcement  
61 reports. Decedents with and without known MHP were compared using Chi-square tests. Logistic regression  
62 analyses estimated adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and  
63 race/ethnicity.

## 64 **RESULTS (584/600 words)**

65 The most recent overall suicide rates (representing 2014-2016) varied four-fold, from 6.9 (D.C.) to 29.2  
66 (Montana) per 100,000 persons per year (Table 1). Across the study period, rates increased in all states, except  
67 Nevada (with the 9<sup>th</sup> highest current suicide rate), with absolute increases ranging from +0.8 (Delaware) to +8.1  
68 (Wyoming) per 100,000. Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota),  
69 with increases of at least 30% observed in 25 states.

70  
71 Modeled suicide rate trends indicated significant increases for 44 states, as well as for the U.S. overall (Table 1).  
72 By sex, modeled rate trends indicated significant increases in 34 states for males and in 43 states for females.  
73 Nationally, the model-estimated AAPC for the overall suicide rate was +1.5%. By sex, the national AAPC was  
74 +1.1% for males and +2.6% for females.

75  
76 Suicide decedents without known MHP (N=11,039) were compared to those with MHP (N=9,407). While all  
77 decedents were predominately male (Table 2; 76.8%) and non-Hispanic white (83.6%), those without known  
78 MHP, relative to those with MHP, were more likely male (83.6% vs. 68.8%; adjusted odds ratio (aOR)=2.3, 95% CI  
79 = 2.2-2.5) and racial/ethnic minorities (odds ratio [OR] range: 1.2-2.1; 95% CI range [1.0-1.3] – [1.6-2.0]). Suicide  
80 decedents without known MHP also had significantly greater odds of perpetrating homicide-suicide (aOR = 2.9,  
81 95% CI = 2.2-3.8), of firearm suicide (aOR = 1.6, 95% CI = 1.5-1.7), and of testing positive for alcohol (aOR = 1.2,  
82 95% CI = 1.1-1.3). Among adult decedents, 20.1% and 15.3% of people without and with MHP, respectively, ever  
83 served in the U.S. military.

**Comment [za19]:** The comment made was that it wasn't clear how we defined MHP since substance use disorders are a diagnosis in DSM-V. Changed this to be more straightforward.

**Comment [za19]:** Scott we had this as 0.2 before?? Can you confirm 0.8 is correct?

**Comment [za19]:** Mallia wanted to know if we could say "had served or were serving" in the U.S. Military.



84 Although firearms were used most often, overall (48.5%), decedents with known MHP died by poisoning  
 85 significantly more than those without known MHP (19.8% vs. 10.4%), most frequently by over-the-  
 86 counter/otherwise unclassified (drugs (35.8%), opioids (32.7%), antidepressants (34.6%) or benzodiazepines  
 87 (25.1%).

88 All suicide decedents with known MHP (N=9,407) and approximately 85% without MHP (N=9,357) had available  
 89 circumstances information (Table 3). People without known MHP were 30% less likely to have any substance  
 90 abuse problems (aOR=0.7, 95% CI=0.7-0.8). While two-thirds of those with known MHP had a history of mental  
 91 health or substance abuse treatment (67.2%), just over half (54.0%) were in current treatment.

92 Decedents without known MHP, versus those with known MHP had a significantly greater likelihood of any  
 93 relationship problem/loss (45.1% vs. 39.6%), specifically intimate partner problems (30.2% vs. 24.1%),  
 94 arguments/conflicts (17.5% vs. 13.6%), and recently perpetrating interpersonal violence (3.0% vs. 1.4%). They  
 95 were also significantly more likely to have experienced other life stressors, such as criminal-legal problems  
 96 (10.7% vs. 6.2%) or eviction/loss of home (4.3% vs. 3.4%), and they were more likely to have had a crisis within  
 97 the preceding or upcoming two weeks (32.9% vs. 26.0%). Among both groups, the most common crises were  
 98 intimate partner (36.2% vs. 34.9%) and physical health problems (13.8% vs. 12.9%), respectively.

99 Decedents without known MHP had significantly lower odds of recent release from any institution, but among  
 100 those who were recently released, those without a known MHP were significantly more likely to be released  
 101 from a correctional facility (25.7% vs. 8.7%) or hospital (43.7% vs. 33.0%) than those with a known MHP. Among  
 102 decedents with known MHP recently released from an institution (10.2%), 42.8% were released from psychiatric  
 103 facilities.

104 Decedents without known MHP, compared to those with known MHP, were 60% less likely to have a history of  
 105 suicidal ideation (aOR=0.4, 95% CI=0.4-0.5) and 70% less likely to have an attempt history (aOR=0.3, 95% CI=0.3-  
 106 0.3). Both groups disclosed suicide intent frequently, (22.4% vs. 24.5%), respectively.

#### 107 **Conclusions and Comments (680/700 words)**

108 The rise in suicide rates in the overall U.S. has been observed for many years [10]. Reporting of state-specific  
 109 trends overall and by sex is much less common. Similarly, while geographic patterning in suicide rates have  
 110 frequently been reported [10], the current findings point to a disturbing pattern of increases nationwide.  
 111 Understanding the contributing circumstances of suicide is obligatory for prevention practice and decision-  
 112 making.

113 Research and prevention practitioners regularly state that suicide is not caused by a single factor, however, the  
 114 focus of suicide research and prevention practices almost solely focus on MHP. The current study found that  
 115 more than half of suicide decedents in NVDRS did *not* have a known MHP. This group suffered more relationship  
 116 problems and life stressors such as criminal-legal matters, eviction/loss of home, and recent or impending crises.  
 117 This is particularly noteworthy in light of findings that suggest many suicides and attempts occur with minimal  
 118 deliberation [12].

119 Among people with MHP, two-thirds had a history of mental health and/or substance abuse treatment and over  
 120 half were in current treatment. This suggests that additional supports for this population are needed to keep  
 121 them safe. This includes broader implementation of affordable and effective treatment modalities such as  
 122 doctor-patient collaborative care models and cognitive-behavioral therapy. Additionally, greater access to  
 123 behavioral health providers, especially in underserved areas is needed, as is expansion of healthcare systems

**Comment [FC]:** I think the comparison group %'s are needed. For instance, drugs (35.8% vs. 35.8%).

I think the presentation of the %'s would be easier here and later on in the results if the p's came out and the text could simply reflect "significant differences" or some variation of indicating in the groups were different.

**I DIDN'T CHANGE THIS B/C IT OPENS UP THE ISSUE OF PEOPLE W/O MHP TAKING ANTIDEP ETC**

**Comment [zaf9]:** I kept this paragraph confined to percentages but did add some additional aOR's in other places.

**Comment [zaf9]:** We were asked to include disclosure of suicide intent. Also, changed the formatting here a bit.



needed that integrate physical and behavioral health and that better support suicide prevention and patient safety, especially through care transitions [11].

Study findings indicate that people with known MHP also experienced other life stressors such as job/financial, relationship, and/or physical health problems. These findings point to the need to both prevent the conditions associated with mental health problems in the first place and the need to support people with known MHP to decrease their risk of poor social, health, and economic outcomes [13].

These results, together, underscore the importance of comprehensive statewide suicide prevention activities that address multiple factors associated with suicide. Prevention strategies may include: strengthening economic supports (e.g., housing stabilization policies, household financial support); teaching coping and problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in life; promoting social connectedness to increase a sense of belongingness and access to informational, tangible, emotional, and social support, and identifying and better supporting people at risk. Other strategies include creating protective environments (e.g., reducing access to lethal means among people at risk, creating organizational and workplace policies to promote help-seeking, easing transitions into and out of work for people with MHP and other life challenges), supporting family and friends after a suicide, and assuring safe reporting by the media in order to prevent suicide contagion [11]. Some states, such as Colorado, are planning and implementing such a comprehensive approach to suicide prevention [14].

These findings have at least three limitations. In the state-level analysis, rankings for four states (MD, MA, RI, UT) might have been impacted by large proportions of injury deaths of undetermined intent (i.e. decreasing suicide rates), or decreased percentages of such deaths over time (i.e. increasing suicide rates). Second, NVDRS is not yet nationally representative, the 27 states included in the current study represent 49.6% of the U.S. population. Third, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the extent of informant knowledge can impact data completeness and accuracy. Studies including in-depth interviews with next-of-kin often see greater attributions to MHP and substance abuse disorders, however many methodological variations across studies exist [15]. It is likely that some people without known MHP in the current study were experiencing mental health challenges that were unknown, and hence unreported by key informants. However, any lack of awareness of decedent MHP suggests, even further, the importance of addressing the range of contributing circumstances.

Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are available. States and communities can use data from NVDRS and resources such as CDC's *Preventing Suicide: a Technical Package of Policies, Programs, and Practices* [11] to better understand their suicide problem and prioritize evidence-based comprehensive suicide prevention.

#### Acknowledgments

The authors acknowledge Robert Anderson, Holly Hedegaard, and Margaret Warner from the Division of Vital Statistics, National Center for Health Statistics, CDC, for their statistical consultation.

**Conflict of Interest** No conflicts of interest were reported.

**Corresponding author:** Deborah M. Stone, [dstone3@cdc.gov](mailto:dstone3@cdc.gov), 770-488-3942

#### Author Affiliations:

<sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis, Research, and Practice Integration, National Center for Injury Prevention and Control, CDC

Comment [za19]: Is this confirmed, Tom?

Comment [za19]: Need to consider this part further.

Comment [za19]: Is this still ok?

Comment [za19]: Cory had a great idea here so took out, Mental illness is an important risk factor for suicide, and is one of many requiring preventive action. She said the media would probably just take away Mental illness is an important risk factor, period.



References:

1. Centers for Disease Control and Prevention, *Web-based Injury Statistics Query and Reporting System (WISQARS)*. Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018. 2016.
2. Ivey-Stephenson, A.Z., et al., *Suicide Trends Among and Within Urbanization Levels by Sex, Race/Ethnicity, Age Group, and Mechanism of Death - United States, 2001-2015*. MMWR Surveill Summ, 2017. **66**(18): p. 1-16.
3. Kegler, S.R., D.M. Stone, and K.M. Holland, *Trends in suicide by level of urbanization—United States, 1999–2015*. MMWR. Morbidity and mortality weekly report, 2017. **66**(10): p. 270.
4. Kochanek, K., et al., *Mortality in the United States, 2016*. NCHS Data Brief, no 293. National Center for Health Statistics, 2017.
5. Office of the Surgeon General and National Action Alliance for Suicide Prevention, *2012 National strategy for suicide prevention: goals and objectives for action: a report of the US Surgeon General and of the National Action Alliance for Suicide Prevention*. 2012.
6. Rosenman, S.J., *Preventing suicide: what will work and what will not*. The Medical Journal of Australia, 1998. **169**(2): p. 100-102.
7. Torguson, K. and A. O'Brien, *Leading Suicide Prevention Efforts Unite to Address Rising National Suicide Rate*. 2017: Washington, D.C.
8. Crepeau-Hobson, F., *The Psychological Autopsy and Determination of Child Suicides: A Survey of Medical Examiners*. Archives of Suicide Research, 2010. **14**(1): p. 24-34.
9. American Psychiatric Association, *Diagnostic and statistical manual of mental disorders (DSM-5®)*. 2013: American Psychiatric Pub.
10. Li, Z., et al., *Attributable risk of psychiatric and socio-economic factors for suicide from individual-level, population-based studies: A systematic review*. Social Science & Medicine, 2011. **72**(4): p. 608-616.
11. Stone, D.M., et al., *Preventing suicide: A technical package of policies, programs, and practice*. 2017.
12. Simon, T.R., et al., *Characteristics of impulsive suicide attempts and attempters*. Suicide and Life-Threatening Behavior, 2002. **32**(s1): p. 49-59.
13. World Health Organization, *Risks to mental health: An overview of vulnerabilities and risk factors*. Geneva: WHO, 2012.
14. Caine, E.D., et al., *Comprehensive, integrated approaches to suicide prevention: practical guidance*. Injury prevention, 2017: p. injuryprev-2017-042366.
15. Hawton, K., et al., *The psychological autopsy approach to studying suicide: a review of methodological issues*. J Affect Disord, 1998. **50**(2-3): p. 269-76.

Comment [zaf9]: Need to replace ref 10 and fix 11-15

Tables and Figures (attachments)

- Table 1 and Figure 1.doc
- Tables 2 and 3.pdf

Word Count: 1762/1800



1 **Short title:** Vital Signs: Increasing Trends in State Suicide Rates and Contributing Circumstances among people  
2 ≥10 years

3 Deborah M. Stone, ScD;<sup>1</sup> Thomas R. Simon PhD;<sup>1</sup> Katherine A. Fowler, PhD;<sup>1</sup> Scott R. Kegler, PhD;<sup>2</sup> Keming Yuan,  
4 MS;<sup>1</sup> Kristin M. Holland, PhD;<sup>1</sup> Asha Z. Ivey-Stephenson, PhD;<sup>1</sup> Alex E. Crosby, MD<sup>1</sup>

5 **Structured abstract (250/250 words—this word count is not included in the 1800 max for the remainder)**

6 **Background:** Suicide rates among people ≥10 years have risen nearly 30% since 1999. Mental health problems  
7 (MHP) are just one factor contributing to suicide. Examining state-level trends in suicide and other contributing  
8 circumstances can inform comprehensive state suicide prevention planning.

9 **Methods:** Trends in age-adjusted suicide rates among people ≥10 years, by state and sex, across six consecutive  
10 three-year periods (1999–2016), were assessed using the National Vital Statistics System in 50 states and  
11 Washington, D.C. (D.C.). Data from the National Violent Death Reporting System, covering 27 states in 2015, was  
12 used to examine contributing precipitating circumstances among decedents with and without known MHP.

13 **Results:** From 1999–2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases  
14 of 30% or more. Rates increased significantly among males and females, in 34 and 43 states, respectively. Over  
15 half (54.0%) of decedents people did not have a known MHP; 46.0% did. Among decedents with circumstance  
16 information those without known MHP were more likely (all  $p < .01$ ) than those with a MHP to have relationship  
17 problems/loss (Groups experienced similar and differing circumstances and some circumstances were common  
18 to both. Among people without known MHP, compared to those with MHP), 45.1% vs and 39.6%), life  
19 stressors/loss ( $p < .01$ ) had any relationship problems/loss, 54.2% vs and 49.7% ( $p < .01$ ) and  
20 recent/impending crises (32.9% vs 26.0%), but these circumstances were common across groups. ad any life  
21 stressors/loss and 32.9% and 26.0% ( $p < .01$ ) had any recent/impending crises, respectively.

22 **Conclusions:** Suicide rates increased significantly across most states from 1999–2016. Various circumstances  
23 contributed to suicides among people with and without known MHP.

24 **Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach  
25 to prevent suicide risk before it occurs, identify and support people at risk, prevent reattempts, and help  
26 friends/family after a suicide occurs.

## 27 INTRODUCTION

### 28 BACKGROUND AND PURPOSE (250/250 words)

29 In 2016, nearly 45,000 suicides (15.6/100,000) occurred in the United States (U.S.), among people ≥10 years old  
30 [1]. Between 1999 and 2016, suicide rates increased across sexes, racial/ethnic groups, and urbanization levels  
31 [2, 3]. Suicide is the 10<sup>th</sup> leading cause of death and is one of just three leading causes that are to be increasing  
32 [1, 4]. Additionally, rates of Emergency Department visits for nonfatal self-harm, a key risk factor for suicide,  
33 increased nearly 45% between 2001 and 2015 [1]. Together, suicides and self-harm injuries cost the nation more  
34 than \$69 billion in direct medical and work loss costs [1].

35 The *National Strategy for Suicide Prevention* (NSSP) [5] calls for a public health approach to suicide prevention  
36 with efforts spanning across multiple levels (i.e., individual, family/relationship, community, and societal). Such  
37 an approach underscores that suicide is rarely caused by any single factor alone, but rather, is multi-determined  
38 (maybe substitute “multifaceted”). Despite the NSSP guidance, suicide prevention efforts largely focus on  
39 identifying and treating individuals with mental health problems (MHP) [6]. Other contributing factors

**Comment [BE]:** Sometimes it is referred to as a ‘contributing circumstance’ and sometimes its referred to as a ‘contributing factor’. I wonder if its best to be consistent so as not to confuse the reader that the two are different. From a plain language perspective, I prefer contributing factors ☺. Also, sometimes it is referred to a just ‘contributing factor’ while other times it is referred to as ‘contributing risk factor’. Also, sometime it is referred to as ‘contributing’ and sometimes as ‘associated’. Should we be consistent?

**I FOUND:**  
CONTRIBUTING CIRCUMSTANCES=3  
PRECIPITATING CIRCUMSTANCES=1  
CIRCUMSTANCES (ALONE)=6  
CONTRIBUTING FACTORS=3  
FACTORS (ALONE)=3  
RISK FACTORS=2

**Comment [tgs9]:** I think we can say contributing circumstances a few times in the text and then just use circumstances.

**Comment [za19]:** Is this still accurate?

**Comment [tgs9]:** Some editing is needed because this read like the data examined circumstances.

**Comment [za19]:** Switched the order here

**Comment [tgs9]:** I saw that Cory made a good suggestion to say among those with circumstance information. If we make one point about the p-value we can save words. The edits I suggested allow us that there are differences but these are common for both.

**Comment [CA]:** Are we going to have to explain this (...) such as putting in (rate 15.6 per 100,000 population)

**Comment [CA]:** Alternate citation though not quite covering the same yrs - Curtin SC, Warner M, Hedegaard H. Suicide rates for females and males by race and ethnicity: United States, 1999 and 2014. NCHS Health E-Stat. National Center for Health Statistics. April 2016.



circumstances include social and economic problems, access to lethal means (e.g., substances, firearms, bridges) among people at risk, poor coping and problem-solving skills, and prior suicide attempts [5]. Expanded awareness of the additional circumstances that contribute to suicide risk apart from MHP, can help reach the nation's goal of reducing suicide rates 20% by 2025 [7]. To assist states in achieving this goal, this study analyzes state-specific trends in suicide rates, assesses the multiple contributing factors, and provides recommendations for multi-level comprehensive suicide prevention.

#### METHODS (255/250 words)

Suicide rates were analyzed for people  $\geq 10$  years only, as attributions of suicidal intent in younger children are variable [8]. Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases 10<sup>th</sup> Revision*, underlying-cause-of death codes X60-X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods from 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Characteristics (Table 2) and circumstances (Table 3) of suicide decedents  $\geq 10$  years, with and without known MHP, were compared in the 27 states with complete data participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines MHP as disorders listed in the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* [9]. For this study, alcohol and other substance use disorders were not defined as MHP, and were examined in both groups. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known MHP were compared using Chi-square tests. Logistic regression analyses estimated adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and race/ethnicity.

#### RESULTS (584/600 words)

The most recent overall suicide rates (representing 2014-2016) varied four-fold, from 6.9 (D.C.) to 29.2 (Montana) per 100,000 persons per year (Table 1). Across the study period, rates increased in all states, except Nevada (with the 9<sup>th</sup> highest current suicide rate), with absolute increases ranging from +0.8 (Delaware) to +8.1 (Wyoming) per 100,000. Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with increases of at least 30% observed in 25 states.

Modeled suicide rate trends indicated significant increases for 44 states, as well as for the U.S. overall (Table 1). By sex, modeled rate trends indicated significant increases in 34 states for males and in 43 states for females. Nationally, the model-estimated AAPC for the overall suicide rate was +1.5%. By sex, the national AAPC was +1.1% for males and +2.6% for females.

Suicide decedents without known MHP (N=11,039) were compared to those with MHP (N=9,407). While all decedents were predominately male (Table 2; 76.8%) and non-Hispanic white (83.6%), those without known MHP, relative to those with MHP, were more likely male (83.6% vs. 68.8%; adjusted odds ratio (aOR)=2.3, 95% CI = 2.2-2.5) and racial/ethnic minorities (odds ratio [OR] range: 1.2-2.1; 95% CI range [1.0-1.3] – [1.6-2.0]). Suicide decedents without known MHP also had significantly greater odds of perpetrating homicide-suicide (aOR = 2.9, 95% CI = 2.2-3.8), of firearm suicide (aOR = 1.6, 95% CI = 1.5-1.7), and of testing positive for alcohol (aOR = 1.2,

**Comment [zaf9]:** The comment made was that it wasn't clear how we defined MHP since substance use disorders are a diagnosis in DSM-V. Changed this to be more straightforward.

**Comment [za19]:** Scott we had this as 0.2 before?? Can you confirm 0.8 is correct?



86 95% CI = 1.1-1.3). Among adult decedents, 20.1% and 15.3% of people without and with MHP, respectively, ever  
 87 served in the U.S. ~~military~~.

88 Although firearms were used most often, overall (48.5%), decedents with known MHP ~~were more likely to die~~  
 89 ~~by suffocation (31.3 vs. 26.9%) and poisoning (19.8% vs. 10.4%) significantly more~~ than those without known  
 90 MHP (19.8% vs. 10.4%), most frequently by over-the-counter/otherwise unclassified ~~drugs (35.8%), opioids~~  
 91 ~~(32.7%), antidepressants (34.6%) or benzodiazepines (25.1%).~~

92 All suicide decedents with known MHP (N=9,407) and approximately 85% without MHP (N=9,357) had available  
 93 circumstances information (Table 3). People without known MHP were ~~30%~~ less likely to have any substance  
 94 abuse problems (aOR=0.7, 95% CI=0.7-0.8). While two-thirds of those with known MHP had a history of mental  
 95 health or substance abuse treatment (67.2%), just over half (54.0%) were in current treatment.

96 ~~Decedents without known MHP, versus those with known MHP had a significantly greater likelihood of any~~  
 97 ~~relationship problem/loss (45.1% vs. 39.6%), specifically intimate partner problems (30.2% vs. 24.1%),~~  
 98 ~~arguments/conflicts (17.5% vs. 13.6%), and recently perpetrating interpersonal violence (3.0% vs. 1.4%). They~~  
 99 ~~were also significantly more likely to have experienced other life stressors, such as criminal-legal problems~~  
 100 ~~(10.7% vs. 6.2%) or eviction/loss of home (4.3% vs. 3.4%), and they were more likely to have had a crisis within~~  
 101 ~~the preceding or upcoming two weeks (32.9% vs. 26.0%). Among both groups, the most common crises were~~  
 102 ~~intimate partner (36.2% vs. 34.9%) and physical health problems (13.8% vs. 12.9%), respectively.)~~

103 Decedents without known MHP had significantly lower odds of recent release from any institution, but among  
 104 those who were recently released (~~5.1%~~), those without a known MHP were significantly more likely to be  
 105 released from a correctional facility (25.7% vs. 8.7%) or hospital (43.7% vs. 33.0%) than those with a known  
 106 MHP. Among decedents with known MHP recently released from an institution (10.2%), 42.8% were released  
 107 from psychiatric facilities.

108 ~~Decedents without known MHP, compared to those with known MHP, were 60% less likely to have a history of~~  
 109 ~~suicidal ideation (aOR=0.4, 95% CI=0.4-0.5) and 70% less likely to have an prior suicide attempt history~~  
 110 ~~(aOR=0.3, 95% CI=0.3-0.3). Both groups disclosed suicide intent frequently, (22.4% vs. 24.5%), respectively.)~~

# 111 Conclusions and Comments (680/700 words)

112 The rise in suicide rates in the overall U.S. has been observed for many years [10]. ~~Reporting of state-specific~~  
 113 ~~trends overall and by sex is much less common.~~ Similarly, while geographic patterning in suicide rates have  
 114 frequently been reported [10], the current findings point to a disturbing pattern of increases nationwide.  
 115 Understanding the contributing circumstances of suicide is obligatory ~~(maybe substitute "essential")~~ for  
 116 prevention practice and decision-making.

117 Researchers and ~~prevention~~-practitioners regularly state that suicide is not caused by a single factor, however,  
 118 the focus of suicide research and prevention practices almost solely focus on MHP. The current study found that  
 119 more than half of suicide decedents in NVDRS did *not* have a known MHP. This group suffered more relationship  
 120 problems and life stressors such as criminal-legal matters, eviction/loss of home, and recent or impending crises.  
 121 This is particularly noteworthy in light of findings that suggest many suicides and attempts occur with minimal  
 122 deliberation [12].

123 Among people with MHP, two-thirds had a history of mental health and/or substance abuse treatment and over  
 124 half were in current treatment. This suggests that additional supports for this population are needed to keep  
 125 them safe. This includes broader implementation of affordable and effective treatment modalities such as  
 126 doctor-patient collaborative care models and cognitive-behavioral therapy. Additionally, greater access to

Comment [zaf9]: Malia wanted to know if we could say "had served or were serving" in the U.S. Military.

Comment [tgs9]: I think that is fine.

Comment [FC()]: I think the comparison group %'s are needed. For instance, drugs (35.8% vs. 35.8%).

I think the presentation of the %'s would be easier here and later on in the results if the p's came out and the text could simply reflect "significant differences" or some variation of indicating in the groups were different.

I DIDN'T CHANGE THIS B/C IT OPENS UP THE ISSUE OF PEOPLE W/O MHP TAKING ANTIDEP ETC

Do we even need to give this distribution? We don't talk about the types in the discussion

Comment [zaf9]: I kept this paragraph confined to percentages but did add some additional aOR's in other places.

Comment [tgs9]: We should be consistent and add this if we have the 10.2% below.

Comment [zaf9]: We were asked to include disclosure of suicide intent. Also, changed the formatting here a bit.

Comment [tgs9]: Why did you add this? It sounds like others have done it already. I think the last version of the start of the conclusion was more compelling.



127 behavioral health providers, especially in underserved areas is needed, as is expansion of healthcare systems  
 128 needed that integrate physical and behavioral health and that better support suicide prevention and patient  
 129 safety, especially through care transitions [11].

130 Study findings indicate that people with known MHP also experienced other life stressors such as job/financial,  
 131 relationship, and/or physical health problems. These findings point to the need to both prevent the conditions  
 132 associated with mental health problems in the first place and the need to support people with known MHP to  
 133 decrease their risk of poor social, health, and economic outcomes [13].

134 These results, together, underscore the importance of comprehensive statewide suicide prevention activities  
 135 that address multiple factors associated with suicide. Prevention strategies may include: strengthening  
 136 economic supports (e.g., housing stabilization policies, household financial support); teaching coping and  
 137 problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in  
 138 life; promoting social connectedness to increase a sense of belongingness and access to informational, tangible,  
 139 emotional, and social support, and identifying and better supporting people at risk. Other strategies include  
 140 creating protective environments (e.g., reducing access to lethal means among people at risk, creating  
 141 organizational and workplace policies to promote help-seeking, easing transitions into and out of work for  
 142 people with MHP and other life challenges), supporting family and friends after a suicide, and assuring safe  
 143 reporting by the media in order to prevent suicide contagion [11]. Some states, such as Colorado, are planning  
 144 and implementing such a comprehensive approach to suicide prevention [14].

145 These findings have at least three limitations. In the state-level analysis, rankings for four states (MD, MA, RI,  
 146 UT) might have been impacted by large proportions of injury deaths of undetermined intent (i.e. decreasing  
 147 suicide rates), or decreased percentages of such deaths over time (i.e. increasing suicide rates). Second, NVDRS  
 148 is not yet nationally representative, the 27 states included in the current study represent 49.6% of the U.S.  
 149 population. Third, abstractors of NVDRS data are limited to information contained in investigative reports.

150 Therefore, the extent of informant knowledge can impact data completeness and accuracy. Studies including in-  
 151 depth interviews with next-of-kin often see greater attributions to MHP and substance abuse disorders,  
 152 however many methodological variations across studies exist [15]. It is likely that some people without known  
 153 MHP in the current study were experiencing mental health challenges that were unknown, and hence  
 154 unreported by key informants. However, any lack of awareness of decedent MHP suggests, even further, the  
 155 importance of addressing the broad range of contributing circumstances.

156 Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are  
 157 available. States and communities can use data from NVDRS and resources such as CDC's *Preventing Suicide: a*  
 158 *Technical Package of Policies, Programs, and Practices* [11] to better understand their suicide problem and  
 159 prioritize evidence-based comprehensive suicide prevention.

#### 160 Acknowledgments

161 The authors acknowledge Robert Anderson, Holly Hedegaard, and Margaret Warner from the Division of Vital  
 162 Statistics, National Center for Health Statistics, CDC, for their statistical consultation.

163  
 164 **Conflict of Interest** No conflicts of interest were reported.

165  
 166 **Corresponding author:** Deborah M. Stone, [dstone3@cdc.gov](mailto:dstone3@cdc.gov), 770-488-3942

167  
 168 **Author Affiliations:**

Comment [zaf9]: Is this confirmed, Tom?

Comment [tgs9]: This is from the 2015 NVDRS SS

Comment [CA]: Good addition

Comment [zaf9]: Need to consider this part further.

Comment [zaf9]: Is this still ok?

Comment [zaf9]: Cory had a great idea here so took out, Mental illness is an important risk factor for suicide, and is one of many requiring preventive action. She said the media would probably just take away Mental illness is an important risk factor, period.



<sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis, Research, and Practice Integration, National Center for Injury Prevention and Control, CDC

## References:

1. Centers for Disease Control and Prevention, *Web-based Injury Statistics Query and Reporting System (WISQARS)*. Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018. 2016.
2. Ivey-Stephenson, A.Z., et al., *Suicide Trends Among and Within Urbanization Levels by Sex, Race/Ethnicity, Age Group, and Mechanism of Death - United States, 2001-2015*. MMWR Surveill Summ, 2017. **66**(18): p. 1-16.
3. Kegler, S.R., D.M. Stone, and K.M. Holland, *Trends in suicide by level of urbanization—United States, 1999–2015*. MMWR. Morbidity and mortality weekly report, 2017. **66**(10): p. 270.
4. Kochanek, K., et al., *Mortality in the United States, 2016*. NCHS Data Brief, no 293. National Center for Health Statistics, 2017.
5. Office of the Surgeon General and National Action Alliance for Suicide Prevention, *2012 National strategy for suicide prevention: goals and objectives for action: a report of the US Surgeon General and of the National Action Alliance for Suicide Prevention*. 2012.
6. Rosenman, S.J., *Preventing suicide: what will work and what will not*. The Medical Journal of Australia, 1998. **169**(2): p. 100-102.
7. Torguson, K. and A. O'Brien, *Leading Suicide Prevention Efforts Unite to Address Rising National Suicide Rate*. 2017: Washington, D.C.
8. Crepeau-Hobson, F., *The Psychological Autopsy and Determination of Child Suicides: A Survey of Medical Examiners*. Archives of Suicide Research, 2010. **14**(1): p. 24-34.
9. American Psychiatric Association, *Diagnostic and statistical manual of mental disorders (DSM-5®)*. 2013: American Psychiatric Pub.
10. Li, Z., et al., *Attributable risk of psychiatric and socio-economic factors for suicide from individual-level, population-based studies: A systematic review*. Social Science & Medicine, 2011. **72**(4): p. 608-616.
11. Stone, D.M., et al., *Preventing suicide: A technical package of policies, programs, and practice*. 2017.
12. Simon, T.R., et al., *Characteristics of impulsive suicide attempts and attempters*. Suicide and Life-Threatening Behavior, 2002. **32**(s1): p. 49-59.
13. World Health Organization, *Risks to mental health: An overview of vulnerabilities and risk factors*. Geneva: WHO, 2012.
14. Caine, E.D., et al., *Comprehensive, integrated approaches to suicide prevention: practical guidance*. Injury prevention, 2017: p. injuryprev-2017-042366.
15. Hawton, K., et al., *The psychological autopsy approach to studying suicide: a review of methodological issues*. J Affect Disord, 1998. **50**(2-3): p. 269-76.

## Tables and Figures (attachments)

Table 1 and Figure 1.doc

Tables 2 and 3.pdf

**Word Count:** 1762/1800

**Comment [zaf9]:** Need to replace ref 10 and fix 11-15

1 **Short title:** Increasing Trends in State Suicide Rates and Contributing Circumstances among people ≥10 years

Comment [za19]: Need to edit this. Could be interpreted that contributing circumstances are increasing as well.

2 Deborah M. Stone, ScD;<sup>1</sup> Thomas R. Simon PhD;<sup>1</sup> Katherine A. Fowler, PhD;<sup>1</sup> Scott R. Kegler, PhD;<sup>2</sup> Keming Yuan,  
3 MS;<sup>1</sup> Kristin M. Holland, PhD;<sup>1</sup> Asha Z. Ivey-Stephenson, PhD;<sup>1</sup> Alex E. Crosby, MD<sup>1</sup>

Comment [za19]: Is this still accurate?

4 **Structured abstract (245/250 words—this word count is not included in the 1800 max for the remainder)**

5 **Background:** Suicide rates have risen nearly 30% since 1999. Mental health problems (MHP) are just one factor  
6 contributing to suicide. Examining state-level trends in suicide and other contributing circumstances can inform  
7 comprehensive state suicide prevention planning.

8 **Methods:** Trends in age-adjusted suicide rates among people aged ≥10 years, by state and sex, across six  
9 consecutive three-year periods (1999-2016), were assessed using data from the National Vital Statistics System  
10 for 50 states and Washington, D.C (D.C.). Data from the National Violent Death Reporting System, covering 27  
11 states in 2015, were used to examine contributing circumstances among decedents with and without known  
12 MHP.

13 **Results:** From 1999-2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases  
14 of 30% or more. Rates increased significantly among males and females, in 34 and 43 states, respectively. Over  
15 half (54.0%) of decedents did *not* have a known MHP. Among decedents with circumstance information, those  
16 without known MHP were more likely (all  $p \leq .01$ ) than those with a MHP to have relationship problems/loss  
17 (45.1% vs 39.6%), life stressors/loss (54.2% vs 49.7%) and recent/impending crises (32.9% vs 26.0%), but these  
18 circumstances were common across groups.

19 **Conclusions:** Suicide rates increased significantly across most states from 1999-2016. Various circumstances  
20 contributed to suicides among people with and without known MHP.

21 **Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach  
22 to prevent suicide risk before it occurs, identify and support people at risk, prevent reattempts, and help  
23 friends/family after a suicide occurs.

## 24 INTRODUCTION

### 25 BACKGROUND AND PURPOSE (255/250 words)

26 In 2016, nearly 45,000 suicides (15.6/100,000 [age-adjusted]) occurred in the United States (U.S.), among people  
27 ≥10 years old [1]. Between 1999 and 2016, suicide rates increased across sexes, racial/ethnic groups, and  
28 urbanization levels [2, 3]. Suicide is the 10<sup>th</sup> leading cause of death and is one of just three leading causes that  
29 are *increasing* [1, 4]. Additionally, rates of Emergency Department visits for nonfatal self-harm, a key risk factor  
30 for suicide, increased nearly 45% between 2001 and 2015 [1]. Together, suicides and self-harm injuries cost the  
31 nation more than \$69 billion in direct medical and work loss costs [1].

32 The *National Strategy for Suicide Prevention*(NSSP) [5] calls for a public health approach to suicide prevention  
33 with efforts spanning across multiple levels (i.e., individual, family/relationship, community, and societal). Such  
34 an approach underscores that suicide is rarely caused by any single factor, but rather, is multi-determined.  
35 Despite the NSSP guidance, suicide prevention efforts largely focus on identifying and treating individuals with  
36 mental health problems (MHP) [6]. Other contributing circumstances include social and economic problems,  
37 access to lethal means (e.g., substances, firearms, bridges) among people at risk, poor coping and problem-  
38 solving skills, and prior suicide attempts [5]. Expanded awareness of the additional circumstances that  
39 contribute to suicide risk apart from MHP, and action to address them, can help reach the nation's goal of



reducing suicide rates 20% by 2025 [7]. To assist states in achieving this goal, this study analyzes state-specific trends in suicide rates, assesses the multiple contributing factors, and provides recommendations for multi-level comprehensive suicide prevention.

## **METHODS (256/250 words)**

Suicide rates were analyzed for people aged  $\geq 10$  years only, as attributions of suicidal intent in younger children are variable [8]. Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases 10<sup>th</sup> Revision*, underlying-cause-of death codes X60-X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods spanning 1999-2016. Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Characteristics (Table 2) and circumstances (Table 3) of suicide decedents  $\geq 10$  years, with and without known MHP, were compared in the 27 states with complete data participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines MHP as disorders listed in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition [9]. For this study, alcohol and other substance use disorders were not defined as MHP, and were examined in both groups. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known MHP were compared using Chi-square tests. Logistic regression analyses estimated adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and race/ethnicity.

## **RESULTS (584/600 words)**

The most recent overall suicide rates (representing 2014-2016) varied four-fold, from 6.9 (D.C.) to 29.2 (Montana) per 100,000 persons per year (Table 1). Across the study period, rates increased in all states, except Nevada (with the 9<sup>th</sup> highest current suicide rate), with absolute increases ranging from +0.8 (Delaware) to +8.1 (Wyoming) per 100,000. Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with increases more than 30% observed in 25 states.

Modeled suicide rate trends indicated significant increases for 44 states, as well as for the U.S. overall (Table 1). By sex, modeled rate trends indicated significant increases in 34 states for males and in 43 states for females. Nationally, the model-estimated AAPC for the overall suicide rate was +1.5%. By sex, the national AAPC was +1.1% for males and +2.6% for females.

Suicide decedents without known MHP (N=11,039) were compared to those with MHP (N=9,407). While all decedents were predominately male (Table 2; 76.8%) and non-Hispanic white (83.6%), those without known MHP, relative to those with MHP, were more likely male (83.6% vs. 68.8%; adjusted odds ratio (aOR)=2.3, 95% CI = 2.2-2.5) and racial/ethnic minorities (odds ratio [OR] range: 1.2-2.1; 95% CI range [1.0-1.3] – [1.6-2.0]). Suicide decedents without known MHP also had significantly greater odds of perpetrating homicide-suicide (aOR = 2.9, 95% CI = 2.2-3.8), of firearm suicide (aOR = 1.6, 95% CI = 1.5-1.7), and of testing positive for alcohol (aOR = 1.2, 95% CI = 1.1-1.3). Among adult decedents, 20.1% and 15.3% of people without and with MHP, respectively, ever served, or were serving, in the U.S. military.

**Comment [za19]:** The comment made was that it wasn't clear how we defined MHP since substance use disorders are a diagnosis in DSM-V. Changed this to be more straightforward.

**Comment [za19]:** Correct definition for military services?



85 Although firearms were used most often, overall (48.5%), decedents with known MHP were more likely to die by  
86 suffocation (31.3 vs. 26.9%) and poisoning (19.8% vs. 10.4%) than those without known MHP .

87 All suicide decedents with known MHP (N=9,407) and approximately 85% without MHP (N=9,357) had available  
88 circumstances information (Table 3). People without known MHP were less likely to have any substance abuse  
89 problems (aOR=0.7, 95% CI=0.7-0.8). While two-thirds of those with known MHP had a history of mental health  
90 or substance abuse treatment (67.2%), just over half (54.0%) were in current treatment.

91 Decedents without known MHP, versus those with known MHP had a significantly greater likelihood of any  
92 relationship problem/loss (45.1% vs. 39.6%), specifically intimate partner problems (30.2% vs. 24.1%),  
93 arguments/conflicts (17.5% vs. 13.6%), and recently perpetrating interpersonal violence (3.0% vs. 1.4%). They  
94 were also significantly more likely to have experienced other life stressors, such as criminal-legal problems  
95 (10.7% vs. 6.2%) or eviction/loss of home (4.3% vs. 3.4%), and they were more likely to have had a crisis within  
96 the preceding or upcoming two weeks (32.9% vs. 26.0%). Among both groups, the most common crises were  
97 intimate partner (36.2% vs. 34.9%) and physical health problems (13.8% vs. 12.9%), respectively.

98 Decedents without known MHP had significantly lower odds of recent release from any institution, but among  
99 those who were recently released (5.1%), those without a known MHP were significantly more likely to be  
100 released from a correctional facility (25.7% vs. 8.7%) or hospital (43.7% vs. 33.0%) than those with a known  
101 MHP. Among decedents with known MHP who were recently released from an institution (10.2%), 42.8% were  
102 released from psychiatric facilities.

103 Decedents without known MHP, compared to those with MHP, were less likely to have a history of suicidal  
104 ideation (aOR=0.4, 95% CI=0.4-0.5) and prior suicide attempt (aOR=0.3, 95% CI=0.3-0.3). Both groups disclosed  
105 suicide intent frequently, (22.4% vs. 24.5%), respectively.

#### 106 Conclusions and Comments (680/700 words)

107 From 1999-2016, 44 states saw significant suicide rate increases. Half of the states experienced increases of 30%  
108 or more. Rates increased significantly in 34 states among males and 43 states among females. More research  
109 into the causes of these trends is necessary [10].

110 Researchers and practitioners regularly state that suicide is not caused by a single factor, however, the focus of  
111 suicide research and prevention practices, almost solely, focus on identify and treating MHP. The current study  
112 found that more than half of suicide decedents in NVDRS did not have a known MHP. This group suffered more  
113 relationship problems and life stressors such as criminal-legal matters, eviction/loss of home, and recent or  
114 impending crises. This is particularly noteworthy in light of findings that suggest many suicides and attempts  
115 occur with minimal deliberation [12].

116 Among people with MHP, two-thirds had a history of mental health and/or substance abuse treatment and over  
117 half were in current treatment. This suggests that additional supports for this population are needed to keep  
118 them safe. This includes broader implementation of affordable and effective treatment modalities such as  
119 doctor-patient collaborative care models and cognitive-behavioral therapy. Additionally, greater access to  
120 behavioral health providers, especially in underserved areas is needed, as is expansion of healthcare systems  
121 needed that integrate physical and behavioral health and that better support suicide prevention and patient  
122 safety, especially through care transitions [11].

123 Study findings indicate that people with known MHP also experienced other life stressors such as job/financial,  
124 relationship, and/or physical health problems. These findings point to the need to both prevent the conditions

Comment [za19]: I kept this paragraph confined to percentages but did add some additional aOR's in other places.

Comment [za19]: We were asked to include disclosure of suicide intent.

Comment [za19]: Thinking to add something here like, This latter finding may indicate that the historical protective effect of being female may be changing.

Comment [za19]: May switch this out if we put in the above statement.

Comment [za19]: Replaced with prior version.



125 associated with mental health problems in the first place and the need to support people with known MHP to  
126 decrease their risk of poor social, health, and economic outcomes [13].

127 These results, together, underscore the importance of comprehensive statewide suicide prevention activities  
128 that address multiple factors associated with suicide. Prevention strategies may include: strengthening  
129 economic supports (e.g., housing stabilization policies, household financial support); teaching coping and  
130 problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in  
131 life; promoting social connectedness to increase a sense of belongingness and access to informational, tangible,  
132 emotional, and social support, and identifying and better supporting people at risk. Other strategies include  
133 creating protective environments (e.g., reducing access to lethal means among people at risk, creating  
134 organizational and workplace policies to promote help-seeking, easing transitions into and out of work for  
135 people with MHP and other life challenges), supporting family and friends after a suicide, and assuring safe  
136 reporting by the media in order to prevent suicide contagion [11]. Some states, such as Colorado, are planning  
137 and implementing such a comprehensive approach to suicide prevention [14].

138 These findings have at least three limitations. In the state-level analysis, rankings for four states (MD, MA, RI,  
139 UT) might have been impacted by large proportions of injury deaths of undetermined intent (i.e. decreasing  
140 suicide rates), or decreased percentages of such deaths over time (i.e. increasing suicide rates). Second, NVDRS  
141 is not yet nationally representative, the 27 states included in the current study represent 49.6% of the U.S.  
142 population. Third, abstractors of NVDRS data are limited to information contained in investigative reports.

143 Therefore, the extent of informant knowledge can impact data completeness and accuracy. Studies including in-  
144 depth interviews with next-of-kin often see greater attributions to MHP (and substance abuse disorders),  
145 however many methodological variations across studies exist [15]. It is likely that some people without known  
146 MHP in the current study were experiencing mental health challenges that were unknown, and hence  
147 unreported by key informants. However, any lack of awareness of decedent MHP suggests, even further, the  
148 importance of addressing the range of contributing circumstances.

149 Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are  
150 available. States and communities can use data from NVDRS and resources such as CDC's *Preventing Suicide: a*  
151 *Technical Package of Policies, Programs, and Practices* [11] to better understand their suicide problem and  
152 prioritize evidence-based comprehensive suicide prevention.

#### 153 Acknowledgments

154 The authors acknowledge Robert Anderson, Holly Hedegaard, and Margaret Warner from the Division of Vital  
155 Statistics, National Center for Health Statistics, CDC, for their statistical consultation.

156  
157 **Conflict of Interest** No conflicts of interest were reported.

158  
159 **Corresponding author:** Deborah M. Stone, [dstone3@cdc.gov](mailto:dstone3@cdc.gov), 770-488-3942

#### 160 161 Author Affiliations:

162 <sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis,  
163 Research, and Practice Integration, National Center for Injury Prevention and Control, CDC

#### 164 References:

Comment [za19]: Is this confirmed, Tom?

Comment [tgs9]: This is from the 2015 NVDRS SS

Comment [za19]: Need to consider this part further.

Comment [za19]: Is this still ok?

Comment [za19]: Cory had a great idea here so took out, Mental illness is an important risk factor for suicide, and is one of many requiring preventive action. She said the media would probably just take away Mental illness is an important risk factor, period.

Comment [za19]: Was Sally at the meeting where we discussed Scott's table? I don't believe so but wanted to double check and didn't want to forget her if she was there.

- 165 1. Centers for Disease Control and Prevention, *Web-based Injury Statistics Query and Reporting System*  
 166 *(WISQARS)*. Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018.  
 167 2016.
- 168 2. Ivey-Stephenson, A.Z., et al., *Suicide Trends Among and Within Urbanization Levels by Sex,*  
 169 *Race/Ethnicity, Age Group, and Mechanism of Death - United States, 2001-2015*. MMWR Surveill Summ,  
 170 2017. **66**(18): p. 1-16.
- 171 3. Kegler, S.R., D.M. Stone, and K.M. Holland, *Trends in suicide by level of urbanization—United States,*  
 172 *1999–2015*. MMWR. Morbidity and mortality weekly report, 2017. **66**(10): p. 270.
- 173 4. Kochanek, K., et al., *Mortality in the United States, 2016*. NCHS Data Brief, no 293. National Center for  
 174 Health Statistics, 2017.
- 175 5. Office of the Surgeon General and National Action Alliance for Suicide Prevention, *2012 National*  
 176 *strategy for suicide prevention: goals and objectives for action: a report of the US Surgeon General and*  
 177 *of the National Action Alliance for Suicide Prevention*. 2012.
- 178 6. Rosenman, S.J., *Preventing suicide: what will work and what will not*. The Medical Journal of Australia,  
 179 1998. **169**(2): p. 100-102.
- 180 7. Torguson, K. and A. O'Brien, *Leading Suicide Prevention Efforts Unite to Address Rising National Suicide*  
 181 *Rate*. 2017: Washington, D.C.
- 182 8. Crepeau-Hobson, F., *The Psychological Autopsy and Determination of Child Suicides: A Survey of Medical*  
 183 *Examiners*. Archives of Suicide Research, 2010. **14**(1): p. 24-34.
- 184 9. American Psychiatric Association, *Diagnostic and statistical manual of mental disorders (DSM-5®)*. 2013:  
 185 American Psychiatric Pub.
- 186 10. Li, Z., et al., *Attributable risk of psychiatric and socio-economic factors for suicide from individual-level,*  
 187 *population-based studies: A systematic review*. Social Science & Medicine, 2011. **72**(4): p. 608-616.
- 188 11. Stone, D.M., et al., *Preventing suicide: A technical package of policies, programs, and practice*. 2017.
- 189 12. Simon, T.R., et al., *Characteristics of impulsive suicide attempts and attempters*. Suicide and Life-  
 190 Threatening Behavior, 2002. **32**(s1): p. 49-59.
- 191 13. World Health Organization, *Risks to mental health: An overview of vulnerabilities and risk factors*.  
 192 Geneva: WHO, 2012.
- 193 14. Caine, E.D., et al., *Comprehensive, integrated approaches to suicide prevention: practical guidance*.  
 194 Injury prevention, 2017: p. injuryprev-2017-042366.
- 195 15. Hawton, K., et al., *The psychological autopsy approach to studying suicide: a review of methodological*  
 196 *issues*. J Affect Disord, 1998. **50**(2-3): p. 269-76.

197 **Tables and Figures (attachments)**

198 Table 1 and Figure 1.doc

199 Tables 2 and 3.pdf

200 **Word Count:** 1775/1800



# Vital Signs: Trends in State Suicide Rates — United States, 1999–2016 and Circumstances Contributing to Suicide — 27 States, 2015

Deborah M. Stone, ScD<sup>1</sup>; Thomas R. Simon PhD<sup>1</sup>; Katherine A. Fowler, PhD<sup>1</sup>; Scott R. Kegler, PhD<sup>2</sup>; Keming Yuan, MS<sup>1</sup>; Kristin M. Holland, PhD<sup>1</sup>; Asha Z. Ivey-Stephenson, PhD<sup>1</sup>; Alex E. Crosby, MD<sup>1</sup>

## Abstract

**Introduction:** Suicide rates in the United States have risen nearly 30% since 1999, and mental health problems are just one factor contributing to suicide. Examining state-level trends in suicide and the multiple circumstances contributing to it can inform comprehensive state suicide prevention planning.

**Methods:** Trends in age-adjusted suicide rates among persons aged  $\geq 10$  years, by state and sex, across six consecutive 3-year periods (1999–2016), were assessed using data from the National Vital Statistics System for 50 states and the District of Columbia (DC). Data from the National Violent Death Reporting System, covering 27 states in 2015, were used to examine contributing circumstances among decedents with and without known mental health problems.

**Results:** During 1999–2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases  $>30\%$ . Rates increased significantly among males and females in 34 and 43 states, respectively. In 2015, a total of 54% of decedents in 27 states did not have a known mental health problem. Among decedents with information on circumstances available, several circumstances were significantly more likely among those without known mental health problems than among those with mental health problems, including relationship problems/loss (45.1% versus 39.6%), life stressors (54.2% versus 49.7%), and recent/impending crises (32.9% versus 26.0%), but these circumstances were common across groups.

**Conclusions:** Suicide rates increased significantly across most states during 1999–2016. Various circumstances contributed to suicides among persons with and without known mental health problems.

**Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach to prevent suicide risk before it occurs, identify and support persons at risk, prevent reattempts, and help friends and family in the aftermath of a suicide.

## Introduction

In 2016, nearly 45,000 suicides (15.6/100,000 population [age-adjusted]) occurred in the United States among persons aged  $\geq 10$  years (1). From 1999 to 2015, suicide rates increased among both sexes, all racial/ethnic groups, and all urbanization levels (2,3). Suicide rates have also increased among all age groups younger than 75 years, with the highest percent increases among those aged 45–64 and those aged 10–14 (3). Suicide is the 10th leading cause of death and is one of just three leading causes that are increasing (1,4). In addition, rates of emergency department visits for nonfatal self-harm, a key risk factor for suicide, increased 42% from 2001 to 2016 (1). Together, suicides and self-harm injuries cost the nation approximately \$69 billion in direct medical and work loss costs (1).

The National Strategy for Suicide Prevention (NSSP) (5) calls for a public health approach to suicide prevention with efforts spanning multiple levels (i.e., individual, family/relationship, community, and societal). Such a comprehensive approach underscores that suicide is rarely caused by any single factor, but rather, is determined by multiple factors. Despite NSSP guidance, suicide prevention largely focuses on identifying suicidal persons, providing treatment for mental health problems, and preventing reattempts (6). In addition to mental health problems and prior attempts, other circumstances contributing to suicide

Comment [ST]: Delete the “a”

Comment [ST]: Should we add also to help with the transition?

Comment [ST]: Note: font changed. It looks like you ran this for those aged 10+. Is that correct?

Comment [ST]: Did Curtis confirm this cost estimate?



include social and economic problems, access to lethal means (e.g., substances, firearms) among persons at risk, and poor coping and problem-solving skills (5). Expanded awareness of these additional circumstances contributing to suicide risk and action to address them can help reach the national goal, established by the National Action Alliance for Suicide Prevention and the American Foundation for Suicide Prevention, ~~and the National Action Alliance of Suicide Prevention~~ of reducing the annual suicide rates ~~by~~ 20% by 2025 (7). To assist states in achieving this goal, CDC analyzed state-specific trends in suicide rates and assessed the multiple contributing factors to suicide; this report presents options for multilevel comprehensive suicide prevention based on the best available evidence.

## Methods

Suicide rates were analyzed for persons aged  $\geq 10$  years only, as determining suicidal intent in younger children can be difficult (8). Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases, Tenth Revision*, underlying-cause-of-death codes X60–X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive 3-year aggregate periods spanning 1999–2016 (1999–2001; 2002–2004; 2005–2007; 2008–2010; 2011–2013; and 2014–2016). Rate estimates were age-adjusted to the U.S. 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same 3-year data aggregates, employing weighted least-squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Characteristics of persons aged  $\geq 10$  years who died by suicide, with and without known mental health problems, and the circumstances surrounding the suicides were compared in the 27 states\* with complete data participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines mental health problems as disorders and syndromes listed in the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (9), with the exception of alcohol and other substance use disorders, which are captured separately in NVDRS. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known mental health problems were compared using Chi-square tests. Logistic regression analyses estimated adjusted odds ratios (aORs) with 95% confidence intervals (CIs), controlling for age group, sex, and race/ethnicity. A range of circumstances have been identified as potential risk factors for suicide. NVDRS only captures relationship problems, life stressors, and recent/imminent crises that were identified as having contributed to the suicide. Decedents could have experienced multiple circumstances.

## Results

The most recent overall suicide rates (representing 2014–2016) varied fourfold, from 6.9 (DC) to 29.2 (Montana) per 100,000 persons per year (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>). Across the study period, rates increased in all states except Nevada (where the rate was consistently high throughout the study period), with absolute increases ranging from 0.8 per 100,000 (Delaware) to 8.1 (Wyoming). Percentage increases in rates ranged from 5.9% (Delaware) to 57.6% (North Dakota), with increases  $>30\%$  observed in 25 states (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>) (Figure 1).

Modeled suicide rate trends indicated significant increases in 44 states, among males (34 states) and females (43 states), as well as for the United States overall (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>). Nationally, the model-estimated AAPC for the overall suicide rate was an increase of 1.5%. By sex, estimated national rate trends further indicated significant AAPC increases for males (1.1%) and females (2.6%) (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>).

**Comment [ST]:** Check indenting

**Comment [ST]:** What do you think of this shortened version of the text that Katie and you developed? I edited this slightly from what I sent earlier.

We need to make a distinction between these 3 and all the other circumstances in Table 2 because these are linked a contributors but the others might not be.

**Comment [ST]:** This spacing looks odd. Are there options to fix it?



Suicide decedents without known mental health problems (11,039) were compared with those with known mental health problems (9,407) in 27 states. Whereas all decedents were predominately male (76.8%) (Table 1) and non-Hispanic white (83.6%), those without known mental health problems, relative to those with mental health problems, were more likely to be male (83.6% versus 68.8%; odds ratio (OR) = 2.3, 95% CI = 2.2–2.5) and belong to a racial/ethnic minority (OR range = 1.2–2.0). Suicide decedents without known mental health problems also had significantly higher odds of perpetrating homicide-suicide (aOR = 2.9, 95% CI = 2.2–3.8). Among adult decedents aged  $\geq 18$  years, 20.1% of those without known mental health problems and 15.3% of those with mental health problems had ever served, or were currently serving, in the U.S. military.

Whereas firearms were the most common method of suicide overall (48.5%) and among decedents with and without mental health problems, decedents without known mental health problems, relative to those with known mental health problems, were more likely to die by firearm (55.3% versus 40.6%) and less likely to die by hanging/strangulation/suffocation (26.9% versus 31.3%) or poisoning (10.4% versus 19.8%). These differences remained significant in the adjusted models.

Decedents without known mental health problems were less likely to receive toxicology testing. Among those with toxicology results, decedents without known mental health problems were less likely to test positive for any substance overall (aOR = 0.8, 95% CI = 0.7–0.8), including opioids (aOR = 0.90, 95% CI = 0.81–0.99), but were more likely to test positive for alcohol (aOR = 1.2, 95% CI = 1.1–1.3).

Information on circumstances surrounding suicide were available for all decedents with mental health problems (n = 9,407) and approximately 85% of those without known mental health problems (n = 9,357) in 27 states (Table 2). Persons without known mental health problems were less likely to have any substance use disorders (aOR = 0.7, 95% CI = 0.7–0.8) than were persons with known mental health problems. Whereas two thirds of decedents with known mental health problems had a history of mental health or substance use treatment (67.2%), just over half (54.0%) were in current treatment.

Decedents without known mental health problems had a significantly higher likelihood of any relationship problem/loss (45.1%) than did those with known mental health problems (39.6%), specifically intimate partner problems (30.2% versus 24.1%), arguments/conflicts (17.5% versus 13.6%), and recently perpetrating interpersonal violence (3.0% versus 1.4%). Decedents without known mental health problems were also more likely than were those with known mental health problems to have experienced any life stressors (54.2% versus 49.7%) such as criminal/legal problems (10.7% versus 6.2%) or eviction/loss of home (4.3% versus 3.4%) and were more likely to have had a recent or impending (within the preceding or upcoming 2 weeks, respectively) crisis (a current or acute event thought to contribute to the suicide) (32.9% versus 26.0%). All of these differences remained significant in the adjusted models. Physical health problems and job/financial problems were commonly contributing stressors among both persons without mental health problems (23.2% and 15.6%, respectively) and those with mental health problems (21.4% and 16.8%, respectively). Similarly, among all persons with recent crises, intimate partner problems were the most common types and did not differ by group. Similarly, physical health problems and job/financial problems were commonly experienced among both persons without mental health problems (23.2% and 15.6%, respectively) and those with mental health problems (21.4% and 16.8%, respectively).

Decedents without known mental health problems had significantly lower odds of recent release from any institution (aOR = 0.5, 95% CI = 0.4–0.5). Among those recently released, decedents without known mental health problems but those who were recently released (5.1%), were significantly more likely to have been released from a correctional facility (25.7% versus 8.7%), hospital (43.7% versus 33.0%), or other facility (e.g., alcohol/substance treatment) (aOR = 2.5 95% CI = 1.8–3.3 24.2% versus 11.6%), than were those recently released with a known mental health problem. Among decedents with known mental health problems who were recently released from an institution (10.1%), 46.7% were released from psychiatric facilities.

**Comment [ST()]:** I'm wondering if we should reverse the order of these because physical and job problem are reported as general stressors and crises. The %'s here are for the overall stressors but the original order seemed to imply that we are describing the crises.

**Comment [HTM()]:** This is the section I found confusing.

**Comment [HTM()]:** So the first number is the % of 5.1% of decedents with no known mental health issue who were recently release.

**CORRECT**

And, the second number is the % of some % of decedents with a known mental health issue who were recently released, correct?

**CORRECT**

As I said on the phone, I had to read several times to figure who was who and where the percentages were coming from.

**I HOPE THESE EDITS HELP CLARIFY NOW.**

**I TOOK OUT THE 5.1% AND DIDN'T INCLUDE THE 10.2% SINCE WE SAY AMONG THOSE RECENTLY RELEASED.**

Maybe something along the lines of below:

Decedents without known mental health problems had significantly lower odds of having been recently released from any institution (aOR = 0.5, 95% CI = 0.4–0.5). Among those recently released from an institution, decedents without a known mental health issue (5.1%), when compared with those with a known mental health problem (X%), were significantly more likely to have been released from a correctional facility (25.7% versus 8.7%), hospital (43.7% versus 33.0%), or other facility (e.g., alcohol/substance treatment) (aOR = 2.5 95% CI = 1.8–3.3).

**Comment [ST()]:** Should we drop this %. It is confusing and you don't give the % among those without MHP.



Decedents without known mental health problems were significantly less likely to have a history of suicidal ideation (23.0%) or prior suicide attempts (10.3%) compared with those with known mental health problems (40.8% and 29.4%, respectively). Suicide intent was disclosed by 22.4% and 24.5% of persons without and with known mental health problems, respectively.

## Conclusions and Comments

During 1999–2016, suicide rates increased significantly in 44 states, and 25 states experienced increases >30%. Rates increased significantly among males in 34 states, and females in 43 states. **This finding is consistent with prior research that indicated a decreasing gender gap in male-female suicide rates during 1999–2014 (3).** Additional research into the specific causes of these trends is needed. Data from the 27 states participating in NVDRS provide important insight into circumstances surrounding suicide and can help states identify prevention priorities.

Suicidologists regularly state that suicide is not caused by a single factor (5); however, suicide prevention is often oriented toward downstream identification of suicidal persons, treatment of mental health problems, and prevention of reattempts. This study found that approximately half of suicide decedents in NVDRS did not have a known mental health problem, indicating that additional focus on nonmental health factors further upstream could provide important information for a public health approach (10). Those without a known mental health problem suffered more from relationship problems and other life stressors such as criminal/legal matters, eviction/loss of home, and recent or impending crises.

Similarly, persons with mental health problems often experienced relationship problems and other life stressors such as job/financial or physical health problems. These findings point to the need to help persons both manage and prevent the conditions associated with mental health problems in the first place, and to support persons with known mental health problems to decrease their risk for poor outcomes (11). Two thirds of this group with mental health problems had a history of treatment for any mental health or substance use or both, with approximately half in treatment when they died. This finding suggests the need for additional safety supports, including broader implementation of affordable and effective treatment modalities, such as doctor-patient collaborative care models and proven cognitive-behavioral therapies. In addition, increased access to behavioral health providers in underserved areas is needed, as is expansion of health care systems that integrate physical and behavioral health, with a priority on suicide prevention and patient safety, especially through care transitions (12).

Comprehensive statewide suicide prevention activities are needed to address the full range of factors contributing to suicide. Prevention strategies include strengthening economic supports (e.g., housing stabilization policies, household financial support); teaching coping and problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in life; promoting social connectedness to increase a sense of belonging and access to informational, tangible, emotional, and social support; and identifying and better supporting persons at risk (e.g., military veterans, persons with physical/mental health problems) (12). Other strategies include creating protective environments (e.g., reducing access to lethal means among persons at risk, creating organizational and workplace policies to promote help-seeking, easing transitions into and out of work for persons with mental health problems and other life challenges), supporting family and friends after a suicide, and assuring the media follow safe reporting **recommendations guidelines** (12). Some states, such as Colorado, are planning to implement such a comprehensive approach to suicide prevention (10).

The findings in this report are subject to at least three limitations. First, in the state-level analysis, rankings for four states (Maryland, Massachusetts, Rhode Island, and Utah) might have been affected by large proportions of injury deaths of undetermined intent (potentially biasing reported suicide rates downward) or decreased percentages of such deaths over time (potentially biasing estimated rate trends upward). Second, NVDRS is not yet nationally representative; the 27 states included represent 49.6% of the

**Comment [ST]:** I thought Scott suggested dropping or reframing this point.

**Comment [ST]:** We should use "recommendations" to be consistent with how these are described



population (<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml>). Finally, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the extent of informant knowledge can affect data completeness and accuracy. Studies that include more in-depth interviews with next-of-kin often identify greater attributions to mental disorders (13); however, many methodological variations across studies exist (14). It is likely that some persons without known mental health problems in the current study were experiencing mental health challenges that were unknown, and hence underreported by key informants. Nonetheless, the high prevalence of diverse contributing circumstances among those with and without known mental health problems suggests the importance of addressing the broad range of factors that contribute to suicide.

Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are available. States and communities can use data from NVDRS and resources such as CDC's Preventing Suicide: a Technical Package of Policy, Programs, and Practices (12) to better understand their suicide problem, prioritize evidence-based comprehensive suicide prevention, and save lives.

#### Acknowledgments

Robert Anderson, Holly Hedegaard, Margaret Warner, Division of Vital Statistics, National Center for Health Statistics, CDC.

#### Conflict of Interest

No conflicts of interest were reported.

<sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis, Research, and Practice Integration, National Center for Injury Prevention and Control, CDC.

**Corresponding author:** Deborah M. Stone, [dstone3@cdc.gov](mailto:dstone3@cdc.gov), 770-488-3942.

#### References

1. CDC. Web-based Injury Statistics Query and Reporting System (WISQARS). Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018. In.
2. Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide trends among and within urbanization levels by sex, race/ethnicity, age group, and mechanism of death—United States, 2001–2015. *MMWR Surveill Summ* 2017;66(No. SS-18).
3. Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999–2014. NCHS data brief no 241. Hyattsville, MD: US Department of Health and Human Services, CDC, National Center for Health Statistics; 2016. <https://www.cdc.gov/nchs/data/databriefs/db241.pdf>
4. Kochanek K, Murphy S, Xu J, Arias E. Mortality in the United States, 2016. NCHS data brief no 293. Hyattsville, MD: US Department of Health and Human Services, CDC, National Center for Health Statistics; 2017. <https://www.cdc.gov/nchs/data/databriefs/db293.pdf>
5. Office of the Surgeon General; National Action Alliance for Suicide Prevention. 2012 national strategy for suicide prevention: goals and objectives for action. Washington, DC: US Department of Health and Human Services, Office of the Surgeon General; 2012. <https://www.surgeongeneral.gov/library/reports/national-strategy-suicide-prevention/full-report.pdf>
6. Zalsman G, Hawton K, Wasserman D, et al. Suicide prevention strategies revisited: 10-year systematic review. *Lancet Psychiatry* 2016;3:646–59.
7. Torguson K, O'Brien A. Leading suicide prevention efforts unite to address rising national suicide rate. Washington, DC: American Foundation for Suicide Prevention; 2017. <https://afsp.org/leading-suicide-prevention-efforts-unite-address-rising-national-suicide-rate/>

8. Crepeau-Hobson F. The psychological autopsy and determination of child suicides: a survey of medical examiners. *Arch Suicide Res* 2010;14:24–34.
9. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5). Washington, DC: American Psychiatric Association; 2013.
10. Caine ED, Reed J, Hindman J, Quinlan K. Comprehensive, integrated approaches to suicide prevention: practical guidance. *Inj Prev* 2017. Epub December 20, 2017.
11. World Health Organization. Risks to mental health: an overview of vulnerabilities and risk factors. Geneva, Switzerland: World Health Organization; 2012.
12. Stone DM, Holland KM, Bartholow BN, Crosby AE, Davis SP, Wilkins N. Preventing suicide: a technical package of policy views, programs, and practice. Atlanta, GA: US Department of Health and Human Services, CDC; 2017.  
<https://www.cdc.gov/violenceprevention/pdf/suicidetechnicalpackage.pdf>
13. Milner A, Svetlicic J, De Leo D. Suicide in the absence of mental disorder? A review of psychological autopsy studies across countries. *Int J Soc Psychiatry* 2013;59:545–54.
14. Pouliot L, De Leo D. Critical issues in psychological autopsy studies. *Suicide Life Threat Behav* 2006;36:491–510.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

## Summary

### What is already known about this topic?

In 2016, nearly 45,000 deaths were caused by suicide in the United States.

### What is added by this report?

During 1999–2016, suicide rates increased in nearly every state, including >30% increases in 25 states. Mental health problems often contribute to suicide; however, 2015 data from the National Violent Death Reporting System (27 states) indicate 54% of suicide decedents were not known to have such problems. Other contributors included relationship, substance use, health, and job/financial problems.

### What are the implications for public health practice?

A comprehensive approach using proven prevention strategies, such as those in CDC's Technical Package for Suicide Prevention, can help reach the national goal of reducing suicide rates 20% by 2025.

**Comment [ST()]:** How about saying "lives were lost to suicide..."



TABLE 1. Selected demographic and descriptive characteristics of suicides among persons aged ≥10 years with and without known mental health problems — National Violent Death Reporting System, 27 states,\* 2015

Characteristic	Total (N = 20,446)	Known mental health problem† (n = 9,407)	No known mental health problem (n = 11,039)	P-value	OR‡ (95% CI)	Adjusted OR† (95% CI)
<b>Sex</b>						
Male	15,702 (76.8)	6,469 (68.8)	9,233 (83.6)	0.01	2.3 (2.2–2.5)	1.1 (1.0–1.1)
Female	4,744 (23.2)	2,938 (31.2)	1,806 (16.4)	0.01	0.4 (0.4–0.5)	0.4 (0.3–0.5)
<b>Age (yrs)**</b>						
10–24	2,804 (13.7)	1,211 (12.9)	1,593 (14.4)	0.01	1.1 (1.1–1.2)	1.1 (1.0–1.1)
25–44	6,456 (31.6)	3,036 (32.3)	3,420 (31.0)	0.05	0.9 (0.9–1.0)	0.9 (0.8–0.9)
45–64	7,718 (37.7)	3,820 (40.6)	3,898 (35.3)	0.01	0.8 (0.8–0.8)	0.8 (0.7–0.8)
≥65	3,468 (17.0)	1,340 (14.2)	2,128 (19.3)	0.01	1.4 (1.3–1.5)	1.4 (1.3–1.5)
<b>Race/Ethnicity</b>						
White, non-Hispanic	17,102 (83.6)	8,165 (86.8)	8,937 (81.0)	0.01	0.6 (0.6–0.7)	0.6 (0.5–0.6)
Black, non-Hispanic	1,228 (6.0)	411 (4.4)	817 (7.4)	0.01	1.7 (1.5–2.0)	1.7 (1.5–2.0)
American Indian/Alaska Native, non-Hispanic	378 (1.8)	112 (1.2)	266 (2.4)	0.01	2.0 (1.6–2.6)	2.0 (1.6–2.6)
Asian, non-Hispanic	576 (2.8)	235 (2.5)	341 (3.1)	0.05	1.2 (1.1–1.5)	1.2 (1.1–1.5)
Hispanic	1,096 (5.4)	463 (4.9)	633 (5.7)	0.05	1.2 (1.0–1.3)	1.2 (1.0–1.3)
Other	66 (0.3)	21 (0.2)	45 (0.4)	0.05	1.8 (1.1–3.1)	1.8 (1.1–3.1)
<b>Extended demographics</b>						
Ever served in military††	3,429 (17.8)	1,354 (15.3)	2,075 (20.1)	0.01	1.4 (1.3–1.5)	1.1 (1.0–1.1)
Homeless	240 (1.2)	104 (1.1)	136 (1.3)		1.1 (0.9–1.5)	1.2 (0.9–1.5)
<b>Incident Type</b>						
Single suicide	20,063 (98.2)	9,318 (99.1)	10,745 (97.4)	0.01	0.3 (0.3–0.4)	0.4 (0.3–0.5)
Homicide followed by suicide	319 (1.6)	64 (0.7)	255 (2.3)	0.01	3.5 (2.6–4.5)	2.9 (2.2–3.8)
Multiple suicides	64 (0.3)	25 (0.3)	39 (0.4)	—	1.3 (0.8–2.2)	1.6 (0.9–2.6)
<b>Method</b>						
Firearm	9,909 (48.5)	3,821 (40.6)	6,088 (55.3)	0.01	1.8 (1.7–1.9)	1.6 (1.5–1.7)
Hanging/Strangulation/Suffocation	5,907 (28.9)	2,940 (31.3)	2,967 (26.9)	0.01	0.8 (0.8–0.9)	0.8 (0.7–0.8)
Poisoning	3,003 (14.7)	1,861 (19.8)	1,142 (10.4)	0.01	0.5 (0.4–0.5)	0.6 (0.6–0.7)
<b>Substance class causing death§§</b>						
Other (e.g., over-the-counter)	1,021 (34.0)	666 (35.8)	355 (31.1)	0.01	0.8 (0.7–0.9)	0.9 (0.7–1.0)
Opioids	944 (31.4)	608 (32.7)	336 (29.4)	—	0.9 (0.7–1.0)	0.9 (0.8–1.1)
Antidepressants	800 (26.6)	644 (34.6)	156 (13.7)	0.01	0.3 (0.2–0.4)	0.3 (0.3–0.4)
Benzodiazepines	624 (20.8)	468 (25.1)	156 (13.7)	0.01	0.5 (0.4–0.6)	0.5 (0.4–0.6)
Antipsychotics	219 (7.3)	195 (10.5)	24 (2.1)	0.01	0.2 (0.1–0.3)	0.2 (0.1–0.3)
Other	1,595 (7.8)	780 (8.3)	815 (7.4)	0.05	0.9 (0.8–1.0)	0.9 (0.8–1.0)
<b>Toxicology Results</b>						
Any toxicology testing	13,317 (65.1)	6,658 (70.8)	6,659 (60.3)	0.01	0.6 (0.6–0.7)	0.7 (0.6–0.7)
Positive for ≥1 substance¶¶	9,913 (74.4)	5,192 (78.0)	4,721 (70.9)	0.01	0.7 (0.6–0.7)	0.8 (0.7–0.8)
<b>Substance detected***</b>						
Alcohol						
Tested	10,950 (53.6)	5,409 (57.5)	5,541 (50.2)	0.01	0.7 (0.7–0.8)	0.8 (0.7–0.8)
Positive	4,442 (40.6)	2,115 (39.1)	2,327 (42.0)	0.01	1.1 (1.0–1.2)	1.2 (1.1–1.3)
Opioids						
Tested	8,554 (41.8)	4,258 (45.3)	4,296 (38.9)	0.01	0.8 (0.7–0.8)	0.8 (0.8–0.9)

Comment [HTM()]: These need to be more specific (e.g., N/A, N/R) or footnoted to explain.

Comment [zaf9]: Kening, should this be NA or footnoted? Seems like NA would be appropriate and easier.

Positive	2,279 (26.6)	1,238 (29.1)	1,041 (24.2)	0.01	0.8 (0.7–0.9)	0.9 (0.8–1.0)
Benzodiazepines						
Tested	8,124 (39.7)	4,226 (44.9)	3,898 (35.3)	0.01	0.7 (0.6–0.7)	0.7 (0.7–0.8)
Positive	2,464 (30.3)	1,639 (38.8)	825 (21.2)	0.01	0.4 (0.4–0.5)	0.5 (0.5–0.6)
Cocaine						
Tested	7,978 (39.0)	3,866 (41.1)	4,112 (37.2)	0.01	0.9 (0.8–0.9)	0.9 (0.9–1.0)
Positive	499 (6.3)	216 (5.6)	283 (6.9)	0.05	1.2 (1.0–1.5)	1.2 (1.0–1.5)
Amphetamines						
Tested	7,615 (37.2)	3,696 (39.3)	3,919 (35.5)	0.01	0.9 (0.8–0.9)	0.9 (0.8–0.9)
Positive	736 (9.7)	376 (10.2)	360 (9.2)	— <sup>†††</sup>	0.9 (0.8–1.0)	1.0 (0.8–1.1)
Marijuana						
Tested	6,569 (32.1)	3,127 (33.2)	3,442 (31.2)	0.01	0.9 (0.9–1.0)	0.9 (0.9–1.0)
Positive	1,471 (22.4)	710 (22.7)	761 (22.1)	— <sup>†††</sup>	1.0 (0.9–1.1)	0.9 (0.8–1.0)
Antidepressants						
Tested	5,425 (26.5)	3,103 (33.0)	2,322 (21.0)	0.01	0.5 (0.5–0.6)	0.6 (0.6–0.7)
Positive	2,214 (40.8)	1,735 (55.9)	479 (20.6)	0.01	0.2 (0.2–0.2)	0.2 (0.2–0.3)

Abbreviation: CI = confidence interval; OR = odds ratio.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

† Decedent had been identified as having a current diagnosis of mental health problem in coroner/medical examiner or law enforcement reports.

‡ OR reflects the risk among those without known mental health problem relative to those with known mental health problem.

§ Logistic regression was used to estimate adjusted OR with 95% CIs after controlling for age, sex, race, and ethnicity. Known mental health problem was used as the reference group.

\*\* Decedents were aged ≥10 years, as per standard in the suicide prevention literature.

†† Denominator is decedents aged ≥18 years with reported military service status.

§§ Denominator is decedents who died by poisoning, including overdose.

¶¶ Denominator is decedents with any toxicology tested.

\*\*\* Denominator for each positive group is the number tested for the substance in that group.

††† Not significant.

**TABLE 2. Circumstances preceding suicide among decedents aged ≥10 years with and without known mental health problems — National Violent Death Reporting System, 27 states,\* 2015**

Characteristic	Total	Known mental health problem <sup>†</sup> no. (%)	No known mental health problem no. (%)	P-value	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>§</sup> (95% CI)
Suicide with known circumstances	18,764 (91.8)	9,407 (100)	9,357 (84.8)	<0.01	—	—
<b>Mental health</b>						
<b>Any Current Diagnosed Mental Health Problem**</b>						
Depression/Dysthymia		7,076 (75.2)	—	—	—	—
Anxiety disorder		1,579 (16.8)	—	—	—	—
Bipolar disorder		1,431 (15.2)	—	—	—	—
Schizophrenia		509 (5.4)	—	—	—	—
PTSD		424 (4.5)	—	—	—	—
ADD/ADHD		226 (2.4)	—	—	—	—

Comment [HTM()]: ditto above.

Comment [zaf9]: Same thought, NA?



Unknown		760 (8.1)	—	—	—	—
Current depressed mood		3,962 (42.1)	3,076 (32.9)	<0.01	0.7 (0.6–0.7)	0.7 (0.6–0.7)
<b>Substance problems</b>						
Any Current substance problem	5,319 (28.3)	2,976 (31.6)	2,343 (25.0)	<0.01	0.7 (0.7–0.8)	0.7 (0.7–0.8)
Alcohol problem	3,268 (17.4)	1,862 (19.8)	1,406 (15.0)	<0.01	0.7 (0.7–0.8)	0.7 (0.7–0.8)
Other substance problem	3,084 (16.4)	1,768 (18.8)	1,316 (14.1)	<0.01	0.7 (0.7–0.8)	0.7 (0.7–0.8)
<b>Treatment</b>						
Current mental health/substance abuse treatment	5,141 (27.4)	5,077 (54.0)	64 (0.7)	<0.01	0.01 (0.01–0.01)	0.01 (0.01–0.01)
Ever treated for mental health/substance problem	6,717 (35.8)	6,323 (67.2)	394 (4.2)	<0.01	0.02 (0.02–0.02)	0.02 (0.02–0.03)
<b>Relationship problems/loss</b>						
Any relationship problem/loss	7,948 (42.4)	3,726 (39.6)	4,222 (45.1)	<0.01	1.3 (1.2–1.3)	1.3 (1.2–1.4)
Intimate partner problem	5,098 (27.2)	2,270 (24.1)	2,828 (30.2)	<0.01	1.4 (1.3–1.5)	1.4 (1.3–1.5)
Perpetrator of interpersonal violence in past month	414 (2.2)	131 (1.4)	283 (3.0)	<0.01	2.2 (1.8–2.7)	2.0 (1.6–2.4)
Victim of interpersonal violence in past month	84 (0.4)	53 (0.6)	31 (0.3)	<0.05	0.6 (0.4–0.9)	0.8 (0.5–1.2)
Family relationship problem	1,671 (8.9)	873 (9.3)	798 (8.5)	— <sup>††</sup>	0.9 (0.8–1.0)	1.0 (0.9–1.1)
Other relationship problem (nonintimate)	403 (2.1)	202 (2.1)	201 (2.1)	— <sup>††</sup>	1.0 (0.8–1.2)	1.1 (0.9–1.3)
Argument or conflict (not specified)	2,914 (15.5)	1,278 (13.6)	1,636 (17.5)	<0.01	1.3 (1.2–1.5)	1.4 (1.3–1.5)
Death of a loved one (any)	1,497 (8.0)	826 (8.8)	671 (7.2)	<0.01	0.8 (0.7–0.9)	0.9 (0.8–0.9)
Nonsuicide death	1,181 (6.3)	647 (6.9)	534 (5.7)	<0.01	0.8 (0.7–0.9)	0.9 (0.8–1.0)
Suicide of family or friend	379 (2.0)	217 (2.3)	162 (1.7)	<0.01	0.7 (0.6–0.9)	0.8 (0.7–1.0)
<b>Other life stressors</b>						
Any life stressor	9,743 (51.9)	4,675 (49.7)	5,068 (54.2)	<0.01	1.2 (1.1–1.3)	1.1 (1.1–1.2)
Recent criminal legal problem	1,588 (8.5)	586 (6.2)	1,002 (10.7)	<0.01	1.8 (1.6–2.0)	1.7 (1.5–1.9)
Other legal problem	748 (4.0)	378 (4.0)	370 (4.0)	— <sup>††</sup>	1.0 (0.8–1.1)	1.0 (0.9–1.2)
Physical health problem	4,179 (22.3)	2,012 (21.4)	2,167 (23.2)	<0.01	1.1 (1.0–1.2)	1.0 (1.0–1.1)
Job/Financial problem <sup>§§</sup>	2941 (16.2)	1530 (16.8)	1411 (15.6)	<0.05	0.9 (0.8–1.0)	0.9 (0.8–1.0)
Eviction or loss of home	722 (3.8)	317 (3.4)	405 (4.3)	<0.01	1.3 (1.1–1.5)	1.4 (1.2–1.6)
School problem <sup>¶¶</sup>	162 (19.9)	70 (17.8)	92 (21.9)	— <sup>††</sup>	1.3 (0.9–1.8)	1.3 (0.9–1.9)
Recent release from an institution***	1,412 (7.6)	941 (10.2)	471 (5.1)	<0.01	0.5 (0.4–0.5)	0.5 (0.4–0.5)
Jail/Prison/Detention facility	203 (14.4)	82 (8.7)	121 (25.7)	<0.01	3.6 (2.7–4.9)	4.5 (3.2–6.4)
Hospital	517 (36.6)	311 (33.0)	206 (43.7)	<0.01	1.6 (1.3–2.0)	1.3 (1.0–1.7)
Psychiatric hospital/institution	469 (33.2)	439 (46.7)	30 (6.4)	<0.01	0.1 (0.1–0.1)	0.1 (0.1–0.1)
Other (includes alcohol/SA treatment facilities)	223 (15.8)	109 (11.6)	114 (24.2)	<0.01	2.4 (1.8–3.3)	2.5 (1.8–3.3)
<b>Recent or Impending Crisis</b>						
Crisis within past or upcoming 2 weeks <sup>†††</sup>	5,525 (29.4)	2,444 (26.0)	3,081 (32.9)	<0.01	1.4 (1.3–1.5)	1.4 (1.3–1.5)
Intimate partner problem crisis	1968 (35.6)	854 (34.9)	1114 (36.2)	— <sup>††</sup>	1.1 (0.9–1.2)	1.1 (0.9–1.2)
Physical health problem crisis	739 (13.4)	315 (12.9)	424 (13.8)	— <sup>††</sup>	1.1 (0.9–1.3)	1.0 (0.8–1.2)
Criminal legal problem crisis	621 (11.2)	203 (8.3)	418 (13.6)	<0.01	1.7 (1.5–2.1)	1.6 (1.3–1.9)
Family relationship problem crisis	430 (7.8)	212 (8.7)	218 (7.1)	<0.05	0.8 (0.7–1.0)	0.9 (0.7–1.1)
Job problem crisis	354 (6.4)	191 (7.8)	163 (5.3)	<0.01	0.7 (0.5–0.8)	0.7 (0.5–0.8)
<b>Suicide event/history</b>						
Left a note	6,468 (34.5)	3,182 (33.8)	3,286 (35.1)	— <sup>††</sup>	1.1 (1.0–1.1)	1.2 (1.1–1.2)
Disclosed suicide intent	4,405 (23.5)	2,306 (24.5)	2,099 (22.4)	<0.01	0.9 (0.8–1.0)	0.9 (0.8–0.9)
History of ideation	5,990 (31.9)	3,838 (40.8)	2,152 (23.0)	<0.01	0.4 (0.4–0.5)	0.4 (0.4–0.5)
History of attempts	3,732 (19.9)	2,770 (29.4)	962 (10.3)	<0.01	0.3 (0.3–0.3)	0.3 (0.3–0.3)

**Abbreviations:** ADD/ADHD = attention deficit disorder/attention deficit hyperactivity disorder; OR = odds ratio; PTSD = posttraumatic stress disorder; SA = substance abuse.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

**Comment [zaf9]:** These four settings should be indented as they are a subset of the recent release from an institution. Recent release should remain unbolded (saying this in case you were to bold it as with other categories) as its part of 'Other life stressors' overarching category.

**Comment [zaf9]:** Same comment as above, these are a subset of the recent crisis within the past or upcoming two weeks and should be indented.

† Decedent had been identified as having a current diagnosis of mental health problem in coroner/medical examiner or law enforcement reports.

§ OR reflects the risk among those without known mental health problem relative to those with known mental health problem.

¶ Logistic regression was used to estimate adjusted OR with 95% CIs after controlling for age, sex, race, and ethnicity. Known mental health problem was the reference group.

\*\* Includes decedents with one or more diagnosed current mental health problems, which are not mutually exclusive. Therefore, sums of percentages for the diagnosed conditions exceed 100%. Denominator includes the number of decedents with one or more current diagnosed mental health problems.

†† Not significant.

§§ Denominator is decedents aged ≥18 years.

¶¶ Denominator is decedents aged 10–18 years.

\*\*\* Denominator of institution subgroup is decedents with recent release from an institution. Recent release from an institution is defined as having occurred within the past month.

††† Denominator of crisis subgroup is decedents with any crisis within past or upcoming 2 weeks. Crises depicted here represent the most commonly occurring categories.

**FIGURE. Percentage change in annual suicide rate,\* by state — United States, from 1999–2001 to 2014–2016<Fig\_Small></Fig\_Small>**

The figure above is a map of the United States showing the percentage change in annual suicide rate, by state, from 1999 to 2016.

\* Per 100,000 population, age-adjusted to the 2000 U.S. standard population.



# Vital Signs: Trends in State Suicide Rates — United States, 1999–2016 and Circumstances Contributing to Suicide — 27 States, 2015

Deborah M. Stone, ScD<sup>1</sup>; Thomas R. Simon PhD<sup>1</sup>; Katherine A. Fowler, PhD<sup>1</sup>; Scott R. Kegler, PhD<sup>2</sup>; Keming Yuan, MS<sup>1</sup>; Kristin M. Holland, PhD<sup>1</sup>; Asha Z. Ivey-Stephenson, PhD<sup>1</sup>; Alex E. Crosby, MD<sup>1</sup>

## Abstract

**Introduction:** Suicide rates in the United States have risen nearly 30% since 1999, and mental health problems are just one factor contributing to suicide. Examining state-level trends in suicide and the multiple circumstances contributing to it can inform comprehensive state suicide prevention planning.

**Methods:** Trends in age-adjusted suicide rates among persons aged  $\geq 10$  years, by state and sex, across six consecutive 3-year periods (1999–2016), were assessed using data from the National Vital Statistics System for 50 states and the District of Columbia (DC). Data from the National Violent Death Reporting System, covering 27 states in 2015, were used to examine contributing circumstances among decedents with and without known mental health problems.

**Results:** During 1999–2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases  $>30\%$ . Rates increased significantly among males and females in 34 and 43 states, respectively. In 2015, a total of 54% of decedents in 27 states did not have a known mental health problem. Among decedents with information on circumstances available, several circumstances were significantly more likely among those without a known mental health problems than among those with mental health problems, including relationship problems/loss (45.1% versus 39.6%), life stressors (54.2% versus 49.7%), and recent/impending crises (32.9% versus 26.0%), but these circumstances were common across groups.

**Conclusions:** Suicide rates increased significantly across most states during 1999–2016. Various circumstances contributed to suicides among persons with and without known mental health problems.

**Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach to prevent suicide risk before it occurs, identify and support persons at risk, prevent reattempts, and help friends and family in the aftermath of a suicide.

## Introduction

In 2016, nearly 45,000 suicides (15.6/100,000 population [age-adjusted]) occurred in the United States among persons aged  $\geq 10$  years (1). From 1999 to 2015, suicide rates increased among both sexes, all racial/ethnic groups, and all urbanization levels (2,3). Suicide rates have also increased among all age groups younger than 75 years, with the highest percent increases among those aged 45–64 and those aged 10–14 (1,3). Suicide is the 10th leading cause of death and is one of just three leading causes that are increasing (1,4). In addition, rates of emergency department visits for nonfatal self-harm, a key risk factor for suicide, increased 42% from 2001 to 2016 (1). Together, suicides and self-harm injuries cost the nation approximately \$69 billion in direct medical and work loss costs (1).

The National Strategy for Suicide Prevention (NSSP) (5) calls for a public health approach to suicide prevention with efforts spanning multiple levels (i.e., individual, family/relationship, community, and societal). Such a comprehensive approach underscores that suicide is rarely caused by any single factor, but rather, is determined by multiple factors. Despite NSSP guidance, suicide prevention largely focuses on identifying suicidal persons, providing treatment for mental health problems, and preventing reattempts (6). In addition to mental health problems and prior attempts, other circumstances contributing to suicide



include social and economic problems, access to lethal means (e.g., substances, firearms) among persons at risk, and poor coping and problem-solving skills (5). Expanded awareness of these additional circumstances contributing to suicide risk and action to address them can help reach the national goal, established by the National Action Alliance for Suicide Prevention and the American Foundation for Suicide Prevention, ~~and the National Action Alliance of Suicide Prevention~~ of reducing the annual suicide rates ~~by~~ 20% by 2025 (7). To assist states in achieving this goal, CDC analyzed state-specific trends in suicide rates and assessed the multiple contributing factors to suicide; this report presents options for multilevel comprehensive suicide prevention based on the best available evidence.

## Methods

Suicide rates were analyzed for persons aged  $\geq 10$  years only, as determining suicidal intent in younger children can be difficult (8). Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases, Tenth Revision*, underlying-cause-of-death codes X60–X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive 3-year aggregate periods spanning 1999–2016 (1999–2001; 2002–2004; 2005–2007; 2008–2010; 2011–2013; and 2014–2016). Rate estimates were age-adjusted to the U.S. 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same 3-year data aggregates, employing weighted least-squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Characteristics of persons aged  $\geq 10$  years who died by suicide, with and without known mental health problems, and the circumstances surrounding the suicides were compared in the 27 states\* with complete data participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines mental health problems as disorders and syndromes listed in the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (9), with the exception of alcohol and other substance use disorders, which are captured separately in NVDRS. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. A range of circumstances (relationship problems, life stressors, and recent/impending crises) has been identified as potential risk factors for suicide. Circumstances captured by NVDRS are those identified by next of kin as having actively contributed to a person's suicide. Decedents could have experienced multiple circumstances. Decedents with and without known mental health problems were compared using Chi-square tests. Logistic regression analyses estimated adjusted odds ratios (aORs) with 95% confidence intervals (CIs), controlling for age group, sex, and race/ethnicity.

## Results

The most recent overall suicide rates (representing 2014–2016) varied fourfold, from 6.9 (DC) to 29.2 (Montana) per 100,000 persons per year (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>). Across the study period, rates increased in all states except Nevada (where the rate was consistently high throughout the study period), with absolute increases ranging from 0.8 per 100,000 (Delaware) to 8.1 (Wyoming). Percentage increases in rates ranged from 5.9% (Delaware) to 57.6% (North Dakota), with increases  $>30\%$  observed in 25 states (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>) (Figure 1).

Modeled suicide rate trends indicated significant increases in 44 states, among males (34 states) and females (43 states), as well as for the United States overall (Supplementary Table;

**Comment [ST()]:** This spacing looks odd. Are there options to fix it?



<https://stacks.cdc.gov/view/cdc/53785>). Nationally, the model-estimated AAPC for the overall suicide rate was an increase of 1.5%. By sex, estimated national rate trends further indicated significant AAPC increases for males (1.1%) and females (2.6%) (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>).

Suicide decedents without known mental health problems (11,039) were compared with those with known mental health problems (9,407) in 27 states. Whereas all decedents were predominately male (76.8%) (Table 1) and non-Hispanic white (83.6%), those without known mental health problems, relative to those with mental health problems, were more likely to be male (83.6% versus 68.8%; odds ratio (OR) = 2.3, 95% CI = 2.2–2.5) and belong to a racial/ethnic minority (OR range = 1.2–2.0). Suicide decedents without known mental health problems also had significantly higher odds of perpetrating homicide-suicide (aOR = 2.9, 95% CI = 2.2–3.8). Among adult decedents aged ≥18 years, 20.1% of those without known mental health problems and 15.3% of those with mental health problems had ever served, or were currently serving, in the U.S. military.

Whereas firearms were the most common method of suicide overall (48.5%) and among decedents with and without mental health problems, decedents without known mental health problems, relative to those with known mental health problems, were more likely to die by firearm (55.3% versus 40.6%) and less likely to die by hanging/strangulation/suffocation (26.9% versus 31.3%) or poisoning (10.4% versus 19.8%). These differences remained significant in the adjusted models.

Decedents without known mental health problems were less likely to receive toxicology testing. Among those with toxicology results, decedents without known mental health problems were less likely to test positive for any substance overall (aOR = 0.8, 95% CI = 0.7–0.8), including opioids (aOR = 0.90, 95% CI = 0.81–0.99), but were more likely to test positive for alcohol (aOR = 1.2, 95% CI = 1.1–1.3).

Information on circumstances surrounding suicide were available for all decedents with mental health problems (n = 9,407) and approximately 85% of those without known mental health problems (n = 9,357) in 27 states (Table 2). Persons without known mental health problems were less likely to have any substance use disorders (aOR = 0.7, 95% CI = 0.7–0.8) than were persons with known mental health problems. Whereas two thirds of decedents with known mental health problems had a history of mental health or substance use treatment (67.2%), just over half (54.0%) were in current treatment.

Decedents without known mental health problems had a significantly higher likelihood of any relationship problem/loss (45.1%) than did those with known mental health problems (39.6%), specifically intimate partner problems (30.2% versus 24.1%), arguments/conflicts (17.5% versus 13.6%), and recently perpetrating interpersonal violence (3.0% versus 1.4%). Decedents without known mental health problems were also more likely than were those with known mental health problems to have experienced any life stressors (54.2% versus 49.7%) such as criminal/legal problems (10.7% versus 6.2%) or eviction/loss of home (4.3% versus 3.4%) and were more likely to have had a recent or impending (within the preceding or upcoming 2 weeks, respectively) crisis (a current or acute event thought to contribute to the suicide) (32.9% versus 26.0%). All of these differences remained significant in the adjusted models. Physical health problems and job/financial problems were commonly contributing stressors among both persons without mental health problems (23.2% and 15.6%, respectively) and those with mental health problems (21.4% and 16.8%, respectively). Similarly, among all persons with recent crises, intimate partner problems were the most common types and did not differ by group. Similarly, physical health problems and job/financial problems were commonly experienced among both persons without mental health problems (23.2% and 15.6%, respectively) and those with mental health problems (21.4% and 16.8%, respectively).

Decedents without known mental health problems had significantly lower odds of recent release from any institution (aOR = 0.5, 95% CI = 0.4–0.5). Among those recently released, decedents without known mental health problems but those who were recently released (5.1%), were significantly more likely to have been released from a correctional facility (25.7% versus 8.7%), hospital (43.7% versus 33.0%), or other facility (e.g., alcohol/substance treatment) (aOR = 2.5 95% CI = 1.8–3.3 24.2% versus 11.6%), than were

**Comment [HTM()]:** So the first number is the % of 5.1% of decedents with no known mental health issue who were recently release.

Deleted 5.1%

And, the second number is the % of some % of decedents with a known mental health issue who were recently released, correct?

**CORRECT**

As I said on the phone, I had to read several times to figure who was who and where the percentages were coming from.

**I HOPE THESE EDITS HELP CLARIFY NOW.**

**I TOOK OUT THE 5.1% AND DIDN'T INCLUDE THE 10.2% SINCE WE SAY AMONG THOSE RECENTLY RELEASED.**

Maybe something along the lines of below:

Decedents without known mental health problems had significantly lower odds of having been recently released from any institution (aOR = 0.5, 95% CI = 0.4–0.5). Among those recently released from an institution, decedents without a known mental health issue (5.1%), when compared with those with a known mental health problem (X%), were significantly more likely to have been released from a correctional facility (25.7% versus 8.7%), hospital (43.7% versus 33.0%), or other facility (e.g., alcohol/substance treatment) (aOR = 2.5 95% CI = 1.8–3.3).



those **recently released** with a known mental health problem, **respectively**. Among decedents with known mental health problems who were recently released from an institution ~~(+10.2%)~~, 46.7% were released from psychiatric facilities.

Decedents without known mental health problems were significantly less likely to have a history of suicidal ideation (23.0%) or prior suicide attempts (10.3%) compared with those with known mental health problems (40.8% and 29.4%, respectively). Suicide intent was disclosed by 22.4% and 24.5% of persons without and with known mental health problems, respectively.

## Conclusions and Comments

During 1999–2016, suicide rates increased significantly in 44 states, and 25 states experienced increases >30%. Rates increased significantly among males in 34 states, and females in 43 states. ~~This finding is consistent with prior research that indicated a decreasing gender gap in male-female suicide rates during 1999–2014 (3).~~ Additional research into the specific causes of these trends is needed. Data from the 27 states participating in NVDRS provide important insight into circumstances surrounding suicide and can help states identify prevention priorities.

Suicidologists regularly state that suicide is not caused by a single factor (5); however, suicide prevention is often oriented toward downstream identification of suicidal persons, treatment of mental health problems, and prevention of reattempts. This study found that approximately half of suicide decedents in NVDRS did not have a known mental health problem, indicating that additional focus on nonmental health factors further upstream could provide important information for a public health approach (10). Those without a known mental health problem suffered more from relationship problems and other life stressors such as criminal/legal matters, eviction/loss of home, and recent or impending crises.

Similarly, persons with mental health problems often experienced relationship problems and other life stressors such as job/financial or physical health problems. These findings point to the need to help persons both manage and prevent the conditions associated with mental health problems in the first place, and to support persons with known mental health problems to decrease their risk for poor outcomes (11). Two thirds of this group with mental health problems had a history of treatment for any mental health or substance use or both, with approximately half in treatment when they died. This finding suggests the need for additional safety supports, including broader implementation of affordable and effective treatment modalities, such as doctor-patient collaborative care models and proven cognitive-behavioral therapies. In addition, increased access to behavioral health providers in underserved areas is needed, as is expansion of health care systems that integrate physical and behavioral health, with a priority on suicide prevention and patient safety, especially through care transitions (12).

Comprehensive statewide suicide prevention activities are needed to address the full range of factors contributing to suicide. Prevention strategies include strengthening economic supports (e.g., housing stabilization policies, household financial support); teaching coping and problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in life; promoting social connectedness to increase a sense of belonging and access to informational, tangible, emotional, and social support; and identifying and better supporting persons at risk (e.g., military veterans, persons with physical/mental health problems) (12). Other strategies include creating protective environments (e.g., reducing access to lethal means among persons at risk, creating organizational and workplace policies to promote help-seeking, easing transitions into and out of work for persons with mental health problems and other life challenges), **strengthening access and deliver of care for people at risk**, supporting family and friends after a suicide, and assuring the media follow safe reporting **recommendations guidelines** (12). Some states, such as Colorado, are planning to implement such a comprehensive approach to suicide prevention (10).



The findings in this report are subject to at least three limitations. First, in the state-level analysis, rankings for four states (Maryland, Massachusetts, Rhode Island, and Utah) might have been affected by large proportions of injury deaths of undetermined intent (potentially biasing reported suicide rates downward) or decreased percentages of such deaths over time (potentially biasing estimated rate trends upward). Second, NVDRS is not yet nationally representative; the 27 states included represent 49.6% of the population (<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml>). Finally, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the extent of informant knowledge can affect data completeness and accuracy. Studies that include more in-depth interviews with next-of-kin often identify greater attributions to mental disorders (13); however, many methodological variations across studies exist (14). It is likely that some persons without known mental health problems in the current study were experiencing mental health challenges that were unknown, and hence underreported by key informants. Nonetheless, the high prevalence of diverse contributing circumstances among those with and without known mental health problems suggests the importance of addressing the broad range of factors that contribute to suicide.

Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are available. States and communities can use data from NVDRS and resources such as CDC's Preventing Suicide: a Technical Package of Policy, Programs, and Practices (12) to better understand their suicide problem, prioritize evidence-based comprehensive suicide prevention, and save lives.

#### Acknowledgments

Robert Anderson, Holly Hedegaard, Margaret Warner, Division of Vital Statistics, National Center for Health Statistics, CDC.

#### Conflict of Interest

No conflicts of interest were reported.

<sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis, Research, and Practice Integration, National Center for Injury Prevention and Control, CDC.

**Corresponding author:** Deborah M. Stone, [dstone3@cdc.gov](mailto:dstone3@cdc.gov), 770-488-3942.

#### References

1. CDC. Web-based Injury Statistics Query and Reporting System (WISQARS). Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018. In.
2. Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide trends among and within urbanization levels by sex, race/ethnicity, age group, and mechanism of death—United States, 2001–2015. *MMWR Surveill Summ* 2017;66(No. SS-18).
3. Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999–2014. NCHS data brief no 241. Hyattsville, MD: US Department of Health and Human Services, CDC, National Center for Health Statistics; 2016. <https://www.cdc.gov/nchs/data/databriefs/db241.pdf>
4. Kochanek K, Murphy S, Xu J, Arias E. Mortality in the United States, 2016. NCHS data brief no 293. Hyattsville, MD: US Department of Health and Human Services, CDC, National Center for Health Statistics; 2017. <https://www.cdc.gov/nchs/data/databriefs/db293.pdf>
5. Office of the Surgeon General, National Action Alliance for Suicide Prevention. 2012 National strategy for suicide prevention: goals and objectives for action. Washington, DC: US Department of Health and Human Services, Office of the Surgeon General; 2012. <https://www.surgeongeneral.gov/library/reports/national-strategy-suicide-prevention/full-report.pdf>

6. Zalsman G, Hawton K, Wasserman D, et al. Suicide prevention strategies revisited: 10-year systematic review. *Lancet Psychiatry* 2016;3:646–59.
7. Torguson K, O'Brien A. Leading suicide prevention efforts unite to address rising national suicide rate. Washington, DC: American Foundation for Suicide Prevention; 2017. <https://afsp.org/leading-suicide-prevention-efforts-unite-address-rising-national-suicide-rate/>
8. Crepeau-Hobson F. The psychological autopsy and determination of child suicides: a survey of medical examiners. *Arch Suicide Res* 2010;14:24–34.
9. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5). Washington, DC: American Psychiatric Association; 2013.
10. Caine ED, Reed J, Hindman J, Quinlan K. Comprehensive, integrated approaches to suicide prevention: practical guidance. *Inj Prev* 2017. Epub December 20, 2017.
11. World Health Organization. Risks to mental health: an overview of vulnerabilities and risk factors. Geneva, Switzerland: World Health Organization; 2012.
12. Stone DM, Holland KM, Bartholow BN, Crosby AE, Davis SP, Wilkins N. Preventing suicide: a technical package of policy, programs, and practice. Atlanta, GA: US Department of Health and Human Services, CDC; 2017. <https://www.cdc.gov/violenceprevention/pdf/suicidetechnicalpackage.pdf>
13. Milner A, Svetlicic J, De Leo D. Suicide in the absence of mental disorder? A review of psychological autopsy studies across countries. *Int J Soc Psychiatry* 2013;59:545–54.
14. Pouliot L, De Leo D. Critical issues in psychological autopsy studies. *Suicide Life Threat Behav* 2006;36:491–510.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

## Summary

### What is already known about this topic?

In 2016, nearly 45,000 ~~lives were lost to deaths were caused by~~ suicide in the United States.

### What is added by this report?

During 1999–2016, suicide rates increased in nearly every state, including >30% increases in 25 states. Mental health problems often contribute to suicide; however, 2015 data from the National Violent Death Reporting System (27 states) indicate 54% of suicide decedents were not known to have such problems. Other contributors included relationship, substance use, health, and job/financial problems.

### What are the implications for public health practice?

A comprehensive approach using proven prevention strategies, such as those in CDC's Technical Package for Suicide Prevention, can help reach the national goal of reducing suicide rates 20% by 2025.



TABLE 1. Selected demographic and descriptive characteristics of suicides among persons aged ≥10 years with and without known mental health problems — National Violent Death Reporting System, 27 states,\* 2015

Characteristic	Total (N = 20,446)	Known mental health problem† (n = 9,407)	No known mental health problem (n = 11,039)	P-value	OR‡ (95% CI)	Adjusted OR† (95% CI)
<b>Sex</b>						
Male	15,702 (76.8)	6,469 (68.8)	9,233 (83.6)	0.01	2.3 (2.2–2.5)	1.1
Female	4,744 (23.2)	2,938 (31.2)	1,806 (16.4)	0.01	0.4 (0.4–0.5)	—
<b>Age (yrs)**</b>						
10–24	2,804 (13.7)	1,211 (12.9)	1,593 (14.4)	0.01	1.1 (1.1–1.2)	—
25–44	6,456 (31.6)	3,036 (32.3)	3,420 (31.0)	0.05	0.9 (0.9–1.0)	—
45–64	7,718 (37.7)	3,820 (40.6)	3,898 (35.3)	0.01	0.8 (0.8–0.8)	—
≥65	3,468 (17.0)	1,340 (14.2)	2,128 (19.3)	0.01	1.4 (1.3–1.5)	—
<b>Race/Ethnicity</b>						
White, non-Hispanic	17,102 (83.6)	8,165 (86.8)	8,937 (81.0)	0.01	0.6 (0.6–0.7)	—
Black, non-Hispanic	1,228 (6.0)	411 (4.4)	817 (7.4)	0.01	1.7 (1.5–2.0)	—
American Indian/Alaska Native, non-Hispanic	378 (1.8)	112 (1.2)	266 (2.4)	0.01	2.0 (1.6–2.6)	—
Asian, non-Hispanic	576 (2.8)	235 (2.5)	341 (3.1)	0.05	1.2 (1.1–1.5)	—
Hispanic	1,096 (5.4)	463 (4.9)	633 (5.7)	0.05	1.2 (1.0–1.3)	—
Other	66 (0.3)	21 (0.2)	45 (0.4)	0.05	1.8 (1.1–3.1)	—
<b>Extended demographics</b>						
Ever served in military††	3,429 (17.8)	1,354 (15.3)	2,075 (20.1)	0.01	1.4 (1.3–1.5)	1.1 (1.0–1.1)
Homeless	240 (1.2)	104 (1.1)	136 (1.3)	—††	1.1 (0.9–1.5)	1.2 (0.9–1.5)
<b>Incident Type</b>						
Single suicide	20,063 (98.2)	9,318 (99.1)	10,745 (97.4)	0.01	0.3 (0.3–0.4)	0.4 (0.3–0.5)
Homicide followed by suicide	319 (1.6)	64 (0.7)	255 (2.3)	0.01	3.5 (2.6–4.5)	2.9 (2.2–3.8)
Multiple suicides	64 (0.3)	25 (0.3)	39 (0.4)	—††	1.3 (0.8–2.2)	1.6 (0.9–2.6)
<b>Method</b>						
Firearm	9,909 (48.5)	3,821 (40.6)	6,088 (55.3)	0.01	1.8 (1.7–1.9)	1.6 (1.5–1.7)
Hanging/Strangulation/Suffocation	5,907 (28.9)	2,940 (31.3)	2,967 (26.9)	0.01	0.8 (0.8–0.9)	0.8 (0.7–0.8)
Poisoning	3,003 (14.7)	1,861 (19.8)	1,142 (10.4)	0.01	0.5 (0.4–0.5)	0.6 (0.6–0.7)
<b>Substance class causing death§§</b>						
Other (e.g., over-the-counter)	1,021 (34.0)	666 (35.8)	355 (31.1)	0.01	0.8 (0.7–0.9)	0.9 (0.7–1.0)
Opioids	944 (31.4)	608 (32.7)	336 (29.4)	—††	0.9 (0.7–1.0)	0.9 (0.8–1.1)
Antidepressants	800 (26.6)	644 (34.6)	156 (13.7)	0.01	0.3 (0.2–0.4)	0.3 (0.3–0.4)
Benzodiazepines	624 (20.8)	468 (25.1)	156 (13.7)	0.01	0.5 (0.4–0.6)	0.5 (0.4–0.6)
Antipsychotics	219 (7.3)	195 (10.5)	24 (2.1)	0.01	0.2 (0.1–0.3)	0.2 (0.1–0.3)
Other	1,595 (7.8)	780 (8.3)	815 (7.4)	0.05	0.9 (0.8–1.0)	0.9 (0.8–1.0)
<b>Toxicology Results</b>						
Any toxicology testing	13,317 (65.1)	6,658 (70.8)	6,659 (60.3)	0.01	0.6 (0.6–0.7)	0.7 (0.6–0.7)
Positive for ≥1 substance¶¶	9,913 (74.4)	5,192 (78.0)	4,721 (70.9)	0.01	0.7 (0.6–0.7)	0.8 (0.7–0.8)
<b>Substance detected***</b>						
Alcohol						
Tested	10,950 (53.6)	5,409 (57.5)	5,541 (50.2)	0.01	0.7 (0.7–0.8)	0.8 (0.7–0.8)
Positive	4,442 (40.6)	2,115 (39.1)	2,327 (42.0)	0.01	1.1 (1.0–1.2)	1.2 (1.1–1.3)
Opioids						
Tested	8,554 (41.8)	4,258 (45.3)	4,296 (38.9)	0.01	0.8 (0.7–0.8)	0.8 (0.8–0.9)

Comment [zaf9]: All of these should be <0.01 or <0.05 as in Table 2

Comment [HTM()]: These need to be more specific (e.g., N/A, N/R) or footnoted to explain.

Positive	2,279 (26.6)	1,238 (29.1)	1,041 (24.2)	0.01	0.8 (0.7–0.9)	0.9 (0.8–1.0)
Benzodiazepines						
Tested	8,124 (39.7)	4,226 (44.9)	3,898 (35.3)	0.01	0.7 (0.6–0.7)	0.7 (0.7–0.8)
Positive	2,464 (30.3)	1,639 (38.8)	825 (21.2)	0.01	0.4 (0.4–0.5)	0.5 (0.5–0.6)
Cocaine						
Tested	7,978 (39.0)	3,866 (41.1)	4,112 (37.2)	0.01	0.9 (0.8–0.9)	0.9 (0.9–1.0)
Positive	499 (6.3)	216 (5.6)	283 (6.9)	0.05	1.2 (1.0–1.5)	1.2 (1.0–1.5)
Amphetamines						
Tested	7,615 (37.2)	3,696 (39.3)	3,919 (35.5)	0.01	0.9 (0.8–0.9)	0.9 (0.8–0.9)
Positive	736 (9.7)	376 (10.2)	360 (9.2)	—†††	0.9 (0.8–1.0)	1.0 (0.8–1.1)
Marijuana						
Tested	6,569 (32.1)	3,127 (33.2)	3,442 (31.2)	0.01	0.9 (0.9–1.0)	0.9 (0.9–1.0)
Positive	1,471 (22.4)	710 (22.7)	761 (22.1)	—†††	1.0 (0.9–1.1)	0.9 (0.8–1.0)
Antidepressants						
Tested	5,425 (26.5)	3,103 (33.0)	2,322 (21.0)	0.01	0.5 (0.5–0.6)	0.6 (0.6–0.7)
Positive	2,214 (40.8)	1,735 (55.9)	479 (20.6)	0.01	0.2 (0.2–0.2)	0.2 (0.2–0.3)

**Abbreviation:** CI = confidence interval; OR = odds ratio.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

† Decedent had been identified as having a current diagnosis of mental health problem in coroner/medical examiner or law enforcement reports.

§ OR reflects the risk among those without known mental health problems relative to those with known mental health problems.

¶ Logistic regression was used to estimate adjusted OR with 95% CIs after controlling for age, sex, race, and ethnicity. Known mental health problem was used as the reference group.

\*\* Decedents were aged ≥10 years, as per standard in the suicide prevention literature.

†† Denominator is decedents aged ≥18 years with reported military service status.

§§ Denominator is decedents who died by poisoning, including overdose.

¶¶ Denominator is decedents with any toxicology testing.

\*\*\* Denominator for each positive group is the number tested for the substance in that group.

††† Not significant.

**TABLE 2. Circumstances preceding suicide among decedents aged ≥10 years with and without known mental health problems — National Violent Death Reporting System, 27 states,\* 2015**

Characteristic	Total	Known mental health problem <sup>†</sup> no. (%)	No known mental health problem no. (%)	P-value	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>¶</sup> (95% CI)
<b>Suicide with known circumstances</b>	18,764 (91.8)	9,407 (100)	9,357 (84.8)	<0.01	—	—
<b>Mental health</b>						
<b>Any Current Diagnosed Mental Health Problem<sup>**</sup></b>						
Depression/Dysthymia		7,076 (75.2)	—	—	—	—
Anxiety disorder		1,579 (16.8)	—	—	—	—
Bipolar disorder		1,431 (15.2)	—	—	—	—
Schizophrenia		509 (5.4)	—	—	—	—
PTSD		424 (4.5)	—	—	—	—
ADD/ADHD		226 (2.4)	—	—	—	—



<b>Unknown Not specified</b>		760 (8.1)	—	—	—	—
Current depressed mood		3,962 (42.1)	3,076 (32.9)	<0.01	0.7 (0.6–0.7)	0.7 (0.6–0.7)
<b>Substance problems</b>						
Any Current substance problem		5,319 (28.3)	2,976 (31.6)	2,343 (25.0)	<0.01	0.7 (0.7–0.8)
Alcohol problem		3,268 (17.4)	1,862 (19.8)	1,406 (15.0)	<0.01	0.7 (0.7–0.8)
Other substance problem		3,084 (16.4)	1,768 (18.8)	1,316 (14.1)	<0.01	0.7 (0.7–0.8)
<b>Treatment</b>						
Current mental health/substance abuse treatment		5,141 (27.4)	5,077 (54.0)	64 (0.7)	<0.01	0.01 (0.01–0.01)
Ever treated for mental health/substance problem		6,717 (35.8)	6,323 (67.2)	394 (4.2)	<0.01	0.02 (0.02–0.02)
<b>Relationship problems/loss</b>						
<b>Any relationship problem/loss</b>		7,948 (42.4)	3,726 (39.6)	4,222 (45.1)	<0.01	1.3 (1.2–1.3)
Intimate partner problem		5,098 (27.2)	2,270 (24.1)	2,828 (30.2)	<0.01	1.4 (1.3–1.5)
Perpetrator of interpersonal violence in past month		414 (2.2)	131 (1.4)	283 (3.0)	<0.01	2.2 (1.8–2.7)
Victim of interpersonal violence in past month		84 (0.4)	53 (0.6)	31 (0.3)	<0.05	0.6 (0.4–0.9)
Family relationship problem		1,671 (8.9)	873 (9.3)	798 (8.5)	— <sup>††</sup>	0.9 (0.8–1.0)
Other relationship problem (nonintimate)		403 (2.1)	202 (2.1)	201 (2.1)	— <sup>††</sup>	1.0 (0.8–1.2)
Argument or conflict (not specified)		2,914 (15.5)	1,278 (13.6)	1,636 (17.5)	<0.01	1.3 (1.2–1.5)
Death of a loved one (any)		1,497 (8.0)	826 (8.8)	671 (7.2)	<0.01	0.8 (0.7–0.9)
Nonsuicide death		1,181 (6.3)	647 (6.9)	534 (5.7)	<0.01	0.8 (0.7–0.9)
Suicide of family or friend		379 (2.0)	217 (2.3)	162 (1.7)	<0.01	0.7 (0.6–0.9)
<b>Other life stressors</b>						
Any life stressor		9,743 (51.9)	4,675 (49.7)	5,068 (54.2)	<0.01	1.2 (1.1–1.3)
Recent criminal legal problem		1,588 (8.5)	586 (6.2)	1,002 (10.7)	<0.01	1.8 (1.6–2.0)
Other legal problem		748 (4.0)	378 (4.0)	370 (4.0)	— <sup>††</sup>	1.0 (0.8–1.1)
Physical health problem		4,179 (22.3)	2,012 (21.4)	2,167 (23.2)	<0.01	1.1 (1.0–1.2)
Job/Financial problem <sup>§§</sup>		2941 (16.2)	1530 (16.8)	1411 (15.6)	<0.05	0.9 (0.8–1.0)
Eviction or loss of home		722 (3.8)	317 (3.4)	405 (4.3)	<0.01	1.3 (1.1–1.5)
School problem <sup>¶¶</sup>		162 (19.9)	70 (17.8)	92 (21.9)	— <sup>††</sup>	1.3 (0.9–1.8)
Recent release from an institution <sup>***</sup>		1,412 (7.6)	941 (10.2)	471 (5.1)	<0.01	0.5 (0.4–0.5)
Jail/Prison/Detention facility		203 (14.4)	82 (8.7)	121 (25.7)	<0.01	3.6 (2.7–4.9)
Hospital		517 (36.6)	311 (33.0)	206 (43.7)	<0.01	1.6 (1.3–2.0)
Psychiatric hospital/institution		469 (33.2)	439 (46.7)	30 (6.4)	<0.01	0.1 (0.1–0.1)
Other (includes alcohol/SA treatment facilities)		223 (15.8)	109 (11.6)	114 (24.2)	<0.01	2.4 (1.8–3.3)
<b>Recent or Impending Crisis</b>						
Crisis within past or upcoming 2 weeks <sup>†††</sup>		5,525 (29.4)	2,444 (26.0)	3,081 (32.9)	<0.01	1.4 (1.3–1.5)
Intimate partner problem crisis		1968 (35.6)	854 (34.9)	1114 (36.2)	— <sup>††</sup>	1.1 (0.9–1.2)
Physical health problem crisis		739 (13.4)	315 (12.9)	424 (13.8)	— <sup>††</sup>	1.1 (0.9–1.3)
Criminal legal problem crisis		621 (11.2)	203 (8.3)	418 (13.6)	<0.01	1.7 (1.5–2.1)
Family relationship problem crisis		430 (7.8)	212 (8.7)	218 (7.1)	<0.05	0.8 (0.7–1.0)
Job problem crisis		354 (6.4)	191 (7.8)	163 (5.3)	<0.01	0.7 (0.5–0.8)
<b>Suicide event/history</b>						
Left a note		6,468 (34.5)	3,182 (33.8)	3,286 (35.1)	— <sup>††</sup>	1.1 (1.0–1.1)
Disclosed suicide intent		4,405 (23.5)	2,306 (24.5)	2,099 (22.4)	<0.01	0.9 (0.8–1.0)
History of ideation		5,990 (31.9)	3,838 (40.8)	2,152 (23.0)	<0.01	0.4 (0.4–0.5)
History of attempts		3,732 (19.9)	2,770 (29.4)	962 (10.3)	<0.01	0.3 (0.3–0.3)

**Abbreviations:** ADD/ADHD = attention deficit disorder/attention deficit hyperactivity disorder; OR = odds ratio; PTSD = posttraumatic stress disorder; SA = substance abuse.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

**Comment [zaf9]:** Should these four settings be indented as they are a subset of the recent release from an institution?

**Comment [zaf9]:** Same question as above

† Decedent had been identified as having a current diagnosis of mental health problem in coroner/medical examiner or law enforcement reports.

§ OR reflects the risk among those without known mental health problems relative to those with known mental health problems.

¶ Logistic regression was used to estimate adjusted OR with 95% CIs after controlling for age, sex, race, and ethnicity. Known mental health problem was the reference group.

\*\* Includes decedents with one or more diagnosed current mental health problems, which are not mutually exclusive. Therefore, sums of percentages for the diagnosed conditions exceed 100%. Denominator includes the number of decedents with one or more current diagnosed mental health problems.

†† Not significant.

§§ Denominator is decedents aged ≥18 years.

¶¶ Denominator is decedents aged 10–18 years.

\*\*\* Denominator of institution subgroup is decedents with recent release from an institution. Recent release from an institution is defined as having occurred within the past month.

††† Denominator of crisis subgroup is decedents with any crisis within past or upcoming 2 weeks. Crises depicted here represent the most commonly occurring categories.

**FIGURE. Percentage change in annual suicide rate,\* by state — United States, from 1999–2001 to 2014–2016<Fig\_Small></Fig\_Small>**

The figure above is a map of the United States showing the percentage change in annual suicide rate, by state, from 1999 to 2016.

\* Per 100,000 population, age-adjusted to the 2000 U.S. standard population.



# Vital Signs: Trends in State Suicide Rates — United States, 1999–2016 and Circumstances Contributing to Suicide — 27 States, 2015

Deborah M. Stone, ScD<sup>1</sup>; Thomas R. Simon PhD<sup>1</sup>; Katherine A. Fowler, PhD<sup>1</sup>; Scott R. Kegler, PhD<sup>2</sup>; Keming Yuan, MS<sup>1</sup>; Kristin M. Holland, PhD<sup>1</sup>; Asha Z. Ivey-Stephenson, PhD<sup>1</sup>; Alex E. Crosby, MD<sup>1</sup>

## Abstract

**Introduction:** Suicide rates in the United States have risen nearly 30% since 1999, and mental health problems are just one factor contributing to suicide. Examining state-level trends in suicide and the multiple circumstances contributing to it can inform comprehensive state suicide prevention planning.

**Methods:** Trends in age-adjusted suicide rates among persons aged  $\geq 10$  years, by state and sex, across six consecutive 3-year periods (1999–2016), were assessed using data from the National Vital Statistics System for 50 states and the District of Columbia (DC). Data from the National Violent Death Reporting System, covering 27 states in 2015, were used to examine contributing circumstances among decedents with and without known mental health problems.

**Results:** During 1999–2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases  $>30\%$ . Rates increased significantly among males and females in 34 and 43 states, respectively. In 2015, a total of 54% of decedents in 27 states did not have a known mental health problem. Among decedents with information on circumstances available, several circumstances were significantly more likely among those without known mental health problems than among those with mental health problems, including relationship problems/loss (45.1% versus 39.6%), life stressors (54.2% versus 49.7%), and recent/impending crises (32.9% versus 26.0%), but these circumstances were common across groups.

**Conclusions:** Suicide rates increased significantly across most states during 1999–2016. Various circumstances contributed to suicides among persons with and without known mental health problems.

**Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach to prevent suicide risk before it occurs, identify and support persons at risk, prevent reattempts, and help friends and family in the aftermath of a suicide.

## Introduction

In 2016, nearly 45,000 suicides (15.6/100,000 population [age-adjusted]) occurred in the United States among persons aged  $\geq 10$  years (1). From 1999 to 2015, suicide rates increased among both sexes, all racial/ethnic groups, and all urbanization levels (2,3). Suicide rates have also increased among all age groups younger than 75 years, with the highest percent increases among those aged 45–64 and those aged 10–14 (1,3). Suicide is the 10th leading cause of death and is one of just three leading causes that are increasing (1,4). In addition, rates of emergency department visits for nonfatal self-harm, a key risk factor for suicide, increased 42% from 2001 to 2016 (1). Together, suicides and self-harm injuries cost the nation approximately \$69 billion in direct medical and work loss costs (1).

The National Strategy for Suicide Prevention (NSSP) (5) calls for a public health approach to suicide prevention with efforts spanning multiple levels (i.e., individual, family/relationship, community, and societal). Such a comprehensive approach underscores that suicide is rarely caused by any single factor, but rather, is determined by multiple factors. Despite NSSP guidance, suicide prevention largely focuses on identifying suicidal persons, providing treatment for mental health problems, and preventing reattempts (6). In addition to mental health problems and prior attempts, other circumstances contributing to suicide



include social and economic problems, access to lethal means (e.g., substances, firearms) among persons at risk, and poor coping and problem-solving skills (5). Expanded awareness of these additional circumstances contributing to suicide risk and action to address them can help reach the national goal, established by the National Action Alliance for Suicide Prevention and the American Foundation for Suicide Prevention, of reducing the annual suicide rate 20% by 2025 (7). To assist states in achieving this goal, CDC analyzed state-specific trends in suicide rates and assessed the multiple contributing factors to suicide; this report presents options for multilevel comprehensive suicide prevention based on the best available evidence.

## Methods

Suicide rates were analyzed for persons aged  $\geq 10$  years only, as determining suicidal intent in younger children can be difficult (8). Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases, Tenth Revision*, underlying-cause-of-death codes X60–X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive 3-year aggregate periods spanning 1999–2016 (1999–2001; 2002–2004; 2005–2007; 2008–2010; 2011–2013; and 2014–2016). Rate estimates were age-adjusted to the U.S. 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same 3-year data aggregates, employing weighted least-squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Characteristics of persons aged  $\geq 10$  years who died by suicide, with and without known mental health problems, and the circumstances surrounding the suicides were compared in the 27 states\* with complete data participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines mental health problems as disorders and syndromes listed in the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (9), with the exception of alcohol and other substance use disorders, which are captured separately in NVDRS. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. A range of circumstances (relationship problems, life stressors, and recent/impending crises) has been identified as potential risk factors for suicide. Circumstances captured by NVDRS are those identified by next of kin as having actively contributed to a person's suicide. Decedents could have experienced multiple circumstances. Decedents with and without known mental health problems were compared using Chi-square tests. Logistic regression analyses estimated adjusted odds ratios (aORs) with 95% confidence intervals (CIs), controlling for age group, sex, and race/ethnicity.

## Results

The most recent overall suicide rates (representing 2014–2016) varied fourfold, from 6.9 (DC) to 29.2 (Montana) per 100,000 persons per year (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>). Across the study period, rates increased in all states except Nevada (where the rate was consistently high throughout the study period), with absolute increases ranging from 0.8 per 100,000 (Delaware) to 8.1 (Wyoming). Percentage increases in rates ranged from 5.9% (Delaware) to 57.6% (North Dakota), with increases  $>30\%$  observed in 25 states (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>) (Figure 1).

Modeled suicide rate trends indicated significant increases in 44 states, among males (34 states) and females (43 states), as well as for the United States overall (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>). Nationally, the model-estimated AAPC for the overall suicide rate



was an increase of 1.5%. By sex, estimated national rate trends further indicated significant AAPC increases for males (1.1%) and females (2.6%) (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>).

Suicide decedents without known mental health problems (11,039) were compared with those with known mental health problems (9,407) in 27 states. Whereas all decedents were predominately male (76.8%) (Table 1) and non-Hispanic white (83.6%), those without known mental health problems, relative to those with mental health problems, were more likely to be male (83.6% versus 68.8%; odds ratio (OR) = 2.3, 95% CI = 2.2–2.5) and belong to a racial/ethnic minority (OR range = 1.2–2.0). Suicide decedents without known mental health problems also had significantly higher odds of perpetrating homicide-suicide (aOR = 2.9, 95% CI = 2.2–3.8). Among adult decedents aged  $\geq 18$  years, 20.1% of those without known mental health problems and 15.3% of those with mental health problems had ever served, or were currently serving, in the U.S. military.

Whereas firearms were the most common method of suicide overall (48.5%) and among decedents with and without mental health problems, decedents without known mental health problems, relative to those with known mental health problems, were more likely to die by firearm (55.3% versus 40.6%) and less likely to die by hanging/strangulation/suffocation (26.9% versus 31.3%) or poisoning (10.4% versus 19.8%). These differences remained significant in the adjusted models.

Decedents without known mental health problems were less likely to receive toxicology testing. Among those with toxicology results, decedents without known mental health problems were less likely to test positive for any substance overall (aOR = 0.8, 95% CI = 0.7–0.8), including opioids (aOR = 0.90, 95% CI = 0.81–0.99), but were more likely to test positive for alcohol (aOR = 1.2, 95%, CI = 1.1–1.3).

Information on circumstances surrounding suicide were available for all decedents with mental health problems ( $n = 9,407$ ) and approximately 85% of those without known mental health problems ( $n = 9,357$ ) in 27 states (Table 2). Persons without known mental health problems were less likely to have any substance use disorders (aOR = 0.7, 95% CI = 0.7–0.8) than were persons with known mental health problems. Whereas two thirds of decedents with known mental health problems had a history of mental health or substance use treatment (67.2%), just over half (54.0%) were in current treatment.

Decedents without known mental health problems had a significantly higher likelihood of any relationship problem/loss (45.1%) than did those with known mental health problems (39.6%), specifically intimate partner problems (30.2% versus 24.1%), arguments/conflicts (17.5% versus 13.6%), and recently perpetrating interpersonal violence (3.0% versus 1.4%). Decedents without known mental health problems were also more likely than were those with known mental health problems to have experienced any life stressors (54.2% versus 49.7%) such as criminal/legal problems (10.7% versus 6.2%) or eviction/loss of home (4.3% versus 3.4%) and were more likely to have had a recent or impending (within the preceding or upcoming 2 weeks, respectively) crisis (a current or acute event thought to contribute to the suicide) (32.9% versus 26.0%). All of these differences remained significant in the adjusted models. Physical health problems and job/financial problems were commonly contributing stressors among both persons without mental health problems (23.2% and 15.6%, respectively) and those with mental health problems (21.4% and 16.8%, respectively). Similarly, among all persons with recent crises, intimate partner problems were the most common types and did not differ by group.

Decedents without known mental health problems had significantly lower odds of recent release from any institution (aOR = 0.5, 95% CI = 0.4–0.5). Among those recently released, decedents without known mental health problems, were significantly more likely to have been released from a correctional facility (25.7% versus 8.7%), hospital (43.7% versus 33.0%), or other facility (e.g., alcohol/substance treatment) (24.2% versus 11.6%), than those recently released with a known mental health problem, respectively. Among decedents with known mental health problems who were recently released from an institution, 46.7% were released from psychiatric facilities.

Decedents without known mental health problems were significantly less likely to have a history of suicidal ideation (23.0%) or prior suicide attempts (10.3%) compared with those with known mental health problems (40.8% and 29.4%, respectively). Suicide intent was disclosed by 22.4% and 24.5% of persons without and with known mental health problems, respectively.

## Conclusions and Comments

During 1999–2016, suicide rates increased significantly in 44 states, and 25 states experienced increases >30%. Rates increased significantly among males in 34 states, and females in 43 states. Additional research into the specific causes of these trends is needed. Data from the 27 states participating in NVDRS provide important insight into circumstances surrounding suicide and can help states identify prevention priorities.

Suicidologists regularly state that suicide is not caused by a single factor (5); however, suicide prevention is often oriented toward downstream identification of suicidal persons, treatment of mental health problems, and prevention of reattempts. This study found that approximately half of suicide decedents in NVDRS did not have a known mental health problem, indicating that additional focus on nonmental health factors further upstream could provide important information for a public health approach (10). Those without a known mental health problem suffered more from relationship problems and other life stressors such as criminal/legal matters, eviction/loss of home, and recent or impending crises.

Similarly, persons with mental health problems often experienced relationship problems and other life stressors such as job/financial or physical health problems. These findings point to the need to help persons both manage and prevent the conditions associated with mental health problems in the first place, and to support persons with known mental health problems to decrease their risk for poor outcomes (11). Two thirds of this group with mental health problems had a history of treatment for any mental health or substance use or both, with approximately half in treatment when they died. This finding suggests the need for additional safety supports, including broader implementation of affordable and effective treatment modalities, such as doctor-patient collaborative care models and proven cognitive-behavioral therapies. In addition, increased access to behavioral health providers in underserved areas is needed, as is expansion of health care systems that integrate physical and behavioral health, with a priority on suicide prevention and patient safety, especially through care transitions (12).

Comprehensive statewide suicide prevention activities are needed to address the full range of factors contributing to suicide. Prevention strategies include strengthening economic supports (e.g., housing stabilization policies, household financial support); teaching coping and problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in life; promoting social connectedness to increase a sense of belonging and access to informational, tangible, emotional, and social support; and identifying and better supporting persons at risk (e.g., military veterans, persons with physical/mental health problems) (12). Other strategies include creating protective environments (e.g., reducing access to lethal means among persons at risk, creating organizational and workplace policies to promote help-seeking, easing transitions into and out of work for persons with mental health problems and other life challenges), strengthening access and delivery of care for people at risk, supporting family and friends after a suicide, and assuring the media follow safe reporting recommendations (12). Some states, such as Colorado, are planning to implement such a comprehensive approach to suicide prevention (10).

The findings in this report are subject to at least three limitations. First, in the state-level analysis, rankings for four states (Maryland, Massachusetts, Rhode Island, and Utah) might have been affected by large proportions of injury deaths of undetermined intent (potentially biasing reported suicide rates downward) or decreased percentages of such deaths over time (potentially biasing estimated rate trends upward). Second, NVDRS is not yet nationally representative; the 27 states included represent 49.6% of the population (<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml>). Finally, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the



extent of informant knowledge can affect data completeness and accuracy. Studies that include more in-depth interviews with next-of-kin often identify greater attributions to mental disorders (13); however, many methodological variations across studies exist (14). It is likely that some persons without known mental health problems in the current study were experiencing mental health challenges that were unknown, and hence underreported by key informants. Nonetheless, the high prevalence of diverse contributing circumstances among those with and without known mental health problems suggests the importance of addressing the broad range of factors that contribute to suicide.

Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are available. States and communities can use data from NVDRS and resources such as CDC's Preventing Suicide: a Technical Package of Policy, Programs, and Practices (12) to better understand their suicide problem, prioritize evidence-based comprehensive suicide prevention, and save lives.

#### Acknowledgments

Robert Anderson, Holly Hedegaard, Margaret Warner, Division of Vital Statistics, National Center for Health Statistics, CDC.

#### Conflict of Interest

No conflicts of interest were reported.

<sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis, Research, and Practice Integration, National Center for Injury Prevention and Control, CDC.

**Corresponding author:** Deborah M. Stone, dstone3@cdc.gov, 770-488-3942.

#### References

1. CDC. Web-based Injury Statistics Query and Reporting System (WISQARS). Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018. In.
2. Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide trends among and within urbanization levels by sex, race/ethnicity, age group, and mechanism of death—United States, 2001–2015. *MMWR Surveill Summ* 2017;66(No. SS-18).
3. Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999–2014. NCHS data brief no 241. Hyattsville, MD: US Department of Health and Human Services, CDC, National Center for Health Statistics; 2016. <https://www.cdc.gov/nchs/data/databriefs/db241.pdf>
4. Kochanek K, Murphy S, Xu J, Arias E. Mortality in the United States, 2016. NCHS data brief no 293. Hyattsville, MD: US Department of Health and Human Services, CDC, National Center for Health Statistics; 2017. <https://www.cdc.gov/nchs/data/databriefs/db293.pdf>
5. Office of the Surgeon General, National Action Alliance for Suicide Prevention. 2012 National strategy for suicide prevention: goals and objectives for action. Washington, DC: US Department of Health and Human Services, Office of the Surgeon General; 2012. <https://www.surgeongeneral.gov/library/reports/national-strategy-suicide-prevention/full-report.pdf>
6. Zalsman G, Hawton K, Wasserman D, et al. Suicide prevention strategies revisited: 10-year systematic review. *Lancet Psychiatry* 2016;3:646–59.
7. Torguson K, O'Brien A. Leading suicide prevention efforts unite to address rising national suicide rate. Washington, DC: American Foundation for Suicide Prevention; 2017. <https://afsp.org/leading-suicide-prevention-efforts-unite-address-rising-national-suicide-rate/>

8. Crepeau-Hobson F. The psychological autopsy and determination of child suicides: a survey of medical examiners. *Arch Suicide Res* 2010;14:24–34.
9. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5). Washington, DC: American Psychiatric Association; 2013.
10. Caine ED, Reed J, Hindman J, Quinlan K. Comprehensive, integrated approaches to suicide prevention: practical guidance. *Inj Prev* 2017. Epub December 20, 2017.
11. World Health Organization. Risks to mental health: an overview of vulnerabilities and risk factors. Geneva, Switzerland: World Health Organization; 2012.
12. Stone DM, Holland KM, Bartholow BN, Crosby AE, Davis SP, Wilkins N. Preventing suicide: a technical package of policy, programs, and practice. Atlanta, GA: US Department of Health and Human Services, CDC; 2017.  
<https://www.cdc.gov/violenceprevention/pdf/suicidetechnicalpackage.pdf>
13. Milner A, Svetlicic J, De Leo D. Suicide in the absence of mental disorder? A review of psychological autopsy studies across countries. *Int J Soc Psychiatry* 2013;59:545–54.
14. Pouliot L, De Leo D. Critical issues in psychological autopsy studies. *Suicide Life Threat Behav* 2006;36:491–510.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

## Summary

### What is already known about this topic?

In 2016, nearly 45,000 lives were lost to suicide in the United States.

### What is added by this report?

During 1999–2016, suicide rates increased in nearly every state, including >30% increases in 25 states. Mental health problems often contribute to suicide; however, 2015 data from the National Violent Death Reporting System (27 states) indicate 54% of suicide decedents were not known to have such problems. Other contributors included relationship, substance use, health, and job/financial problems.

### What are the implications for public health practice?

A comprehensive approach using proven prevention strategies, such as those in CDC's Technical Package for Suicide Prevention, can help reach the national goal of reducing suicide rates 20% by 2025.



**TABLE 1. Selected demographic and descriptive characteristics of suicides among persons aged ≥10 years with and without known mental health problems — National Violent Death Reporting System, 27 states,\* 2015**

Characteristic	Total (N = 20,446)	Known mental health problem† (n = 9,407)	No known mental health problem (n = 11,039)	P-value	OR‡ (95% CI)	Adjusted OR¶ (95% CI)
<b>Sex</b>						
Male	15,702 (76.8)	6,469 (68.8)	9,233 (83.6)	0.01	2.3 (2.2–2.5)	—
Female	4,744 (23.2)	2,938 (31.2)	1,806 (16.4)	0.01	0.4 (0.4–0.5)	—
<b>Age (yrs)**</b>						
10–24	2,804 (13.7)	1,211 (12.9)	1,593 (14.4)	0.01	1.1 (1.1–1.2)	—
25–44	6,456 (31.6)	3,036 (32.3)	3,420 (31.0)	0.05	0.9 (0.9–1.0)	—
45–64	7,718 (37.7)	3,820 (40.6)	3,898 (35.3)	0.01	0.8 (0.8–0.8)	—
≥65	3,468 (17.0)	1,340 (14.2)	2,128 (19.3)	0.01	1.4 (1.3–1.5)	—
<b>Race/Ethnicity</b>						
White, non-Hispanic	17,102 (83.6)	8,165 (86.8)	8,937 (81.0)	0.01	0.6 (0.6–0.7)	—
Black, non-Hispanic	1,228 (6.0)	411 (4.4)	817 (7.4)	0.01	1.7 (1.5–2.0)	—
American Indian/Alaska Native, non-Hispanic	378 (1.8)	112 (1.2)	266 (2.4)	0.01	2.0 (1.6–2.6)	—
Asian, non-Hispanic	576 (2.8)	235 (2.5)	341 (3.1)	0.05	1.2 (1.1–1.5)	—
Hispanic	1,096 (5.4)	463 (4.9)	633 (5.7)	0.05	1.2 (1.0–1.3)	—
Other	66 (0.3)	21 (0.2)	45 (0.4)	0.05	1.8 (1.1–3.1)	—
<b>Extended demographics</b>						
Ever served in military††	3,429 (17.8)	1,354 (15.3)	2,075 (20.1)	0.01	1.4 (1.3–1.5)	1.1 (1.0–1.1)
Homeless	240 (1.2)	104 (1.1)	136 (1.3)	—†††	1.1 (0.9–1.5)	1.2 (0.9–1.5)
<b>Incident Type</b>						
Single suicide	20,063 (98.2)	9,318 (99.1)	10,745 (97.4)	0.01	0.3 (0.3–0.4)	0.4 (0.3–0.5)
Homicide followed by suicide	319 (1.6)	64 (0.7)	255 (2.3)	0.01	3.5 (2.6–4.5)	2.9 (2.2–3.8)
Multiple suicides	64 (0.3)	25 (0.3)	39 (0.4)	—†††	1.3 (0.8–2.2)	1.6 (0.9–2.6)
<b>Method</b>						
Firearm	9,909 (48.5)	3,821 (40.6)	6,088 (55.3)	0.01	1.8 (1.7–1.9)	1.6 (1.5–1.7)
Hanging/Strangulation/Suffocation	5,907 (28.9)	2,940 (31.3)	2,967 (26.9)	0.01	0.8 (0.8–0.9)	0.8 (0.7–0.8)
Poisoning	3,003 (14.7)	1,861 (19.8)	1,142 (10.4)	0.01	0.5 (0.4–0.5)	0.6 (0.6–0.7)
<b>Substance class causing death§§</b>						
Other (e.g., over-the-counter)	1,021 (34.0)	666 (35.8)	355 (31.1)	0.01	0.8 (0.7–0.9)	0.9 (0.7–1.0)
Opioids	944 (31.4)	608 (32.7)	336 (29.4)	—†††	0.9 (0.7–1.0)	0.9 (0.8–1.1)
Antidepressants	800 (26.6)	644 (34.6)	156 (13.7)	0.01	0.3 (0.2–0.4)	0.3 (0.3–0.4)
Benzodiazepines	624 (20.8)	468 (25.1)	156 (13.7)	0.01	0.5 (0.4–0.6)	0.5 (0.4–0.6)
Antipsychotics	219 (7.3)	195 (10.5)	24 (2.1)	0.01	0.2 (0.1–0.3)	0.2 (0.1–0.3)
Other	1,595 (7.8)	780 (8.3)	815 (7.4)	0.05	0.9 (0.8–1.0)	0.9 (0.8–1.0)
<b>Toxicology Results</b>						
Any toxicology testing	13,317 (65.1)	6,658 (70.8)	6,659 (60.3)	0.01	0.6 (0.6–0.7)	0.7 (0.6–0.7)
Positive for ≥1 substance¶¶	9,913 (74.4)	5,192 (78.0)	4,721 (70.9)	0.01	0.7 (0.6–0.7)	0.8 (0.7–0.8)
<b>Substance detected***</b>						
<b>Alcohol</b>						
Tested	10,950 (53.6)	5,409 (57.5)	5,541 (50.2)	0.01	0.7 (0.7–0.8)	0.8 (0.7–0.8)
Positive	4,442 (40.6)	2,115 (39.1)	2,327 (42.0)	0.01	1.1 (1.0–1.2)	1.2 (1.1–1.3)
<b>Opioids</b>						
Tested	8,554 (41.8)	4,258 (45.3)	4,296 (38.9)	0.01	0.8 (0.7–0.8)	0.8 (0.8–0.9)

Positive	2,279 (26.6)	1,238 (29.1)	1,041 (24.2)	0.01	0.8 (0.7–0.9)	0.9 (0.8–1.0)
Benzodiazepines						
Tested	8,124 (39.7)	4,226 (44.9)	3,898 (35.3)	0.01	0.7 (0.6–0.7)	0.7 (0.7–0.8)
Positive	2,464 (30.3)	1,639 (38.8)	825 (21.2)	0.01	0.4 (0.4–0.5)	0.5 (0.5–0.6)
Cocaine						
Tested	7,978 (39.0)	3,866 (41.1)	4,112 (37.2)	0.01	0.9 (0.8–0.9)	0.9 (0.9–1.0)
Positive	499 (6.3)	216 (5.6)	283 (6.9)	0.05	1.2 (1.0–1.5)	1.2 (1.0–1.5)
Amphetamines						
Tested	7,615 (37.2)	3,696 (39.3)	3,919 (35.5)	0.01	0.9 (0.8–0.9)	0.9 (0.8–0.9)
Positive	736 (9.7)	376 (10.2)	360 (9.2)	— <sup>†††</sup>	0.9 (0.8–1.0)	1.0 (0.8–1.1)
Marijuana						
Tested	6,569 (32.1)	3,127 (33.2)	3,442 (31.2)	0.01	0.9 (0.9–1.0)	0.9 (0.9–1.0)
Positive	1,471 (22.4)	710 (22.7)	761 (22.1)	— <sup>†††</sup>	1.0 (0.9–1.1)	0.9 (0.8–1.0)
Antidepressants						
Tested	5,425 (26.5)	3,103 (33.0)	2,322 (21.0)	0.01	0.5 (0.5–0.6)	0.6 (0.6–0.7)
Positive	2,214 (40.8)	1,735 (55.9)	479 (20.6)	0.01	0.2 (0.2–0.2)	0.2 (0.2–0.3)

**Abbreviation:** CI = confidence interval; OR = odds ratio.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

† Decedent had been identified as having a current diagnosis of mental health problem in coroner/medical examiner or law enforcement reports.

§ OR reflects the risk among those without known mental health problems relative to those with known mental health problems.

¶ Logistic regression was used to estimate adjusted OR with 95% CIs after controlling for age, sex, race, and ethnicity. Known mental health problem was used as the reference group.

\*\* Decedents were aged ≥10 years, as per standard in the suicide prevention literature.

†† Denominator is decedents aged ≥18 years with reported military service status.

§§ Denominator is decedents who died by poisoning, including overdose.

¶¶ Denominator is decedents with any toxicology testing.

\*\*\* Denominator for each positive group is the number tested for the substance in that group.

††† Not significant.

**TABLE 2. Circumstances preceding suicide among decedents aged ≥10 years with and without known mental health problems — National Violent Death Reporting System, 27 states,\* 2015**

Characteristic	Total	Known mental health problem <sup>†</sup> no. (%)	No known mental health problem no. (%)	P-value	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>¶</sup> (95% CI)
<b>Suicide with known circumstances</b>	18,764 (91.8)	9,407 (100)	9,357 (84.8)	<0.01	—	—
<b>Mental health</b>						
<b>Any Current Diagnosed Mental Health Problem**</b>						
Depression/Dysthymia		7,076 (75.2)	—	—	—	—
Anxiety disorder		1,579 (16.8)	—	—	—	—
Bipolar disorder		1,431 (15.2)	—	—	—	—
Schizophrenia		509 (5.4)	—	—	—	—
PTSD		424 (4.5)	—	—	—	—
ADD/ADHD		226 (2.4)	—	—	—	—



Not specified		760 (8.1)	—	—	—	—
Current depressed mood		3,962 (42.1)	3,076 (32.9)	<0.01	0.7 (0.6–0.7)	0.7 (0.6–0.7)
<b>Substance problems</b>						
Any Current substance problem	5,319 (28.3)	2,976 (31.6)	2,343 (25.0)	<0.01	0.7 (0.7–0.8)	0.7 (0.7–0.8)
Alcohol problem	3,268 (17.4)	1,862 (19.8)	1,406 (15.0)	<0.01	0.7 (0.7–0.8)	0.7 (0.7–0.8)
Other substance problem	3,084 (16.4)	1,768 (18.8)	1,316 (14.1)	<0.01	0.7 (0.7–0.8)	0.7 (0.7–0.8)
<b>Treatment</b>						
Current mental health/substance abuse treatment	5,141 (27.4)	5,077 (54.0)	64 (0.7)	<0.01	0.01 (0.01–0.01)	0.01 (0.01–0.01)
Ever treated for mental health/substance problem	6,717 (35.8)	6,323 (67.2)	394 (4.2)	<0.01	0.02 (0.02–0.02)	0.02 (0.02–0.03)
<b>Relationship problems/loss</b>						
Any relationship problem/loss	7,948 (42.4)	3,726 (39.6)	4,222 (45.1)	<0.01	1.3 (1.2–1.3)	1.3 (1.2–1.4)
Intimate partner problem	5,098 (27.2)	2,270 (24.1)	2,828 (30.2)	<0.01	1.4 (1.3–1.5)	1.4 (1.3–1.5)
Perpetrator of interpersonal violence in past month	414 (2.2)	131 (1.4)	283 (3.0)	<0.01	2.2 (1.8–2.7)	2.0 (1.6–2.4)
Victim of interpersonal violence in past month	84 (0.4)	53 (0.6)	31 (0.3)	<0.05	0.6 (0.4–0.9)	0.8 (0.5–1.2)
Family relationship problem	1,671 (8.9)	873 (9.3)	798 (8.5)	—††	0.9 (0.8–1.0)	1.0 (0.9–1.1)
Other relationship problem (nonintimate)	403 (2.1)	202 (2.1)	201 (2.1)	—††	1.0 (0.8–1.2)	1.1 (0.9–1.3)
Argument or conflict (not specified)	2,914 (15.5)	1,278 (13.6)	1,636 (17.5)	<0.01	1.3 (1.2–1.5)	1.4 (1.3–1.5)
Death of a loved one (any)	1,497 (8.0)	826 (8.8)	671 (7.2)	<0.01	0.8 (0.7–0.9)	0.9 (0.8–0.9)
Nonsuicide death	1,181 (6.3)	647 (6.9)	534 (5.7)	<0.01	0.8 (0.7–0.9)	0.9 (0.8–1.0)
Suicide of family or friend	379 (2.0)	217 (2.3)	162 (1.7)	<0.01	0.7 (0.6–0.9)	0.8 (0.7–1.0)
<b>Other life stressors</b>						
Any life stressor	9,743 (51.9)	4,675 (49.7)	5,068 (54.2)	<0.01	1.2 (1.1–1.3)	1.1 (1.1–1.2)
Recent criminal legal problem	1,588 (8.5)	586 (6.2)	1,002 (10.7)	<0.01	1.8 (1.6–2.0)	1.7 (1.5–1.9)
Other legal problem	748 (4.0)	378 (4.0)	370 (4.0)	—††	1.0 (0.8–1.1)	1.0 (0.9–1.2)
Physical health problem	4,179 (22.3)	2,012 (21.4)	2,167 (23.2)	<0.01	1.1 (1.0–1.2)	1.0 (1.0–1.1)
Job/Financial problem <sup>§§</sup>	2941 (16.2)	1530 (16.8)	1411 (15.6)	<0.05	0.9 (0.8–1.0)	0.9 (0.8–1.0)
Eviction or loss of home	722 (3.8)	317 (3.4)	405 (4.3)	<0.01	1.3 (1.1–1.5)	1.4 (1.2–1.6)
School problem <sup>¶¶</sup>	162 (19.9)	70 (17.8)	92 (21.9)	—††	1.3 (0.9–1.8)	1.3 (0.9–1.9)
Recent release from an institution <sup>***</sup>	1,412 (7.6)	941 (10.2)	471 (5.1)	<0.01	0.5 (0.4–0.5)	0.5 (0.4–0.5)
Jail/Prison/Detention facility	203 (14.4)	82 (8.7)	121 (25.7)	<0.01	3.6 (2.7–4.9)	4.5 (3.2–6.4)
Hospital	517 (36.6)	311 (33.0)	206 (43.7)	<0.01	1.6 (1.3–2.0)	1.3 (1.0–1.7)
Psychiatric hospital/institution	469 (33.2)	439 (46.7)	30 (6.4)	<0.01	0.1 (0.1–0.1)	0.1 (0.1–0.1)
Other (includes alcohol/SA treatment facilities)	223 (15.8)	109 (11.6)	114 (24.2)	<0.01	2.4 (1.8–3.3)	2.5 (1.8–3.3)
<b>Recent or Impending Crisis</b>						
Crisis within past or upcoming 2 weeks <sup>†††</sup>	5,525 (29.4)	2,444 (26.0)	3,081 (32.9)	<0.01	1.4 (1.3–1.5)	1.4 (1.3–1.5)
Intimate partner problem crisis	1968 (35.6)	854 (34.9)	1114 (36.2)	—††	1.1 (0.9–1.2)	1.1 (0.9–1.2)
Physical health problem crisis	739 (13.4)	315 (12.9)	424 (13.8)	—††	1.1 (0.9–1.3)	1.0 (0.8–1.2)
Criminal legal problem crisis	621 (11.2)	203 (8.3)	418 (13.6)	<0.01	1.7 (1.5–2.1)	1.6 (1.3–1.9)
Family relationship problem crisis	430 (7.8)	212 (8.7)	218 (7.1)	<0.05	0.8 (0.7–1.0)	0.9 (0.7–1.1)
Job problem crisis	354 (6.4)	191 (7.8)	163 (5.3)	<0.01	0.7 (0.5–0.8)	0.7 (0.5–0.8)
<b>Suicide event/history</b>						
Left a note	6,468 (34.5)	3,182 (33.8)	3,286 (35.1)	—††	1.1 (1.0–1.1)	1.2 (1.1–1.2)
Disclosed suicide intent	4,405 (23.5)	2,306 (24.5)	2,099 (22.4)	<0.01	0.9 (0.8–1.0)	0.9 (0.8–0.9)
History of ideation	5,990 (31.9)	3,838 (40.8)	2,152 (23.0)	<0.01	0.4 (0.4–0.5)	0.4 (0.4–0.5)
History of attempts	3,732 (19.9)	2,770 (29.4)	962 (10.3)	<0.01	0.3 (0.3–0.3)	0.3 (0.3–0.3)

**Abbreviations:** ADD/ADHD = attention deficit disorder/attention deficit hyperactivity disorder; OR = odds ratio; PTSD = posttraumatic stress disorder; SA = substance abuse.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

† Decedent had been identified as having a current diagnosis of mental health problem in coroner/medical examiner or law enforcement reports.

§ OR reflects the risk among those without known mental health problems relative to those with known mental health problems.

¶ Logistic regression was used to estimate adjusted OR with 95% CIs after controlling for age, sex, race, and ethnicity. Known mental health problem was the reference group.

\*\* Includes decedents with one or more diagnosed current mental health problems, which are not mutually exclusive. Therefore, sums of percentages for the diagnosed conditions exceed 100%. Denominator includes the number of decedents with one or more current diagnosed mental health problems.

†† Not significant.

§§ Denominator is decedents aged ≥18 years.

¶¶ Denominator is decedents aged 10–18 years.

\*\*\* Denominator of institution subgroup is decedents with recent release from an institution. Recent release from an institution is defined as having occurred within the past month.

††† Denominator of crisis subgroup is decedents with any crisis within past or upcoming 2 weeks. Crises depicted here represent the most commonly occurring categories.

**FIGURE. Percentage change in annual suicide rate,\* by state — United States, from 1999–2001 to 2014–2016<Fig\_Small></Fig\_Small>**

The figure above is a map of the United States showing the percentage change in annual suicide rate, by state, from 1999 to 2016.

\* Per 100,000 population, age-adjusted to the 2000 U.S. standard population.



# Vital Signs: Trends in State Suicide Rates — United States, 1999–2016 and Circumstances Contributing to Suicide — 27 States, 2015

Deborah M. Stone, ScD<sup>1</sup>; Thomas R. Simon PhD<sup>1</sup>; Katherine A. Fowler, PhD<sup>1</sup>; Scott R. Kegler, PhD<sup>2</sup>; Keming Yuan, MS<sup>1</sup>; Kristin M. Holland, PhD<sup>1</sup>; Asha Z. Ivey-Stephenson, PhD<sup>1</sup>; Alex E. Crosby, MD<sup>1</sup>

## Abstract

**Introduction:** Suicide rates in the United States have risen nearly 30% since 1999, and mental health conditions are just one factor contributing to suicide. Examining state-level trends in suicide and the multiple circumstances contributing to it can inform comprehensive state suicide prevention planning.

**Methods:** Trends in age-adjusted suicide rates among persons aged ≥10 years, by state and sex, across six consecutive 3-year periods (1999–2016), were assessed using data from the National Vital Statistics System for 50 states and the District of Columbia (DC). Data from the National Violent Death Reporting System, covering 27 states in 2015, were used to examine contributing circumstances among decedents with and without known mental health conditions.

**Results:** During 1999–2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases >30%. Rates increased significantly among males and females in 34 and 43 states, respectively. In 2015, a total of 54% of decedents in 27 states did not have a known mental health condition. Among decedents with available information, several circumstances were significantly more likely among those without a known mental health condition than among those with mental health condition, including relationship problems/loss (45.1% versus 39.6%), life stressors (54.2% versus 49.7%), and recent/impending crises (32.9% versus 26.0%), but these circumstances were common across groups.

**Conclusions:** Suicide rates increased significantly across most states during 1999–2016. Various circumstances contributed to suicides among persons with and without known mental health conditions.

**Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach to prevent suicide risk before it occurs, identify and support persons at risk, prevent reattempts, and help friends and family in the aftermath of a suicide.

## Introduction

In 2016, nearly 45,000 suicides (15.6/100,000 population [age-adjusted]) occurred in the United States among persons aged ≥10 years (1). From 1999 to 2015, suicide rates increased among both sexes, all racial/ethnic groups, and all urbanization levels (2,3). Suicide rates also increased among all age groups younger than 75 years, with the highest percent increases among those aged 10–14 (76% increase [from 1.2 to 2.1 per 100,000 in 1999 and 2016, respectively]) and those aged 45–64 (45% increase [from 13.2 to 19.2 per 100,000 in 1999 and 2016, respectively]). Suicide is the 10th leading cause of death and is one of just three leading causes that are increasing (1,4). In addition, rates of emergency department visits for nonfatal self-harm, a main risk factor for suicide, increased 42% from 2001 to 2016 (1). Together, suicides and self-harm injuries cost the nation approximately \$69 billion in direct medical and work loss costs (1).

The National Strategy for Suicide Prevention (NSSP) (5) calls for a public health approach to suicide prevention with efforts spanning multiple levels (i.e., individual, family/relationship, community, and societal). Such a comprehensive approach underscores that suicide is rarely caused by any single factor, but rather, is determined by multiple factors. Despite NSSP guidance, suicide prevention largely focuses on identifying suicidal persons, providing treatment for mental health conditions, and preventing reattempts.

**Comment [KC():** L1. Please replace "mental health problems" with "mental health conditions" throughout. By definition in methods, these are medical conditions. Calling them "problems" trivializes them and adds further stigma because a person should be able to cope with their problems in our culture. Most are conditions that can be medically treated.

Also, MMWR is a the scientific basis for the fact sheet, and all but the summary box should be written in scientific fashion.

Happy to discuss with author.

**Comment [HTM():** From Michael Iademarco:

L2. Stigmatizing language. I don't want to rock the boat so late in the process. Are these mental health "problems?" I want to be sure we are not using stigmatizing language. How about "conditions?" This occurs throughout the manuscript. In Methods, it seems the data source will support the use of the word conditions and diagnoses.

**Comment [KC():** Mental health condition different than relationship problem, even if both can be devastating.

**Comment [KC():** L3. Find confusing.

**Comment [za9]:** The original ordering here is preferred. The circumstances noted are just three of many. We'd like to highlight the differences between people with and without mental health conditions while at the same time noting that these factors are actually very important to both groups.

**Comment [KC():** Please go through rest of report and change.

**Comment [za9]:** Done!



(6). In addition to mental health conditions and prior suicide attempts, other contributing circumstances include social and economic problems, access to lethal means (e.g., substances, firearms) among persons at risk, and poor coping and problem-solving skills (5). Expanded awareness of these additional circumstances contributing to suicide risk and action to address them can help reach the national goal established by the American Foundation for Suicide Prevention and the National Action Alliance of Suicide Prevention of reducing suicide rates by 20% by 2025 (7). To assist states in achieving this goal, CDC analyzed state-specific trends in suicide rates and assessed the multiple contributing factors to suicide; this report presents options for multilevel comprehensive suicide prevention based on the best available evidence.

## Methods

Suicide rates were analyzed for persons aged  $\geq 10$  years only, as determining suicidal intent in younger children can be difficult (8). Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases, Tenth Revision*, underlying-cause-of-death codes X60–X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive 3-year aggregate periods spanning 1999–2016 (1999–2001; 2002–2004; 2005–2007; 2008–2010; 2011–2013; and 2014–2016). Rate estimates were age-adjusted to the U.S. 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same 3-year data aggregates, employing weighted least-squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Characteristics of persons aged  $\geq 10$  years who died by suicide, with and without known mental health conditions, and the circumstances surrounding the suicides were compared in the 27 states\* with complete data participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines mental health conditions as disorders and syndromes listed in the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (9), with the exception of alcohol and other substance use disorders, which are captured separately in NVDRS. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known mental health conditions were compared using Chi-square tests. Logistic regression analyses estimated adjusted odds ratios (aORs) with 95% confidence intervals (CIs), controlling for age group, sex, and race/ethnicity.

## Results

The most recent overall suicide rates (representing 2014–2016) varied fourfold, from 6.9 (DC) to 29.2 (Montana) per 100,000 persons per year (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>). Across the study period, rates increased in all states except Nevada (where the rate was consistently high throughout the study period), with absolute increases ranging from 0.8 per 100,000 (Delaware) to 8.1 (Wyoming). Percentage increases in rates ranged from 5.9% (Delaware) to 57.6% (North Dakota), with increases  $>30\%$  observed in 25 states (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>) (Figure 1).

Modeled suicide rate trends indicated significant increases in 44 states, among males (34 states) and females (43 states), as well as for the United States overall (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>). Nationally, the model-estimated AAPC-average annual percentage change for the overall suicide rate was an increase of 1.5%. By sex, estimated national rate trends further indicated significant AAPC-average annual percentage change increases for males (1.1%) and females (2.6%) (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>).

**Comment [KC()]:** L3. Because used only 2 more times, suggest spell throughout.

**Comment [zaf9]:** Removed acronym in all three instances where it appeared.

**Comment [KC()]:** L3. To make it easier for reader, please define abbreviations for states in this table. Some people might not have all 50 abbreviations in their heads.

**Comment [zaf9]:** Will add define abbreviations in the supplementary table.



Suicide decedents without known mental health conditions (11,039) were compared with those with known mental health conditions (9,407) in 27 states. Whereas all decedents were predominately male (76.8%) (Table 1) and non-Hispanic white (83.6%), those without known mental health conditions, relative to those with mental health conditions, were more likely to be male (83.6% versus 68.8%; odds ratio (OR) = 2.3, 95% CI = 2.2–2.5) and belong to a racial/ethnic minority (OR range = 1.2–2.0). Suicide decedents without known mental health conditions also had significantly higher odds of perpetrating homicide-suicide (aOR = 2.9, 95% CI = 2.2–3.8). Among adult decedents aged  $\geq 18$  years, 20.1% of those without known mental health conditions and 15.3% of those with mental health conditions had ever served in the U.S. military or were serving at the time of death.

Whereas firearms were the most common method of suicide overall (48.5%) and among decedents with and without mental health conditions, decedents without known mental health conditions, relative to those with known mental health conditions, were more likely to die by firearm (55.3% versus 40.6%) and less likely to die by hanging/strangulation/suffocation (26.9% versus 31.3%) or poisoning (10.4% versus 19.8%). These differences remained significant in the adjusted models.

Toxicology testing was less likely to be performed for decedents without known mental health conditions. Among those with toxicology results, decedents without known mental health conditions were less likely to test positive for any substance overall (aOR = 0.8, 95% CI = 0.7–0.8), including opioids (aOR = 0.90, 95% CI = 0.81–0.99), but were more likely to test positive for alcohol (aOR = 1.2, 95% CI = 1.1–1.3).

Information on circumstances surrounding suicide were available for all decedents with mental health conditions ( $n = 9,407$ ) and approximately 85% of those without known mental health conditions ( $n = 9,357$ ) in 27 states (Table 2). Persons without known mental health conditions were less likely to have any substance use disorders (aOR = 0.7, 95% CI = 0.7–0.8) than were persons with known mental health conditions. Whereas two thirds of decedents with known mental health conditions had a history of mental health or substance use treatment (67.2%), just over half (54.0%) were in treatment at the time of death.

Decedents without known mental health conditions had a significantly higher likelihood of any relationship problem/loss (45.1%) than did those with known mental health conditions (39.6%), specifically intimate partner problems (30.2% versus 24.1%), arguments/conflicts (17.5% versus 13.6%), and recently perpetrating interpersonal violence (3.0% versus 1.4%). Decedents without known mental health conditions were also more likely than were those with known mental health conditions to have experienced any life stressors (54.2% versus 49.7%) such as criminal/legal problems (10.7% versus 6.2%) or eviction/loss of home (4.3% versus 3.4%) and were more likely to have had a recent or impending (within the preceding or upcoming 2 weeks, respectively) crisis (a current or acute event thought to contribute to the suicide) (32.9% versus 26.0%). All of these differences remained significant in the adjusted models. Among all persons with recent crises, intimate partner problems were the most common types and did not differ by group. Similarly, physical health problems and job/financial problems were commonly experienced among both persons without mental health conditions (23.2% and 15.6%, respectively) and those with mental health conditions (21.4% and 16.8%, respectively).

Decedents without known mental health conditions had significantly lower odds of recent release from any institution (aOR = 0.5, 95% CI = 0.4–0.5), but those who were recently released (5.1%), were significantly more likely to have been released from a correctional facility (25.7% versus 8.7%), hospital (43.7% versus 33.0%), or other facility (e.g., alcohol/substance treatment) (aOR = 2.5 95% CI = 1.8–3.3), than were those with a known mental health condition. Among decedents with known mental health conditions who were recently released from an institution (10.2%), 46.7% were released from psychiatric facilities.

Decedents without known mental health conditions were significantly less likely to have a history of suicidal ideation (23.0%) or prior suicide attempts (10.3%) compared with those with known mental health

conditions (40.8% and 29.4%, respectively). Suicide intent was disclosed by 22.4% and 24.5% of persons without and with known mental health conditions, respectively.

## Conclusions and Comments

During 1999–2016, suicide rates increased significantly in 44 states, and 25 states experienced increases >30%. Rates increased significantly among males in 34 states, and females in 43 states. This finding is consistent with prior research that indicated a decreasing gender gap in male-female suicide rates during 1999–2014 (3). Additional research into the specific causes of these trends is needed. Data from the 27 states participating in NVDRS provide important insight into circumstances surrounding suicide and can help states identify prevention priorities.

Suicidologists regularly state that suicide is not caused by a single factor (5); however, suicide prevention is often oriented toward downstream identification of suicidal persons, treatment of mental health conditions, and prevention of reattempts. This study found that approximately half of suicide decedents in NVDRS did not have a known mental health condition, indicating that additional focus on nonmental health factors further upstream could provide important information for a public health approach (10). Those without a known mental health condition suffered more from relationship problems and other life stressors such as criminal/legal matters, eviction/loss of home, and recent or impending crises.

Similarly, persons with mental health conditions often experienced relationship problems and other life stressors such as job/financial or physical health problems. These findings point to the need to help persons both manage and prevent the conditions associated with mental health conditions in the first place, and to support persons with known mental health conditions to decrease their risk for poor outcomes (11). Two thirds of suicide decedents with mental health conditions had a history of treatment for any mental health or substance use or both, with approximately half in treatment when they died. This finding suggests the need for additional safety supports, including broader implementation of affordable and effective treatment modalities, such as doctor-patient collaborative care models and proven cognitive-behavioral therapies. In addition, increased access to behavioral health providers in underserved areas is needed, as is expansion of health care systems that integrate physical and behavioral health, with a priority on suicide prevention and patient safety, especially through care transitions (12).

Comprehensive statewide suicide prevention activities are needed to address the full range of factors contributing to suicide. Prevention strategies include strengthening economic supports (e.g., housing stabilization policies, household financial support); teaching coping and problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in life; promoting social connectedness to increase a sense of belonging and access to informational, tangible, emotional, and social support; and identifying and better supporting persons at risk (e.g., military veterans, persons with physical/mental health conditions) (12). Other strategies include creating protective environments (e.g., reducing access to lethal means among persons at risk of suicide, creating organizational and workplace policies to promote help-seeking, easing transitions into and out of work for persons with mental health conditions and other life challenges), supporting family and friends after a suicide, and assuring the media follow safe reporting guidelines (12). Some states, such as Colorado, are planning to implement such a comprehensive approach to suicide prevention (10).

The findings in this report are subject to at least three limitations. First, in the state-level analysis, rankings for four states (Maryland, Massachusetts, Rhode Island, and Utah) might have been affected by large proportions of injury deaths of undetermined intent (potentially biasing reported suicide rates downward) or decreased percentages of such deaths over time (potentially biasing estimated rate trends upward). Second, NVDRS is not yet nationally representative; the 27 states included represent 49.6% of the population (<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml>). Finally, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the

**Comment [KC()]:** L2. Has this been reviewed by a psychiatrist? Not sure what is meant by "prevent the conditions", D?

**Comment [za9]:** This hasn't been reviewed by a psychiatrist but we know that certain circumstances such as adverse childhood experiences are associated with future mental health conditions so we want to also prevent those conditions from occurring in the first place.

**Comment [HTM()]:** Michael Iademarco: L3. MMWR, of self-inflicted injury...

**Comment [za9]:** Prefer to say suicide here vs self-inflicted injury.



extent of informant knowledge can affect data completeness and accuracy. Studies that include more in-depth interviews with next-of-kin often identify greater attributions to mental disorders (13); however, many methodological variations across studies exist (14). It is likely that some persons without known mental health conditions in the current study were experiencing mental health challenges that were unknown, and hence underreported by key informants. Nonetheless, the high prevalence of diverse contributing circumstances among those with and without known mental health conditions suggests the importance of addressing the broad range of factors that contribute to suicide.

Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are available. States and communities can use data from NVDRS and resources such as CDC's Preventing Suicide: a Technical Package of Policies, Programs, and Practices (12) to better understand suicide in their communitiespopulations, prioritize evidence-based comprehensive suicide prevention, and save lives.

#### Acknowledgments

Robert Anderson, Holly Hedegaard, Margaret Warner, Division of Vital Statistics, National Center for Health Statistics, CDC.

#### Conflict of Interest

No conflicts of interest were reported.

<sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis, Research, and Practice Integration, National Center for Injury Prevention and Control, CDC.

**Corresponding author:** Deborah M. Stone, dstone3@cdc.gov, 770-488-3942.

#### References

1. CDC. Web-based Injury Statistics Query and Reporting System (WISQARS). Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018. In.
2. Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide trends among and within urbanization levels by sex, race/ethnicity, age group, and mechanism of death—United States, 2001–2015. *MMWR Surveill Summ* 2017;66(No. SS-18).
3. Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999–2014. NCHS data brief no 241. Hyattsville, MD: US Department of Health and Human Services, CDC, National Center for Health Statistics; 2016. <https://www.cdc.gov/nchs/data/databriefs/db241.pdf>
4. Kochanek K, Murphy S, Xu J, Arias E. Mortality in the United States, 2016. NCHS data brief no 293. Hyattsville, MD: US Department of Health and Human Services, CDC, National Center for Health Statistics; 2017. <https://www.cdc.gov/nchs/data/databriefs/db293.pdf>
5. Office of the Surgeon General; National Action Alliance for Suicide Prevention. 2012 national strategy for suicide prevention: goals and objectives for action. Washington, DC: US Department of Health and Human Services, Office of the Surgeon General; 2012. <https://www.surgeongeneral.gov/library/reports/national-strategy-suicide-prevention/full-report.pdf>
6. Zalsman G, Hawton K, Wasserman D, et al. Suicide prevention strategies revisited: 10-year systematic review. *Lancet Psychiatry* 2016;3:646–59.
7. Torguson K, O'Brien A. Leading suicide prevention efforts unite to address rising national suicide rate. Washington, DC: American Foundation for Suicide Prevention; 2017. <https://afsp.org/leading-suicide-prevention-efforts-unite-address-rising-national-suicide-rate/>

8. Crepeau-Hobson F. The psychological autopsy and determination of child suicides: a survey of medical examiners. *Arch Suicide Res* 2010;14:24–34.
9. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5). Washington, DC: American Psychiatric Association; 2013.
10. Caine ED, Reed J, Hindman J, Quinlan K. Comprehensive, integrated approaches to suicide prevention: practical guidance. *Inj Prev* 2017. Epub December 20, 2017.
11. World Health Organization. Risks to mental health: an overview of vulnerabilities and risk factors. Geneva, Switzerland: World Health Organization; 2012.
12. Stone DM, Holland KM, Bartholow BN, Crosby AE, Davis SP, Wilkins N. Preventing suicide: a technical package of policies, programs, and practice. Atlanta, GA: US Department of Health and Human Services, CDC; 2017.  
<https://www.cdc.gov/violenceprevention/pdf/suicidetechnicalpackage.pdf>
13. Milner A, Svetlicic J, De Leo D. Suicide in the absence of mental disorder? A review of psychological autopsy studies across countries. *Int J Soc Psychiatry* 2013;59:545–54.
14. Pouliot L, De Leo D. Critical issues in psychological autopsy studies. *Suicide Life Threat Behav* 2006;36:491–510.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

## Summary

### What is already known about this topic?

In 2016, nearly 45,000 ~~deaths were caused~~ people died by suicide in the United States. Mental health conditions can contribute to suicide.

### What is added by this report?

During 1999–2016, suicide rates increased in nearly every state, including >30% increases in 25 states. ~~Mental health problems often contribute to suicide; however,~~ 2015 data from the ~~National Violent Death Reporting System~~ (27 states) indicate 54% of suicide decedents were not known to have mental health conditions. Other contributors included relationship, substance use, health, and job/financial problems, among others.

### What are the implications for public health practice?

A comprehensive approach using proven prevention strategies, such as those in CDC's Technical Package for Suicide Prevention, can help reach the national goal of reducing the annual suicide rate ~~suicide rates~~ 20% by 2025.



TABLE 1. Selected demographic and descriptive characteristics of suicides among persons aged ≥10 years with and without known mental health conditions — National Violent Death Reporting System, 27 states,\* 2015

Characteristic	Total (N = 20,446)	Known mental health condition† (n = 9,407)	No known mental health condition (n = 11,039)	P-value	OR‡ (95% CI)	Adjusted OR† (95% CI)
<b>Sex</b>						
Male	15,702 (76.8)	6,469 (68.8)	9,233 (83.6)	0.01	2.3 (2.2–2.5)	1.1 (1.0–1.1)
Female	4,744 (23.2)	2,938 (31.2)	1,806 (16.4)	0.01	0.4 (0.4–0.5)	—
<b>Age (yrs)**</b>						
10–24	2,804 (13.7)	1,211 (12.9)	1,593 (14.4)	0.01	1.1 (1.1–1.2)	—
25–44	6,456 (31.6)	3,036 (32.3)	3,420 (31.0)	0.05	0.9 (0.9–1.0)	—
45–64	7,718 (37.7)	3,820 (40.6)	3,898 (35.3)	0.01	0.8 (0.8–0.8)	—
≥65	3,468 (17.0)	1,340 (14.2)	2,128 (19.3)	0.01	1.4 (1.3–1.5)	—
<b>Race/Ethnicity</b>						
White, non-Hispanic	17,102 (83.6)	8,165 (86.8)	8,937 (81.0)	0.01	0.6 (0.6–0.7)	—
Black, non-Hispanic	1,228 (6.0)	411 (4.4)	817 (7.4)	0.01	1.7 (1.5–2.0)	—
American Indian/Alaska Native, non-Hispanic	378 (1.8)	112 (1.2)	266 (2.4)	0.01	2.0 (1.6–2.6)	—
Asian, non-Hispanic	576 (2.8)	235 (2.5)	341 (3.1)	0.05	1.2 (1.1–1.5)	—
Hispanic	1,096 (5.4)	463 (4.9)	633 (5.7)	0.05	1.2 (1.0–1.3)	—
Other	66 (0.3)	21 (0.2)	45 (0.4)	0.05	1.8 (1.1–3.1)	—
<b>Extended demographics</b>						
Ever served in military††	3,429 (17.8)	1,354 (15.3)	2,075 (20.1)	0.01	1.4 (1.3–1.5)	1.1 (1.0–1.1)
Homeless	240 (1.2)	104 (1.1)	136 (1.3)		1.1 (0.9–1.5)	1.2 (0.9–1.5)
<b>Incident Type</b>						
Single suicide	20,063 (98.2)	9,318 (99.1)	10,745 (97.4)	0.01	0.3 (0.3–0.4)	0.4 (0.3–0.5)
Homicide followed by suicide	319 (1.6)	64 (0.7)	255 (2.3)	0.01	3.5 (2.6–4.5)	2.9 (2.2–3.8)
Multiple suicides	64 (0.3)	25 (0.3)	39 (0.4)	—	1.3 (0.8–2.2)	1.6 (0.9–2.6)
<b>Method</b>						
Firearm	9,909 (48.5)	3,821 (40.6)	6,088 (55.3)	0.01	1.8 (1.7–1.9)	1.6 (1.5–1.7)
Hanging/Strangulation/Suffocation	5,907 (28.9)	2,940 (31.3)	2,967 (26.9)	0.01	0.8 (0.8–0.9)	0.8 (0.7–0.8)
Poisoning	3,003 (14.7)	1,861 (19.8)	1,142 (10.4)	0.01	0.5 (0.4–0.5)	0.6 (0.6–0.7)
<b>Substance class causing death§§</b>						
Other (e.g., over-the-counter)	1,021 (34.0)	666 (35.8)	355 (31.1)	0.01	0.8 (0.7–0.9)	0.9 (0.7–1.0)
Opioids	944 (31.4)	608 (32.7)	336 (29.4)	—	0.9 (0.7–1.0)	0.9 (0.8–1.1)
Antidepressants	800 (26.6)	644 (34.6)	156 (13.7)	0.01	0.3 (0.2–0.4)	0.3 (0.3–0.4)
Benzodiazepines	624 (20.8)	468 (25.1)	156 (13.7)	0.01	0.5 (0.4–0.6)	0.5 (0.4–0.6)
Antipsychotics	219 (7.3)	195 (10.5)	24 (2.1)	0.01	0.2 (0.1–0.3)	0.2 (0.1–0.3)
Other	1,595 (7.8)	780 (8.3)	815 (7.4)	0.05	0.9 (0.8–1.0)	0.9 (0.8–1.0)
<b>Toxicology Results</b>						
Any toxicology testing	13,317 (65.1)	6,658 (70.8)	6,659 (60.3)	0.01	0.6 (0.6–0.7)	0.7 (0.6–0.7)
Positive for ≥1 substance¶¶	9,913 (74.4)	5,192 (78.0)	4,721 (70.9)	0.01	0.7 (0.6–0.7)	0.8 (0.7–0.8)
<b>Substance detected***</b>						
Alcohol						
Tested	10,950 (53.6)	5,409 (57.5)	5,541 (50.2)	0.01	0.7 (0.7–0.8)	0.8 (0.7–0.8)
Positive	4,442 (40.6)	2,115 (39.1)	2,327 (42.0)	0.01	1.1 (1.0–1.2)	1.2 (1.1–1.3)
Opioids						
Tested	8,554 (41.8)	4,258 (45.3)	4,296 (38.9)	0.01	0.8 (0.7–0.8)	0.8 (0.8–0.9)

**Comment [zaf9]:** This footnote also applies to the other dashes in this column. Not sure if you want the dashes to remain or not so left them in.

Positive	2,279 (26.6)	1,238 (29.1)	1,041 (24.2)	0.01	0.8 (0.7–0.9)	0.9 (0.8–1.0)
Benzodiazepines						
Tested	8,124 (39.7)	4,226 (44.9)	3,898 (35.3)	0.01	0.7 (0.6–0.7)	0.7 (0.7–0.8)
Positive	2,464 (30.3)	1,639 (38.8)	825 (21.2)	0.01	0.4 (0.4–0.5)	0.5 (0.5–0.6)
Cocaine						
Tested	7,978 (39.0)	3,866 (41.1)	4,112 (37.2)	0.01	0.9 (0.8–0.9)	0.9 (0.9–1.0)
Positive	499 (6.3)	216 (5.6)	283 (6.9)	0.05	1.2 (1.0–1.5)	1.2 (1.0–1.5)
Amphetamines						
Tested	7,615 (37.2)	3,696 (39.3)	3,919 (35.5)	0.01	0.9 (0.8–0.9)	0.9 (0.8–0.9)
Positive	736 (9.7)	376 (10.2)	360 (9.2)	—†††	0.9 (0.8–1.0)	1.0 (0.8–1.1)
Marijuana						
Tested	6,569 (32.1)	3,127 (33.2)	3,442 (31.2)	0.01	0.9 (0.9–1.0)	0.9 (0.9–1.0)
Positive	1,471 (22.4)	710 (22.7)	761 (22.1)	—†††	1.0 (0.9–1.1)	0.9 (0.8–1.0)
Antidepressants						
Tested	5,425 (26.5)	3,103 (33.0)	2,322 (21.0)	0.01	0.5 (0.5–0.6)	0.6 (0.6–0.7)
Positive	2,214 (40.8)	1,735 (55.9)	479 (20.6)	0.01	0.2 (0.2–0.2)	0.2 (0.2–0.3)

Abbreviation: CI = confidence interval; OR = odds ratio.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

† Decedent had been identified as having a current diagnosis of mental health condition in coroner/medical examiner or law enforcement reports.

§ OR reflects the risk among those without known mental health condition relative to those with known mental health condition.

¶ Logistic regression was used to estimate adjusted OR with 95% CIs after controlling for age, sex, race, and ethnicity. Therefore, adjusted OR for age groups, sex and race/ethnicity groups are not presented. Known mental health condition was used as the reference group.

\*\* Decedents were aged ≥10 years, as per standard in the suicide prevention literature.

†† Denominator is decedents aged ≥18 years with reported military service status.

§§ Denominator is decedents who died by poisoning, including overdose.

¶¶ Denominator is decedents with any toxicology tested.

\*\*\* Denominator for each positive group is the number tested for the substance in that group.

††† Not significant.

**TABLE 2. Circumstances preceding suicide among decedents aged ≥10 years with and without known mental health conditions — National Violent Death Reporting System, 27 states,\* 2015**

Characteristic	Total	Known mental health condition† no. (%)	No known mental health condition no. (%)	P-value	OR§ (95% CI)	Adjusted OR¶ (95% CI)
Suicide with known circumstances	18,764 (91.8)	9,407 (100)	9,357 (84.8)	<0.01	—	—
<b>Mental health</b>						
<b>Any Current Diagnosed Mental Health Condition**</b>						
Depression/Dysthymia		7,076 (75.2)	—	—NA	NA—	NA—
Anxiety disorder		1,579 (16.8)	—	NA—	NA—	NA—
Bipolar disorder		1,431 (15.2)	—	NA—	NA—	NA—
Schizophrenia		509 (5.4)	—	NA—	NA—	NA—
PTSD		424 (4.5)	—	NA—	NA—	NA—



ADD/ADHD		226 (2.4)	—	NA—	NA—	NA—
Unknown		760 (8.1)	—	NA—	NA—	NA—
Current depressed mood		3,962 (42.1)	3,076 (32.9)	<0.01	0.7 (0.6–0.7)	0.7 (0.6–0.7)
<b>Substance problems</b>						
Any Current substance problem	5,319 (28.3)	2,976 (31.6)	2,343 (25.0)	<0.01	0.7 (0.7–0.8)	0.7 (0.7–0.8)
Alcohol problem	3,268 (17.4)	1,862 (19.8)	1,406 (15.0)	<0.01	0.7 (0.7–0.8)	0.7 (0.7–0.8)
Other substance problem	3,084 (16.4)	1,768 (18.8)	1,316 (14.1)	<0.01	0.7 (0.7–0.8)	0.7 (0.7–0.8)
<b>Treatment</b>						
Current mental health/substance abuse treatment	5,141 (27.4)	5,077 (54.0)	64 (0.7)	<0.01	0.01 (0.01–0.01)	0.01 (0.01–0.01)
Ever treated for mental health/substance problem	6,717 (35.8)	6,323 (67.2)	394 (4.2)	<0.01	0.02 (0.02–0.02)	0.02 (0.02–0.03)
<b>Relationship problems/loss</b>						
Any relationship problem/loss	7,948 (42.4)	3,726 (39.6)	4,222 (45.1)	<0.01	1.3 (1.2–1.3)	1.3 (1.2–1.4)
Intimate partner problem	5,098 (27.2)	2,270 (24.1)	2,828 (30.2)	<0.01	1.4 (1.3–1.5)	1.4 (1.3–1.5)
Perpetrator of interpersonal violence in past month	414 (2.2)	131 (1.4)	283 (3.0)	<0.01	2.2 (1.8–2.7)	2.0 (1.6–2.4)
Victim of interpersonal violence in past month	84 (0.4)	53 (0.6)	31 (0.3)	<0.05	0.6 (0.4–0.9)	0.8 (0.5–1.2)
Family relationship problem	1,671 (8.9)	873 (9.3)	798 (8.5)	—††	0.9 (0.8–1.0)	1.0 (0.9–1.1)
Other relationship problem (nonintimate)	403 (2.1)	202 (2.1)	201 (2.1)	—††	1.0 (0.8–1.2)	1.1 (0.9–1.3)
Argument or conflict (not specified)	2,914 (15.5)	1,278 (13.6)	1,636 (17.5)	<0.01	1.3 (1.2–1.5)	1.4 (1.3–1.5)
Death of a loved one (any)	1,497 (8.0)	826 (8.8)	671 (7.2)	<0.01	0.8 (0.7–0.9)	0.9 (0.8–0.9)
Nonsuicide death	1,181 (6.3)	647 (6.9)	534 (5.7)	<0.01	0.8 (0.7–0.9)	0.9 (0.8–1.0)
Suicide of family or friend	379 (2.0)	217 (2.3)	162 (1.7)	<0.01	0.7 (0.6–0.9)	0.8 (0.7–1.0)
<b>Other life stressors</b>						
Any life stressor	9,743 (51.9)	4,675 (49.7)	5,068 (54.2)	<0.01	1.2 (1.1–1.3)	1.1 (1.1–1.2)
Recent criminal legal problem	1,588 (8.5)	586 (6.2)	1,002 (10.7)	<0.01	1.8 (1.6–2.0)	1.7 (1.5–1.9)
Other legal problem	748 (4.0)	378 (4.0)	370 (4.0)	—††	1.0 (0.8–1.1)	1.0 (0.9–1.2)
Physical health problem	4,179 (22.3)	2,012 (21.4)	2,167 (23.2)	<0.01	1.1 (1.0–1.2)	1.0 (1.0–1.1)
Job/Financial problem <sup>§§</sup>	2941 (16.2)	1530 (16.8)	1411 (15.6)	<0.05	0.9 (0.8–1.0)	0.9 (0.8–1.0)
Eviction or loss of home	722 (3.8)	317 (3.4)	405 (4.3)	<0.01	1.3 (1.1–1.5)	1.4 (1.2–1.6)
School problem <sup>¶¶</sup>	162 (19.9)	70 (17.8)	92 (21.9)	—††	1.3 (0.9–1.8)	1.3 (0.9–1.9)
Recent release from an institution <sup>***</sup>	1,412 (7.6)	941 (10.2)	471 (5.1)	<0.01	0.5 (0.4–0.5)	0.5 (0.4–0.5)
Jail/Prison/Detention facility	203 (14.4)	82 (8.7)	121 (25.7)	<0.01	3.6 (2.7–4.9)	4.5 (3.2–6.4)
Hospital	517 (36.6)	311 (33.0)	206 (43.7)	<0.01	1.6 (1.3–2.0)	1.3 (1.0–1.7)
Psychiatric hospital/institution	469 (33.2)	439 (46.7)	30 (6.4)	<0.01	0.1 (0.1–0.1)	0.1 (0.1–0.1)
Other (includes alcohol/SA treatment facilities)	223 (15.8)	109 (11.6)	114 (24.2)	<0.01	2.4 (1.8–3.3)	2.5 (1.8–3.3)
<b>Recent or Impending Crisis</b>						
Crisis within past or upcoming 2 weeks <sup>†††</sup>	5,525 (29.4)	2,444 (26.0)	3,081 (32.9)	<0.01	1.4 (1.3–1.5)	1.4 (1.3–1.5)
Intimate partner problem crisis	1968 (35.6)	854 (34.9)	1114 (36.2)	—††	1.1 (0.9–1.2)	1.1 (0.9–1.2)
Physical health problem crisis	739 (13.4)	315 (12.9)	424 (13.8)	—††	1.1 (0.9–1.3)	1.0 (0.8–1.2)
Criminal legal problem crisis	621 (11.2)	203 (8.3)	418 (13.6)	<0.01	1.7 (1.5–2.1)	1.6 (1.3–1.9)
Family relationship problem crisis	430 (7.8)	212 (8.7)	218 (7.1)	<0.05	0.8 (0.7–1.0)	0.9 (0.7–1.1)
Job problem crisis	354 (6.4)	191 (7.8)	163 (5.3)	<0.01	0.7 (0.5–0.8)	0.7 (0.5–0.8)
<b>Suicide event/history</b>						
Left a note	6,468 (34.5)	3,182 (33.8)	3,286 (35.1)	—††	1.1 (1.0–1.1)	1.2 (1.1–1.2)
Disclosed suicide intent	4,405 (23.5)	2,306 (24.5)	2,099 (22.4)	<0.01	0.9 (0.8–1.0)	0.9 (0.8–0.9)
History of ideation	5,990 (31.9)	3,838 (40.8)	2,152 (23.0)	<0.01	0.4 (0.4–0.5)	0.4 (0.4–0.5)
History of attempts	3,732 (19.9)	2,770 (29.4)	962 (10.3)	<0.01	0.3 (0.3–0.3)	0.3 (0.3–0.3)

**Abbreviations:** ADD/ADHD = attention deficit disorder/attention deficit hyperactivity disorder; OR = odds ratio; PTSD = posttraumatic stress disorder; SA = substance abuse.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

† Decedent had been identified as having a current diagnosis of mental health condition in coroner/medical examiner or law enforcement reports.

§ OR reflects the risk among those without known mental health condition relative to those with known mental health condition.

¶ Logistic regression was used to estimate adjusted OR with 95% CIs after controlling for age, sex, race, and ethnicity. Known mental health condition was the reference group.

\*\* Includes decedents with one or more diagnosed current mental health conditions, which are not mutually exclusive. Therefore, sums of percentages for the diagnosed conditions exceed 100%. Denominator includes the number of decedents with one or more current diagnosed mental health conditions.

†† Not significant.

§§ Denominator is decedents aged ≥18 years.

¶¶ Denominator is decedents aged 10–18 years.

\*\*\* Denominator of institution subgroup is decedents with recent release from an institution. Recent release from an institution is defined as having occurred within the past month.

††† Denominator of crisis subgroup is decedents with any crisis within past or upcoming 2 weeks. Crises depicted here represent the most commonly occurring categories.

**FIGURE. Percentage change in annual suicide rate,\* by state — United States, from 1999–2001 to 2014–2016<Fig\_Small></Fig\_Small>**

The figure above is a map of the United States showing the percentage change in annual suicide rate, by state, from 1999 to 2016.

\* Per 100,000 population, age-adjusted to the 2000 U.S. standard population.



# Vital Signs: Trends in State Suicide Rates — United States, 1999–2016 and Circumstances Contributing to Suicide — 27 States, 2015

Deborah M. Stone, ScD<sup>1</sup>; Thomas R. Simon PhD<sup>1</sup>; Katherine A. Fowler, PhD<sup>1</sup>; Scott R. Kegler, PhD<sup>2</sup>; Keming Yuan, MS<sup>1</sup>; Kristin M. Holland, PhD<sup>1</sup>; Asha Z. Ivey-Stephenson, PhD<sup>1</sup>; Alex E. Crosby, MD<sup>1</sup>

## Abstract

**Introduction:** Suicide rates in the United States have risen nearly 30% since 1999, and mental health conditions are just one factor contributing to suicide. Examining state-level trends in suicide and the multiple circumstances contributing to it can inform comprehensive state suicide prevention planning.

**Methods:** Trends in age-adjusted suicide rates among persons aged  $\geq 10$  years, by state and sex, across six consecutive 3-year periods (1999–2016), were assessed using data from the National Vital Statistics System for 50 states and the District of Columbia (DC). Data from the National Violent Death Reporting System, covering 27 states in 2015, were used to examine contributing circumstances among decedents with and without known mental health conditions.

**Results:** During 1999–2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases  $>30\%$ . Rates increased significantly among males and females in 34 and 43 states, respectively. In 2015, 54% of decedents in 27 states did not have a known mental health condition. Among decedents with available information, several circumstances were significantly more likely among those without a known mental health condition than among those with mental health condition, including relationship problems/loss (45.1% versus 39.6%), life stressors (54.2% versus 49.7%), and recent/impending crises (32.9% versus 26.0%), but these circumstances were common across groups.

**Conclusions:** Suicide rates increased significantly across most states during 1999–2016. Various circumstances contributed to suicides among persons with and without known mental health conditions.

**Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach to prevent suicide risk before it occurs, identify and support persons at risk, prevent reattempts, and help friends and family in the aftermath of a suicide.

## Introduction

In 2016, nearly 45,000 suicides (15.6/100,000 population [age-adjusted]) occurred in the United States among persons aged  $\geq 10$  years (*1*). From 1999 to 2015, suicide rates increased among both sexes, all racial/ethnic groups, and all urbanization levels (*2,3*). Suicide is the 10th leading cause of death and is one of just three leading causes that are increasing (*1,4*). In addition, rates of emergency department visits for nonfatal self-harm, a main risk factor for suicide, increased 42% from 2001 to 2016 (*1*). Together, suicides and self-harm injuries cost the nation approximately \$69 billion in direct medical and work loss costs (*1*).

The National Strategy for Suicide Prevention (NSSP) (*5*) calls for a public health approach to suicide prevention with efforts spanning multiple levels (i.e., individual, family/relationship, community, and societal). Such a comprehensive approach underscores that suicide is rarely caused by any single factor, but rather, is determined by multiple factors. Despite NSSP guidance, suicide prevention largely focuses on identifying suicidal persons, providing treatment for mental health conditions, and preventing reattempts (*6*). In addition to mental health conditions and prior suicide attempts, other contributing circumstances include social and economic problems, access to lethal means (e.g., substances, firearms) among persons at risk, and poor coping and problem-solving skills (*5*). Expanded awareness of these additional



circumstances contributing to suicide risk and action to address them can help reach the national goal established by the American Foundation for Suicide Prevention and the National Action Alliance of Suicide Prevention of reducing suicide rates by 20% by 2025 (7). To assist states in achieving this goal, CDC analyzed state-specific trends in suicide rates and assessed the multiple contributing factors to suicide; this report presents options for multilevel comprehensive suicide prevention based on the best available evidence.

## Methods

Suicide rates were analyzed for persons aged  $\geq 10$  years only, as determining suicidal intent in younger children can be difficult (8). Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases, Tenth Revision*, underlying-cause-of-death codes X60–X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive 3-year aggregate periods spanning 1999–2016 (1999–2001; 2002–2004; 2005–2007; 2008–2010; 2011–2013; and 2014–2016). Rate estimates were age-adjusted to the U.S. 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same 3-year data aggregates, employing weighted least-squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes.

Characteristics of persons aged  $\geq 10$  years who died by suicide, with and without known mental health conditions, and the circumstances surrounding the suicides were compared in the 27 states\* with complete data participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines mental health conditions as disorders and syndromes listed in the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (9), with the exception of alcohol and other substance use disorders, which are captured separately in NVDRS. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known mental health conditions were compared using Chi-square tests. Logistic regression analyses estimated adjusted odds ratios (aORs) with 95% confidence intervals (CIs), controlling for age group, sex, and race/ethnicity.

## Results

The most recent overall suicide rates (representing 2014–2016) varied fourfold, from 6.9 (DC) to 29.2 (Montana) per 100,000 persons per year (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>). Across the study period, rates increased in all states except Nevada (where the rate was consistently high throughout the study period), with absolute increases ranging from 0.8 per 100,000 (Delaware) to 8.1 (Wyoming). Percentage increases in rates ranged from 5.9% (Delaware) to 57.6% (North Dakota), with increases  $>30\%$  observed in 25 states (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>) (Figure).

Modeled suicide rate trends indicated significant increases in 44 states, among males (34 states) and females (43 states), as well as for the United States overall (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>). Nationally, the model-estimated average annual percentage change for the overall suicide rate was an increase of 1.5%. By sex, estimated national rate trends further indicated significant average annual percentage change increases for males (1.1%) and females (2.6%) (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>).

Suicide decedents without known mental health conditions (11,039) were compared with those with known mental health conditions (9,407) in 27 states. Whereas all decedents were predominately male (76.8%) (Table 1) and non-Hispanic white (83.6%), those without known mental health conditions, relative



to those with mental health conditions, were more likely to be male (83.6% versus 68.8%; odds ratio (OR) = 2.3, 95% CI = 2.2–2.5) and belong to a racial/ethnic minority (OR range = 1.2–2.0). Suicide decedents without known mental health conditions also had significantly higher odds of perpetrating homicide-suicide (aOR = 2.9, 95% CI = 2.2–3.8). Among adult decedents aged  $\geq 18$  years, 20.1% of those without known mental health conditions and 15.3% of those with mental health conditions had ever served in the U.S. military or were serving at the time of death.

Whereas firearms were the most common method of suicide overall (48.5%) and among decedents with and without mental health conditions, decedents without known mental health conditions, relative to those with known mental health conditions, were more likely to die by firearm (55.3% versus 40.6%) and less likely to die by hanging/strangulation/suffocation (26.9% versus 31.3%) or poisoning (10.4% versus 19.8%). These differences remained significant in the adjusted models.

Toxicology testing was less likely to be performed for decedents without known mental health conditions. Among those with toxicology results, decedents without known mental health conditions were less likely to test positive for any substance overall (aOR = 0.8, 95% CI = 0.7–0.8), including opioids (aOR = 0.90, 95% CI = 0.81–0.99), but were more likely to test positive for alcohol (aOR = 1.2, 95% CI = 1.1–1.3).

Information on circumstances surrounding suicide were available for all decedents with mental health conditions ( $n = 9,407$ ) and approximately 85% of those without known mental health conditions ( $n = 9,357$ ) in 27 states (Table 2). Persons without known mental health conditions were less likely to have any substance use disorders (aOR = 0.7, 95% CI = 0.7–0.8) than were persons with known mental health conditions. Whereas two thirds of decedents with known mental health conditions had a history of mental health or substance use treatment (67.2%), just over half (54.0%) were in treatment at the time of death.

Decedents without known mental health conditions had a significantly higher likelihood of any relationship problem/loss (45.1%) than did those with known mental health conditions (39.6%), specifically intimate partner problems (30.2% versus 24.1%), arguments/conflicts (17.5% versus 13.6%), and recently perpetrating interpersonal violence (3.0% versus 1.4%). Decedents without known mental health conditions were also more likely than were those with known mental health conditions to have experienced any life stressors (54.2% versus 49.7%) such as criminal/legal problems (10.7% versus 6.2%) or eviction/loss of home (4.3% versus 3.4%) and were more likely to have had a recent or impending (within the preceding or upcoming 2 weeks, respectively) crisis (a current or acute event thought to contribute to the suicide) (32.9% versus 26.0%). All of these differences remained significant in the adjusted models. Among all persons with recent crises, intimate partner problems were the most common types and did not differ by group. Similarly, physical health problems and job/financial problems were commonly experienced among both persons without mental health conditions (23.2% and 15.6%, respectively) and those with mental health conditions (21.4% and 16.8%, respectively).

Decedents without known mental health conditions had significantly lower odds of recent release from any institution (aOR = 0.5, 95% CI = 0.4–0.5), but those who were recently released (5.1%), were significantly more likely to have been released from a correctional facility (25.7% versus 8.7%), hospital (43.7% versus 33.0%), or other facility (e.g., alcohol/substance treatment) (aOR = 2.5 95% CI = 1.8–3.3), than were those with a known mental health condition. Among decedents with known mental health conditions who were recently released from an institution (10.2%), 46.7% were released from psychiatric facilities.

Decedents without known mental health conditions were significantly less likely to have a history of suicidal ideation (23.0%) or prior suicide attempts (10.3%) compared with those with known mental health conditions (40.8% and 29.4%, respectively). Suicide intent was disclosed by 22.4% and 24.5% of persons without and with known mental health conditions, respectively.

## Conclusions and Comments

During 1999–2016, suicide rates increased significantly in 44 states, and 25 states experienced increases >30%. Rates increased significantly among males in 34 states, and females in 43 states. This finding is consistent with prior research that indicated a decreasing gender gap in male-female suicide rates during 1999–2014 (3). Additional research into the specific causes of these trends is needed. Data from the 27 states participating in NVDRS provide important insight into circumstances surrounding suicide and can help states identify prevention priorities.

Suicidologists regularly state that suicide is not caused by a single factor (5); however, suicide prevention is often oriented toward downstream identification of suicidal persons, treatment of mental health conditions, and prevention of reattempts. This study found that approximately half of suicide decedents in NVDRS did not have a known mental health condition, indicating that additional focus on nonmental health factors further upstream could provide important information for a public health approach (10). Those without a known mental health condition suffered more from relationship problems and other life stressors such as criminal/legal matters, eviction/loss of home, and recent or impending crises.

Similarly, persons with mental health conditions often experienced relationship problems and other life stressors such as job/financial or physical health problems. These findings point to the need to help persons both manage and prevent the conditions associated with mental health conditions in the first place, and to support persons with known mental health conditions to decrease their risk for poor outcomes (11). Two thirds of suicide decedents with mental health conditions had a history of treatment for any mental health or substance use or both, with approximately half in treatment when they died. This finding suggests the need for additional safety supports, including broader implementation of affordable and effective treatment modalities, such as doctor-patient collaborative care models and proven cognitive-behavioral therapies. In addition, increased access to behavioral health providers in underserved areas is needed, as is expansion of health care systems that integrate physical and behavioral health, with a priority on suicide prevention and patient safety, especially through care transitions (12).

Comprehensive statewide suicide prevention activities are needed to address the full range of factors contributing to suicide. Prevention strategies include strengthening economic supports (e.g., housing stabilization policies, household financial support); teaching coping and problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in life; promoting social connectedness to increase a sense of belonging and access to informational, tangible, emotional, and social support; and identifying and better supporting persons at risk (e.g., military veterans, persons with physical/mental health conditions) (12). Other strategies include creating protective environments (e.g., reducing access to lethal means among persons at risk of suicide, creating organizational and workplace policies to promote help-seeking, easing transitions into and out of work for persons with mental health conditions and other life challenges), supporting family and friends after a suicide, and assuring the media follow safe reporting guidelines (12). Some states, such as Colorado, are planning to implement such a comprehensive approach to suicide prevention (10).

The findings in this report are subject to at least three limitations. First, in the state-level analysis, rankings for four states (Maryland, Massachusetts, Rhode Island, and Utah) might have been affected by large proportions of injury deaths of undetermined intent (potentially biasing reported suicide rates downward) or decreased percentages of such deaths over time (potentially biasing estimated rate trends upward). Second, NVDRS is not yet nationally representative; the 27 states included represent 49.6% of the population (<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml>). Finally, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the extent of informant knowledge can affect data completeness and accuracy. Studies that include more in-depth interviews with next-of-kin often identify greater attributions to mental disorders (13); however, many methodological variations across studies exist (14). It is likely that some persons without known



mental health conditions in the current study were experiencing mental health challenges that were unknown, and hence underreported by key informants. Nonetheless, the high prevalence of diverse contributing circumstances among those with and without known mental health conditions suggests the importance of addressing the broad range of factors that contribute to suicide.

Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are available. States and communities can use data from NVDRS and resources such as CDC's Preventing Suicide: a Technical Package of Policies, Programs, and Practices (12) to better understand suicide in their populations, prioritize evidence-based comprehensive suicide prevention, and save lives.

#### Acknowledgments

Robert Anderson, Holly Hedegaard, Margaret Warner, Division of Vital Statistics, National Center for Health Statistics, CDC.

#### Conflict of Interest

No conflicts of interest were reported.

<sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis, Research, and Practice Integration, National Center for Injury Prevention and Control, CDC.

**Corresponding author:** Deborah M. Stone, dstone3@cdc.gov, 770-488-3942.

#### References

1. CDC. Web-based Injury Statistics Query and Reporting System (WISQARS). Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018. In.
2. Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide trends among and within urbanization levels by sex, race/ethnicity, age group, and mechanism of death—United States, 2001–2015. *MMWR Surveill Summ* 2017;66(No. SS-18).
3. Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999–2014. NCHS data brief no 241. Hyattsville, MD: US Department of Health and Human Services, CDC, National Center for Health Statistics; 2016. <https://www.cdc.gov/nchs/data/databriefs/db241.pdf>
4. Kochanek K, Murphy S, Xu J, Arias E. Mortality in the United States, 2016. NCHS data brief no 293. Hyattsville, MD: US Department of Health and Human Services, CDC, National Center for Health Statistics; 2017. <https://www.cdc.gov/nchs/data/databriefs/db293.pdf>
5. Office of the Surgeon General; National Action Alliance for Suicide Prevention. 2012 national strategy for suicide prevention: goals and objectives for action. Washington, DC: US Department of Health and Human Services, Office of the Surgeon General; 2012. <https://www.surgeongeneral.gov/library/reports/national-strategy-suicide-prevention/full-report.pdf>
6. Zalsman G, Hawton K, Wasserman D, et al. Suicide prevention strategies revisited: 10-year systematic review. *Lancet Psychiatry* 2016;3:646–59.
7. Torguson K, O'Brien A. Leading suicide prevention efforts unite to address rising national suicide rate. Washington, DC: American Foundation for Suicide Prevention; 2017. <https://afsp.org/leading-suicide-prevention-efforts-unite-address-rising-national-suicide-rate/>
8. Crepeau-Hobson F. The psychological autopsy and determination of child suicides: a survey of medical examiners. *Arch Suicide Res* 2010;14:24–34.
9. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5). Washington, DC: American Psychiatric Association; 2013.

10. Caine ED, Reed J, Hindman J, Quinlan K. Comprehensive, integrated approaches to suicide prevention: practical guidance. *Inj Prev* 2017. Epub December 20, 2017.
11. World Health Organization. Risks to mental health: an overview of vulnerabilities and risk factors. Geneva, Switzerland: World Health Organization; 2012.
12. Stone DM, Holland KM, Bartholow BN, Crosby AE, Davis SP, Wilkins N. Preventing suicide: a technical package of policies, programs, and practice. Atlanta, GA: US Department of Health and Human Services, CDC; 2017.  
<https://www.cdc.gov/violenceprevention/pdf/suicidetechnicalpackage.pdf>
13. Milner A, Svetcic J, De Leo D. Suicide in the absence of mental disorder? A review of psychological autopsy studies across countries. *Int J Soc Psychiatry* 2013;59:545–54.
14. Pouliot L, De Leo D. Critical issues in psychological autopsy studies. *Suicide Life Threat Behav* 2006;36:491–510.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

## Summary

### What is already known about this topic?

In 2016, nearly 45,000 people died by suicide in the United States. Mental health conditions can contribute to suicide.

### What is added by this report?

During 1999–2016, suicide rates increased in nearly every state, including >30% increases in 25 states. 2015 data from 27 states indicate 54% of suicide decedents were not known to have mental health conditions. Other contributors included relationship, substance use, health, and job/financial problems, among others.

### What are the implications for public health practice?

A comprehensive approach using proven prevention strategies, such as those in CDC's Technical Package for Suicide Prevention, can help reach the national goal of reducing the annual suicide rate 20% by 2025.



**TABLE 1. Selected demographic and descriptive characteristics of suicides among persons aged ≥10 years with and without known mental health conditions — National Violent Death Reporting System, 27 states,\* 2015**

Characteristic	Total (N = 20,446)	Known mental health condition† (n = 9,407)	No known mental health condition (n = 11,039)	P-value	OR‡ (95% CI)	Adjusted OR† (95% CI)
<b>Sex</b>						
Male	15,702 (76.8)	6,469 (68.8)	9,233 (83.6)	0.01	2.3 (2.2–2.5)	—
Female	4,744 (23.2)	2,938 (31.2)	1,806 (16.4)	0.01	0.4 (0.4–0.5)	—
<b>Age (yrs)**</b>						
10–24	2,804 (13.7)	1,211 (12.9)	1,593 (14.4)	0.01	1.1 (1.1–1.2)	—
25–44	6,456 (31.6)	3,036 (32.3)	3,420 (31.0)	0.05	0.9 (0.9–1.0)	—
45–64	7,718 (37.7)	3,820 (40.6)	3,898 (35.3)	0.01	0.8 (0.8–0.8)	—
≥65	3,468 (17.0)	1,340 (14.2)	2,128 (19.3)	0.01	1.4 (1.3–1.5)	—
<b>Race/Ethnicity</b>						
White, non-Hispanic	17,102 (83.6)	8,165 (86.8)	8,937 (81.0)	0.01	0.6 (0.6–0.7)	—
Black, non-Hispanic	1,228 (6.0)	411 (4.4)	817 (7.4)	0.01	1.7 (1.5–2.0)	—
American Indian/Alaska Native, non-Hispanic	378 (1.8)	112 (1.2)	266 (2.4)	0.01	2.0 (1.6–2.6)	—
Asian, non-Hispanic	576 (2.8)	235 (2.5)	341 (3.1)	0.05	1.2 (1.1–1.5)	—
Hispanic	1,096 (5.4)	463 (4.9)	633 (5.7)	0.05	1.2 (1.0–1.3)	—
Other	66 (0.3)	21 (0.2)	45 (0.4)	0.05	1.8 (1.1–3.1)	—
<b>Extended demographics</b>						
Ever served in military††	3,429 (17.8)	1,354 (15.3)	2,075 (20.1)	0.01	1.4 (1.3–1.5)	1.1 (1.0–1.1)
Homeless	240 (1.2)	104 (1.1)	136 (1.3)		1.1 (0.9–1.5)	1.2 (0.9–1.5)
<b>Incident Type</b>						
Single suicide	20,063 (98.2)	9,318 (99.1)	10,745 (97.4)	0.01	0.3 (0.3–0.4)	0.4 (0.3–0.5)
Homicide followed by suicide	319 (1.6)	64 (0.7)	255 (2.3)	0.01	3.5 (2.6–4.5)	2.9 (2.2–3.8)
Multiple suicides	64 (0.3)	25 (0.3)	39 (0.4)	—	1.3 (0.8–2.2)	1.6 (0.9–2.6)
<b>Method</b>						
Firearm	9,909 (48.5)	3,821 (40.6)	6,088 (55.3)	0.01	1.8 (1.7–1.9)	1.6 (1.5–1.7)
Hanging/Strangulation/Suffocation	5,907 (28.9)	2,940 (31.3)	2,967 (26.9)	0.01	0.8 (0.8–0.9)	0.8 (0.7–0.8)
Poisoning	3,003 (14.7)	1,861 (19.8)	1,142 (10.4)	0.01	0.5 (0.4–0.5)	0.6 (0.6–0.7)
<b>Substance class causing death§§</b>						
Other (e.g., over-the-counter)	1,021 (34.0)	666 (35.8)	355 (31.1)	0.01	0.8 (0.7–0.9)	0.9 (0.7–1.0)
Opioids	944 (31.4)	608 (32.7)	336 (29.4)	—	0.9 (0.7–1.0)	0.9 (0.8–1.1)
Antidepressants	800 (26.6)	644 (34.6)	156 (13.7)	0.01	0.3 (0.2–0.4)	0.3 (0.3–0.4)
Benzodiazepines	624 (20.8)	468 (25.1)	156 (13.7)	0.01	0.5 (0.4–0.6)	0.5 (0.4–0.6)
Antipsychotics	219 (7.3)	195 (10.5)	24 (2.1)	0.01	0.2 (0.1–0.3)	0.2 (0.1–0.3)
Other	1,595 (7.8)	780 (8.3)	815 (7.4)	0.05	0.9 (0.8–1.0)	0.9 (0.8–1.0)
<b>Toxicology Results</b>						
Any toxicology testing	13,317 (65.1)	6,658 (70.8)	6,659 (60.3)	0.01	0.6 (0.6–0.7)	0.7 (0.6–0.7)
Positive for ≥1 substance¶¶	9,913 (74.4)	5,192 (78.0)	4,721 (70.9)	0.01	0.7 (0.6–0.7)	0.8 (0.7–0.8)
<b>Substance detected***</b>						
<b>Alcohol</b>						
Tested	10,950 (53.6)	5,409 (57.5)	5,541 (50.2)	0.01	0.7 (0.7–0.8)	0.8 (0.7–0.8)
Positive	4,442 (40.6)	2,115 (39.1)	2,327 (42.0)	0.01	1.1 (1.0–1.2)	1.2 (1.1–1.3)
<b>Opioids</b>						
Tested	8,554 (41.8)	4,258 (45.3)	4,296 (38.9)	0.01	0.8 (0.7–0.8)	0.8 (0.8–0.9)

Positive	2,279 (26.6)	1,238 (29.1)	1,041 (24.2)	0.01	0.8 (0.7–0.9)	0.9 (0.8–1.0)
Benzodiazepines						
Tested	8,124 (39.7)	4,226 (44.9)	3,898 (35.3)	0.01	0.7 (0.6–0.7)	0.7 (0.7–0.8)
Positive	2,464 (30.3)	1,639 (38.8)	825 (21.2)	0.01	0.4 (0.4–0.5)	0.5 (0.5–0.6)
Cocaine						
Tested	7,978 (39.0)	3,866 (41.1)	4,112 (37.2)	0.01	0.9 (0.8–0.9)	0.9 (0.9–1.0)
Positive	499 (6.3)	216 (5.6)	283 (6.9)	0.05	1.2 (1.0–1.5)	1.2 (1.0–1.5)
Amphetamines						
Tested	7,615 (37.2)	3,696 (39.3)	3,919 (35.5)	0.01	0.9 (0.8–0.9)	0.9 (0.8–0.9)
Positive	736 (9.7)	376 (10.2)	360 (9.2)	— <sup>†††</sup>	0.9 (0.8–1.0)	1.0 (0.8–1.1)
Marijuana						
Tested	6,569 (32.1)	3,127 (33.2)	3,442 (31.2)	0.01	0.9 (0.9–1.0)	0.9 (0.9–1.0)
Positive	1,471 (22.4)	710 (22.7)	761 (22.1)	— <sup>†††</sup>	1.0 (0.9–1.1)	0.9 (0.8–1.0)
Antidepressants						
Tested	5,425 (26.5)	3,103 (33.0)	2,322 (21.0)	0.01	0.5 (0.5–0.6)	0.6 (0.6–0.7)
Positive	2,214 (40.8)	1,735 (55.9)	479 (20.6)	0.01	0.2 (0.2–0.2)	0.2 (0.2–0.3)

**Abbreviation:** CI = confidence interval; OR = odds ratio.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

† Decedent had been identified as having a current diagnosis of mental health condition in coroner/medical examiner or law enforcement reports.

§ OR reflects the risk among those without known mental health condition relative to those with known mental health condition.

¶ Logistic regression was used to estimate adjusted OR with 95% CIs after controlling for age, sex, race, and ethnicity. Known mental health condition was used as the reference group.

\*\* Decedents were aged ≥10 years, as per standard in the suicide prevention literature.

†† Denominator is decedents aged ≥18 years with reported military service status.

§§ Denominator is decedents who died by poisoning, including overdose.

¶¶ Denominator is decedents with any toxicology tested.

\*\*\* Denominator for each positive group is the number tested for the substance in that group.

††† Not significant.

**TABLE 2. Circumstances preceding suicide among decedents aged ≥10 years with and without known mental health conditions — National Violent Death Reporting System, 27 states,\* 2015**

Characteristic	Total	Known mental health condition <sup>†</sup> no. (%)	No known mental health condition no. (%)	P-value	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>¶</sup> (95% CI)
<b>Suicide with known circumstances</b>	18,764 (91.8)	9,407 (100)	9,357 (84.8)	<0.01	—	—
<b>Mental health</b>						
<b>Any Current Diagnosed Mental Health Condition**</b>						
Depression/Dysthymia		7,076 (75.2)	—	—	—	—
Anxiety disorder		1,579 (16.8)	—	—	—	—
Bipolar disorder		1,431 (15.2)	—	—	—	—
Schizophrenia		509 (5.4)	—	—	—	—
PTSD		424 (4.5)	—	—	—	—



ADD/ADHD		226 (2.4)	—	—	—	—
Unknown		760 (8.1)	—	—	—	—
Current depressed mood		3,962 (42.1)	3,076 (32.9)	<0.01	0.7 (0.6–0.7)	0.7 (0.6–0.7)
<b>Substance problems</b>						
Any Current substance problem	5,319 (28.3)	2,976 (31.6)	2,343 (25.0)	<0.01	0.7 (0.7–0.8)	0.7 (0.7–0.8)
Alcohol problem	3,268 (17.4)	1,862 (19.8)	1,406 (15.0)	<0.01	0.7 (0.7–0.8)	0.7 (0.7–0.8)
Other substance problem	3,084 (16.4)	1,768 (18.8)	1,316 (14.1)	<0.01	0.7 (0.7–0.8)	0.7 (0.7–0.8)
<b>Treatment</b>						
Current mental health/substance abuse treatment	5,141 (27.4)	5,077 (54.0)	64 (0.7)	<0.01	0.01 (0.01–0.01)	0.01 (0.01–0.01)
Ever treated for mental health/substance problem	6,717 (35.8)	6,323 (67.2)	394 (4.2)	<0.01	0.02 (0.02–0.02)	0.02 (0.02–0.03)
<b>Relationship problems/loss</b>						
Any relationship problem/loss	7,948 (42.4)	3,726 (39.6)	4,222 (45.1)	<0.01	1.3 (1.2–1.3)	1.3 (1.2–1.4)
Intimate partner problem	5,098 (27.2)	2,270 (24.1)	2,828 (30.2)	<0.01	1.4 (1.3–1.5)	1.4 (1.3–1.5)
Perpetrator of interpersonal violence in past month	414 (2.2)	131 (1.4)	283 (3.0)	<0.01	2.2 (1.8–2.7)	2.0 (1.6–2.4)
Victim of interpersonal violence in past month	84 (0.4)	53 (0.6)	31 (0.3)	<0.05	0.6 (0.4–0.9)	0.8 (0.5–1.2)
Family relationship problem	1,671 (8.9)	873 (9.3)	798 (8.5)	—††	0.9 (0.8–1.0)	1.0 (0.9–1.1)
Other relationship problem (nonintimate)	403 (2.1)	202 (2.1)	201 (2.1)	—††	1.0 (0.8–1.2)	1.1 (0.9–1.3)
Argument or conflict (not specified)	2,914 (15.5)	1,278 (13.6)	1,636 (17.5)	<0.01	1.3 (1.2–1.5)	1.4 (1.3–1.5)
Death of a loved one (any)	1,497 (8.0)	826 (8.8)	671 (7.2)	<0.01	0.8 (0.7–0.9)	0.9 (0.8–0.9)
Nonsuicide death	1,181 (6.3)	647 (6.9)	534 (5.7)	<0.01	0.8 (0.7–0.9)	0.9 (0.8–1.0)
Suicide of family or friend	379 (2.0)	217 (2.3)	162 (1.7)	<0.01	0.7 (0.6–0.9)	0.8 (0.7–1.0)
<b>Other life stressors</b>						
Any life stressor	9,743 (51.9)	4,675 (49.7)	5,068 (54.2)	<0.01	1.2 (1.1–1.3)	1.1 (1.1–1.2)
Recent criminal legal problem	1,588 (8.5)	586 (6.2)	1,002 (10.7)	<0.01	1.8 (1.6–2.0)	1.7 (1.5–1.9)
Other legal problem	748 (4.0)	378 (4.0)	370 (4.0)	—††	1.0 (0.8–1.1)	1.0 (0.9–1.2)
Physical health problem	4,179 (22.3)	2,012 (21.4)	2,167 (23.2)	<0.01	1.1 (1.0–1.2)	1.0 (1.0–1.1)
Job/Financial problem <sup>§§</sup>	2941 (16.2)	1530 (16.8)	1411 (15.6)	<0.05	0.9 (0.8–1.0)	0.9 (0.8–1.0)
Eviction or loss of home	722 (3.8)	317 (3.4)	405 (4.3)	<0.01	1.3 (1.1–1.5)	1.4 (1.2–1.6)
School problem <sup>¶¶</sup>	162 (19.9)	70 (17.8)	92 (21.9)	—††	1.3 (0.9–1.8)	1.3 (0.9–1.9)
Recent release from an institution <sup>***</sup>	1,412 (7.6)	941 (10.2)	471 (5.1)	<0.01	0.5 (0.4–0.5)	0.5 (0.4–0.5)
Jail/Prison/Detention facility	203 (14.4)	82 (8.7)	121 (25.7)	<0.01	3.6 (2.7–4.9)	4.5 (3.2–6.4)
Hospital	517 (36.6)	311 (33.0)	206 (43.7)	<0.01	1.6 (1.3–2.0)	1.3 (1.0–1.7)
Psychiatric hospital/institution	469 (33.2)	439 (46.7)	30 (6.4)	<0.01	0.1 (0.1–0.1)	0.1 (0.1–0.1)
Other (includes alcohol/SA treatment facilities)	223 (15.8)	109 (11.6)	114 (24.2)	<0.01	2.4 (1.8–3.3)	2.5 (1.8–3.3)
<b>Recent or Impending Crisis</b>						
Crisis within past or upcoming 2 weeks <sup>†††</sup>	5,525 (29.4)	2,444 (26.0)	3,081 (32.9)	<0.01	1.4 (1.3–1.5)	1.4 (1.3–1.5)
Intimate partner problem crisis	1968 (35.6)	854 (34.9)	1114 (36.2)	—††	1.1 (0.9–1.2)	1.1 (0.9–1.2)
Physical health problem crisis	739 (13.4)	315 (12.9)	424 (13.8)	—††	1.1 (0.9–1.3)	1.0 (0.8–1.2)
Criminal legal problem crisis	621 (11.2)	203 (8.3)	418 (13.6)	<0.01	1.7 (1.5–2.1)	1.6 (1.3–1.9)
Family relationship problem crisis	430 (7.8)	212 (8.7)	218 (7.1)	<0.05	0.8 (0.7–1.0)	0.9 (0.7–1.1)
Job problem crisis	354 (6.4)	191 (7.8)	163 (5.3)	<0.01	0.7 (0.5–0.8)	0.7 (0.5–0.8)
<b>Suicide event/history</b>						
Left a note	6,468 (34.5)	3,182 (33.8)	3,286 (35.1)	—††	1.1 (1.0–1.1)	1.2 (1.1–1.2)
Disclosed suicide intent	4,405 (23.5)	2,306 (24.5)	2,099 (22.4)	<0.01	0.9 (0.8–1.0)	0.9 (0.8–0.9)
History of ideation	5,990 (31.9)	3,838 (40.8)	2,152 (23.0)	<0.01	0.4 (0.4–0.5)	0.4 (0.4–0.5)
History of attempts	3,732 (19.9)	2,770 (29.4)	962 (10.3)	<0.01	0.3 (0.3–0.3)	0.3 (0.3–0.3)

**Abbreviations:** ADD/ADHD = attention deficit disorder/attention deficit hyperactivity disorder; OR = odds ratio; PTSD = posttraumatic stress disorder; SA = substance abuse.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

† Decedent had been identified as having a current diagnosis of mental health condition in coroner/medical examiner or law enforcement reports.

§ OR reflects the risk among those without known mental health condition relative to those with known mental health condition.

¶ Logistic regression was used to estimate adjusted OR with 95% CIs after controlling for age, sex, race, and ethnicity. Known mental health condition was the reference group.

\*\* Includes decedents with one or more diagnosed current mental health conditions, which are not mutually exclusive. Therefore, sums of percentages for the diagnosed conditions exceed 100%. Denominator includes the number of decedents with one or more current diagnosed mental health conditions.

†† Not significant.

§§ Denominator is decedents aged ≥18 years.

¶¶ Denominator is decedents aged 10–18 years.

\*\*\* Denominator of institution subgroup is decedents with recent release from an institution. Recent release from an institution is defined as having occurred within the past month.

††† Denominator of crisis subgroup is decedents with any crisis within past or upcoming 2 weeks. Crises depicted here represent the most commonly occurring categories.

**FIGURE. Percentage change in annual suicide rate,\* by state — United States, from 1999–2001 to 2014–2016<Fig\_Small></Fig\_Small>**

The figure above is a map of the United States showing the percentage change in annual suicide rate, by state, from 1999 to 2016.

\* Per 100,000 population, age-adjusted to the 2000 U.S. standard population.



# Vital Signs: Trends in State Suicide Rates — United States, 1999–2016 and Circumstances Contributing to Suicide — 27 States, 2015

Deborah M. Stone, ScD<sup>1</sup>; Thomas R. Simon PhD<sup>1</sup>; Katherine A. Fowler, PhD<sup>1</sup>; Scott R. Kegler, PhD<sup>2</sup>; Keming Yuan, MS<sup>1</sup>; Kristin M. Holland, PhD<sup>1</sup>; Asha Z. Ivey-Stephenson, PhD<sup>1</sup>; Alex E. Crosby, MD<sup>1</sup>

## Abstract

**Introduction:** Suicide rates in the United States have risen nearly 30% since 1999, and mental health ~~conditions/problems~~ are just one factor contributing to suicide. Examining state-level trends in suicide and the multiple circumstances contributing to it can inform comprehensive state suicide prevention planning.

**Methods:** Trends in age-adjusted suicide rates among persons aged ≥10 years, by state and sex, across six consecutive 3-year periods (1999–2016), were assessed using data from the National Vital Statistics System for 50 states and the District of Columbia (DC). Data from the National Violent Death Reporting System, covering 27 states in 2015, were used to examine contributing circumstances among decedents with and without known mental health ~~conditions/problems~~.

**Results:** During 1999–2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases >30%. Rates increased significantly among males and females in 34 and 43 states, respectively. In 2015, a total of 54% of decedents in 27 states did not have a known mental health ~~condition/problem~~. Among decedents with ~~available information on circumstances available~~, several ~~possible contributing circumstances were common among all decedents~~. However, ~~three were~~ significantly more likely among those without a known mental health ~~condition/problems~~ than among those with mental health ~~condition/problems~~, including relationship ~~problems/loss~~ (45.1% versus 39.6%), life stressors (54.2% versus 49.7%), and recent/impending crises (32.9% versus 26.0%). ~~but these circumstances were common across groups~~.

**Conclusions:** Suicide rates increased significantly across most states during 1999–2016. Various circumstances contributed to suicides among persons with and without known mental health problems.

**Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach to prevent suicide risk before it occurs, identify and support persons at risk, prevent reattempts, and help friends and family in the aftermath of a suicide.

## Introduction

In 2016, nearly 45,000 suicides (15.6/100,000 population [age-adjusted]) occurred in the United States among persons aged ≥10 years (1). From 1999 to 2015, suicide rates increased among both sexes, all racial/ethnic groups, and all urbanization levels (2,3). Suicide is the 10th leading cause of death and is one of just three leading causes that are increasing (1,4). In addition, rates of emergency department visits for nonfatal self-harm, a ~~key-main~~ risk factor for suicide, increased 42% from 2001 to 2016 (1). Together, suicides and self-harm injuries cost the nation approximately \$69 billion in direct medical and work loss costs (1).

The National Strategy for Suicide Prevention (NSSP) (5) calls for a public health approach to suicide prevention with efforts spanning multiple levels (i.e., individual, family/relationship, community, and societal). Such a comprehensive approach underscores that suicide is rarely caused by any single factor, but rather, is determined by multiple factors. Despite NSSP guidance, suicide prevention largely focuses on identifying suicidal persons, providing treatment for mental health ~~conditions/problems~~, and preventing

**Comment [KC():** L1. Please replace "mental health problems" with "mental health conditions" throughout. By definition in methods, these are medical conditions. Calling them "problems" trivializes them and adds further stigma because a person should be able to cope with their problems in our culture. Most are conditions that can be medically treated.

Also, MMWR is the scientific basis for the fact sheet, and all but the summary box should be written in scientific fashion.

Happy to discuss with author. (b)(6)

(b)(6)

**Comment [HTM():** From Michael Iademarco:

L2. Stigmatizing language. I don't want to rock the boat so late in the process. Are these mental health "problems?" I want to be sure we are not using stigmatizing language. How about "conditions?" This occurs throughout the manuscript. In Methods, it seems the data source will support the use of the word conditions and diagnoses.

**Comment [KC():** Mental health condition different than relationship problem, even if both can be devastating.

**Comment [KC():** L3. Find confusing.

**Comment [KC():** Please go through rest of report and change.



re-attempts (6). In addition to mental health ~~conditions~~ **problems** and prior ~~suicide~~ attempts, other ~~contributing~~ circumstances ~~contributing to suicide~~ include social and economic problems, access to lethal means (e.g., substances, firearms) among persons at risk, and poor coping and problem-solving skills (5). Expanded awareness of these additional circumstances contributing to suicide risk and action to address them can help reach the national goal established by the American Foundation for Suicide Prevention and the National Action Alliance of Suicide Prevention of reducing suicide rates by 20% by 2025 (7). To assist states in achieving this goal, CDC analyzed state-specific trends in suicide rates and assessed the multiple contributing factors to suicide; this report presents options for multilevel comprehensive suicide prevention based on the best available evidence.

## Methods

Suicide rates were analyzed for persons aged  $\geq 10$  years only, as determining suicidal intent in younger children can be difficult (8). Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases, Tenth Revision*, underlying-cause-of-death codes X60–X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive 3-year aggregate periods spanning 1999–2016 (1999–2001; 2002–2004; 2005–2007; 2008–2010; 2011–2013; and 2014–2016). Rate estimates were age-adjusted to the U.S. 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same 3-year data aggregates, employing weighted least-squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (**AAPCs**).

Characteristics of persons aged  $\geq 10$  years who died by suicide, with and without known mental health problems, and the circumstances surrounding the suicides were compared in the 27 states\* with complete data participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines mental health problems as disorders and syndromes listed in the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (9), with the exception of alcohol and other substance use disorders, which are captured separately in NVDRS. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known mental health problems were compared using Chi-square tests. Logistic regression analyses estimated adjusted odds ratios (aORs) with 95% confidence intervals (CIs), controlling for age group, sex, and race/ethnicity.

## Results

The most recent overall suicide rates (representing 2014–2016) varied fourfold, from 6.9 (DC) to 29.2 (Montana) per 100,000 persons per year (**Supplementary Table**; <https://stacks.cdc.gov/view/cdc/53785>). Across the study period, rates increased in all states except Nevada (where the rate was consistently high throughout the study period), with absolute increases ranging from 0.8 per 100,000 (Delaware) to 8.1 (Wyoming). Percentage increases in rates ranged from 5.9% (Delaware) to 57.6% (North Dakota), with increases  $>30\%$  observed in 25 states (**Supplementary Table**; <https://stacks.cdc.gov/view/cdc/53785>) (**Figure 4**).

Modeled suicide rate trends indicated significant increases in 44 states, among males (34 states) and females (43 states), as well as for the United States overall (**Supplementary Table**; <https://stacks.cdc.gov/view/cdc/53785>). Nationally, the model-estimated AAPC for the overall suicide rate was an increase of 1.5%. By sex, estimated national rate trends further indicated significant AAPC increases for males (1.1%) and females (2.6%) (**Supplementary Table**; <https://stacks.cdc.gov/view/cdc/53785>).

**Comment [KC()]:** L3. Because used only 2 more times, suggest spell throughout.

**Comment [KC()]:** L3. To make it easier for reader, please define abbreviations for states in this table. Some people might not have all 50 abbreviations in their heads.



Suicide decedents without known mental health problems (11,039) were compared with those with known mental health problems (9,407) in 27 states. Whereas all decedents were predominately male (76.8%) (Table 1) and non-Hispanic white (83.6%), those without known mental health problems, relative to those with mental health problems, were more likely to be male (83.6% versus 68.8%; odds ratio (OR) = 2.3, 95% CI = 2.2–2.5) and belong to a racial/ethnic minority (OR range = 1.2–2.0). Suicide decedents without known mental health problems also had significantly higher odds of perpetrating homicide-suicide (aOR = 2.9, 95% CI = 2.2–3.8). Among adult decedents aged  $\geq 18$  years, 20.1% of those without known mental health problems and 15.3% of those with mental health problems had ever served in the U.S. military, or were currently serving at the time of death, in the U.S. military.

Whereas firearms were the most common method of suicide overall (48.5%) and among decedents with and without mental health problems, decedents without known mental health problems, relative to those with known mental health problems, were more likely to die by firearm (55.3% versus 40.6%) and less likely to die by hanging/strangulation/suffocation (26.9% versus 31.3%) or poisoning (10.4% versus 19.8%). These differences remained significant in the adjusted models.

Toxicology testing was less likely to be performed for Decedents without known mental health problems were less likely to receive toxicology testing. Among those with toxicology results, decedents without known mental health problems were less likely to test positive for any substance overall (aOR = 0.8, 95% CI = 0.7–0.8), including opioids (aOR = 0.90, 95% CI = 0.81–0.99), but were more likely to test positive for alcohol (aOR = 1.2, 95% CI = 1.1–1.3).

Information on circumstances surrounding suicide were available for all decedents with mental health problems (n = 9,407) and approximately 85% of those without known mental health problems (n = 9,357) in 27 states (Table 2). Persons without known mental health problems were less likely to have any substance use disorders (aOR = 0.7, 95% CI = 0.7–0.8) than were persons with known mental health problems. Whereas two thirds of decedents with known mental health problems had a history of mental health or substance use treatment (67.2%), just over half (54.0%) were in current treatment at the time of death.

Decedents without known mental health problems had a significantly higher likelihood of any relationship problem/loss (45.1%) than did those with known mental health problems (39.6%), specifically intimate partner problems (30.2% versus 24.1%), arguments/conflicts (17.5% versus 13.6%), and recently perpetrating interpersonal violence (3.0% versus 1.4%). Decedents without known mental health problems were also more likely than were those with known mental health problems to have experienced any life stressors (54.2% versus 49.7%) such as criminal/legal problems (10.7% versus 6.2%) or eviction/loss of home (4.3% versus 3.4%) and were more likely to have had a recent or impending (within the preceding or upcoming 2 weeks, respectively) crisis (a current or acute event thought to contribute to the suicide) (32.9% versus 26.0%). All of these differences remained significant in the adjusted models. Among all persons with recent crises, intimate partner problems were the most common types and did not differ by group. Similarly, physical health problems and job/financial problems were commonly experienced among both persons without mental health problems (23.2% and 15.6%, respectively) and those with mental health problems (21.4% and 16.8%, respectively).

Decedents without known mental health problems had significantly lower odds of recent release from any institution (aOR = 0.5, 95% CI = 0.4–0.5), but those who were recently released (5.1%), were significantly more likely to have been released from a correctional facility (25.7% versus 8.7%), hospital (43.7% versus 33.0%), or other facility (e.g., alcohol/substance treatment) (aOR = 2.5 95% CI = 1.8–3.3), than were those with a known mental health problem. Among decedents with known mental health problems who were recently released from an institution (10.2%), 46.7% were released from psychiatric facilities.

Decedents without known mental health problems were significantly less likely to have a history of suicidal ideation (23.0%) or prior suicide attempts (10.3%) compared with those with known mental health



problems (40.8% and 29.4%, respectively). Suicide intent was disclosed by 22.4% and 24.5% of persons without and with known mental health problems, respectively.

## Conclusions and Comments

During 1999–2016, suicide rates increased significantly in 44 states, and 25 states experienced increases >30%. Rates increased significantly among males in 34 states, and females in 43 states. This finding is consistent with prior research that indicated a decreasing gender gap in male-female suicide rates during 1999–2014 (3). Additional research into the specific causes of these trends is needed. Data from the 27 states participating in NVDRS provide important insight into circumstances surrounding suicide and can help states identify prevention priorities.

Suicidologists regularly state that suicide is not caused by a single factor (5); however, suicide prevention is often oriented toward downstream identification of suicidal persons, treatment of mental health problems, and prevention of reattempts. This study found that approximately half of suicide decedents in NVDRS did not have a known mental health problem, indicating that additional focus on nonmental health factors further upstream could provide important information for a public health approach (10). Those without a known mental health problem suffered more from relationship problems and other life stressors such as criminal/legal matters, eviction/loss of home, and recent or impending crises.

Similarly, persons with mental health problems often experienced relationship problems and other life stressors such as job/financial or physical health problems. These findings point to the need to help persons both manage and prevent the conditions associated with mental health conditions/problems in the first place, and to support persons with known mental health conditions/problems to decrease their risk for poor outcomes (11). Two thirds of suicide decedents in this group with mental health conditions/problems had a history of treatment for any mental health or substance use or both, with approximately half in treatment when they died. This finding suggests the need for additional safety supports, including broader implementation of affordable and effective treatment modalities, such as doctor-patient collaborative care models and proven cognitive-behavioral therapies. In addition, increased access to behavioral health providers in underserved areas is needed, as is expansion of health care systems that integrate physical and behavioral health, with a priority on suicide prevention and patient safety, especially through care transitions (12).

Comprehensive statewide suicide prevention activities are needed to address the full range of factors contributing to suicide. Prevention strategies include strengthening economic supports (e.g., housing stabilization policies, household financial support); teaching coping and problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in life; promoting social connectedness to increase a sense of belonging and access to informational, tangible, emotional, and social support; and identifying and better supporting persons at risk (e.g., military veterans, persons with physical/mental health problems) (12). Other strategies include creating protective environments (e.g., reducing access to lethal means among persons at risk, creating organizational and workplace policies to promote help-seeking, easing transitions into and out of work for persons with mental health problems and other life challenges), supporting family and friends after a suicide, and assuring the media follow safe reporting guidelines (12). Some states, such as Colorado, are planning to implement such a comprehensive approach to suicide prevention (10).

The findings in this report are subject to at least three limitations. First, in the state-level analysis, rankings for four states (Maryland, Massachusetts, Rhode Island, and Utah) might have been affected by large proportions of injury deaths of undetermined intent (potentially biasing reported suicide rates downward) or decreased percentages of such deaths over time (potentially biasing estimated rate trends upward). Second, NVDRS is not yet nationally representative; the 27 states included represent 49.6% of the population (<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml>). Finally,

**Comment [KC()]:** L2. Has this been reviewed by a psychiatrist? Not sure what is meant by "prevent the conditions", D?

**Comment [HTM()]:** Michael Iademarco: L3. MMWR, of self-inflicted injury...



abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the extent of informant knowledge can affect data completeness and accuracy. Studies that include more in-depth interviews with next-of-kin often identify greater attributions to mental disorders (13); however, many methodological variations across studies exist (14). It is likely that some persons without known mental health problems in the current study were experiencing mental health challenges that were unknown, and hence underreported by key informants. Nonetheless, the high prevalence of diverse contributing circumstances among those with and without known mental health problems suggests the importance of addressing the broad range of factors that contribute to suicide.

Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are available. States and communities can use data from NVDRS and resources such as CDC's Preventing Suicide: a Technical Package of Policies, Programs, and Practices (12) to better understand and manage their suicide in their communities~~problem~~, prioritize evidence-based comprehensive suicide prevention, and save lives.

#### Acknowledgments

Robert Anderson, Holly Hedegaard, Margaret Warner, Division of Vital Statistics, National Center for Health Statistics, CDC.

#### Conflict of Interest

No conflicts of interest were reported.

<sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis, Research, and Practice Integration, National Center for Injury Prevention and Control, CDC.

**Corresponding author:** Deborah M. Stone, dstone3@cdc.gov, 770-488-3942.

#### References

1. CDC. Web-based Injury Statistics Query and Reporting System (WISQARS). Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018. In.
2. Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide trends among and within urbanization levels by sex, race/ethnicity, age group, and mechanism of death—United States, 2001–2015. *MMWR Surveill Summ* 2017;66(No. SS-18).
3. Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999–2014. NCHS data brief no 241. Hyattsville, MD: US Department of Health and Human Services, CDC, National Center for Health Statistics; 2016. <https://www.cdc.gov/nchs/data/databriefs/db241.pdf>
4. Kochanek K, Murphy S, Xu J, Arias E. Mortality in the United States, 2016. NCHS data brief no 293. Hyattsville, MD: US Department of Health and Human Services, CDC, National Center for Health Statistics; 2017. <https://www.cdc.gov/nchs/data/databriefs/db293.pdf>
5. Office of the Surgeon General; National Action Alliance for Suicide Prevention. 2012 national strategy for suicide prevention: goals and objectives for action. Washington, DC: US Department of Health and Human Services, Office of the Surgeon General; 2012. <https://www.surgeongeneral.gov/library/reports/national-strategy-suicide-prevention/full-report.pdf>
6. Zalsman G, Hawton K, Wasserman D, et al. Suicide prevention strategies revisited: 10-year systematic review. *Lancet Psychiatry* 2016;3:646–59.
7. Torguson K, O'Brien A. Leading suicide prevention efforts unite to address rising national suicide rate. Washington, DC: American Foundation for Suicide Prevention; 2017. <https://afsp.org/leading-suicide-prevention-efforts-unite-address-rising-national-suicide-rate/>

8. Crepeau-Hobson F. The psychological autopsy and determination of child suicides: a survey of medical examiners. *Arch Suicide Res* 2010;14:24–34.
9. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5). Washington, DC: American Psychiatric Association; 2013.
10. Caine ED, Reed J, Hindman J, Quinlan K. Comprehensive, integrated approaches to suicide prevention: practical guidance. *Inj Prev* 2017. Epub December 20, 2017.
11. World Health Organization. Risks to mental health: an overview of vulnerabilities and risk factors. Geneva, Switzerland: World Health Organization; 2012.
12. Stone DM, Holland KM, Bartholow BN, Crosby AE, Davis SP, Wilkins N. Preventing suicide: a technical package of policies, programs, and practice. Atlanta, GA: US Department of Health and Human Services, CDC; 2017.  
<https://www.cdc.gov/violenceprevention/pdf/suicidetechnicalpackage.pdf>
13. Milner A, Svetlicic J, De Leo D. Suicide in the absence of mental disorder? A review of psychological autopsy studies across countries. *Int J Soc Psychiatry* 2013;59:545–54.
14. Pouliot L, De Leo D. Critical issues in psychological autopsy studies. *Suicide Life Threat Behav* 2006;36:491–510.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

## Summary

### What is already known about this topic?

In 2016, nearly 45,000 deaths were caused by suicide in the United States. [Mental health conditions often contribute to suicide.](#)

### What is added by this report?

During 1999–2016, suicide rates increased in nearly every state, including >30% increases in 25 states. ~~Mental health problems often contribute to suicide; however,~~ 2015 data from ~~the National Violent Death Reporting System~~ (27 states) indicate 54% of suicide decedents were not known to have [mental health conditions](#) ~~such problems~~. Other contributors included relationship, substance use, health, and job/financial problems.

### What are the implications for public health practice?

A comprehensive approach using proven prevention strategies, such as those in CDC's Technical Package for Suicide Prevention, can help reach the national goal of reducing suicide rates 20% by 2025.



**TABLE 1. Selected demographic and descriptive characteristics of suicides among persons aged ≥10 years with and without known mental health problems — National Violent Death Reporting System, 27 states,\* 2015**

Characteristic	Total (N = 20,446)	Known mental health problem† (n = 9,407)	No known mental health problem (n = 11,039)	P-value	OR‡ (95% CI)	Adjusted OR† (95% CI)
<b>Sex</b>						
Male	15,702 (76.8)	6,469 (68.8)	9,233 (83.6)	0.01	2.3 (2.2–2.5)	—
Female	4,744 (23.2)	2,938 (31.2)	1,806 (16.4)	0.01	0.4 (0.4–0.5)	—
<b>Age (yrs)**</b>						
10–24	2,804 (13.7)	1,211 (12.9)	1,593 (14.4)	0.01	1.1 (1.1–1.2)	—
25–44	6,456 (31.6)	3,036 (32.3)	3,420 (31.0)	0.05	0.9 (0.9–1.0)	—
45–64	7,718 (37.7)	3,820 (40.6)	3,898 (35.3)	0.01	0.8 (0.8–0.8)	—
≥65	3,468 (17.0)	1,340 (14.2)	2,128 (19.3)	0.01	1.4 (1.3–1.5)	—
<b>Race/Ethnicity</b>						
White, non-Hispanic	17,102 (83.6)	8,165 (86.8)	8,937 (81.0)	0.01	0.6 (0.6–0.7)	—
Black, non-Hispanic	1,228 (6.0)	411 (4.4)	817 (7.4)	0.01	1.7 (1.5–2.0)	—
American Indian/Alaska Native, non-Hispanic	378 (1.8)	112 (1.2)	266 (2.4)	0.01	2.0 (1.6–2.6)	—
Asian, non-Hispanic	576 (2.8)	235 (2.5)	341 (3.1)	0.05	1.2 (1.1–1.5)	—
Hispanic	1,096 (5.4)	463 (4.9)	633 (5.7)	0.05	1.2 (1.0–1.3)	—
Other	66 (0.3)	21 (0.2)	45 (0.4)	0.05	1.8 (1.1–3.1)	—
<b>Extended demographics</b>						
Ever served in military††	3,429 (17.8)	1,354 (15.3)	2,075 (20.1)	0.01	1.4 (1.3–1.5)	1.1 (1.0–1.1)
Homeless	240 (1.2)	104 (1.1)	136 (1.3)		1.1 (0.9–1.5)	1.2 (0.9–1.5)
<b>Incident Type</b>						
Single suicide	20,063 (98.2)	9,318 (99.1)	10,745 (97.4)	0.01	0.3 (0.3–0.4)	0.4 (0.3–0.5)
Homicide followed by suicide	319 (1.6)	64 (0.7)	255 (2.3)	0.01	3.5 (2.6–4.5)	2.9 (2.2–3.8)
Multiple suicides	64 (0.3)	25 (0.3)	39 (0.4)	—	1.3 (0.8–2.2)	1.6 (0.9–2.6)
<b>Method</b>						
Firearm	9,909 (48.5)	3,821 (40.6)	6,088 (55.3)	0.01	1.8 (1.7–1.9)	1.6 (1.5–1.7)
Hanging/Strangulation/Suffocation	5,907 (28.9)	2,940 (31.3)	2,967 (26.9)	0.01	0.8 (0.8–0.9)	0.8 (0.7–0.8)
Poisoning	3,003 (14.7)	1,861 (19.8)	1,142 (10.4)	0.01	0.5 (0.4–0.5)	0.6 (0.6–0.7)
<b>Substance class causing death§§</b>						
Other (e.g., over-the-counter)	1,021 (34.0)	666 (35.8)	355 (31.1)	0.01	0.8 (0.7–0.9)	0.9 (0.7–1.0)
Opioids	944 (31.4)	608 (32.7)	336 (29.4)	—	0.9 (0.7–1.0)	0.9 (0.8–1.1)
Antidepressants	800 (26.6)	644 (34.6)	156 (13.7)	0.01	0.3 (0.2–0.4)	0.3 (0.3–0.4)
Benzodiazepines	624 (20.8)	468 (25.1)	156 (13.7)	0.01	0.5 (0.4–0.6)	0.5 (0.4–0.6)
Antipsychotics	219 (7.3)	195 (10.5)	24 (2.1)	0.01	0.2 (0.1–0.3)	0.2 (0.1–0.3)
Other	1,595 (7.8)	780 (8.3)	815 (7.4)	0.05	0.9 (0.8–1.0)	0.9 (0.8–1.0)
<b>Toxicology Results</b>						
Any toxicology testing	13,317 (65.1)	6,658 (70.8)	6,659 (60.3)	0.01	0.6 (0.6–0.7)	0.7 (0.6–0.7)
Positive for ≥1 substance¶¶	9,913 (74.4)	5,192 (78.0)	4,721 (70.9)	0.01	0.7 (0.6–0.7)	0.8 (0.7–0.8)
<b>Substance detected***</b>						
<b>Alcohol</b>						
Tested	10,950 (53.6)	5,409 (57.5)	5,541 (50.2)	0.01	0.7 (0.7–0.8)	0.8 (0.7–0.8)
Positive	4,442 (40.6)	2,115 (39.1)	2,327 (42.0)	0.01	1.1 (1.0–1.2)	1.2 (1.1–1.3)
<b>Opioids</b>						
Tested	8,554 (41.8)	4,258 (45.3)	4,296 (38.9)	0.01	0.8 (0.7–0.8)	0.8 (0.8–0.9)

Positive	2,279 (26.6)	1,238 (29.1)	1,041 (24.2)	0.01	0.8 (0.7–0.9)	0.9 (0.8–1.0)
Benzodiazepines						
Tested	8,124 (39.7)	4,226 (44.9)	3,898 (35.3)	0.01	0.7 (0.6–0.7)	0.7 (0.7–0.8)
Positive	2,464 (30.3)	1,639 (38.8)	825 (21.2)	0.01	0.4 (0.4–0.5)	0.5 (0.5–0.6)
Cocaine						
Tested	7,978 (39.0)	3,866 (41.1)	4,112 (37.2)	0.01	0.9 (0.8–0.9)	0.9 (0.9–1.0)
Positive	499 (6.3)	216 (5.6)	283 (6.9)	0.05	1.2 (1.0–1.5)	1.2 (1.0–1.5)
Amphetamines						
Tested	7,615 (37.2)	3,696 (39.3)	3,919 (35.5)	0.01	0.9 (0.8–0.9)	0.9 (0.8–0.9)
Positive	736 (9.7)	376 (10.2)	360 (9.2)	— <sup>†††</sup>	0.9 (0.8–1.0)	1.0 (0.8–1.1)
Marijuana						
Tested	6,569 (32.1)	3,127 (33.2)	3,442 (31.2)	0.01	0.9 (0.9–1.0)	0.9 (0.9–1.0)
Positive	1,471 (22.4)	710 (22.7)	761 (22.1)	— <sup>†††</sup>	1.0 (0.9–1.1)	0.9 (0.8–1.0)
Antidepressants						
Tested	5,425 (26.5)	3,103 (33.0)	2,322 (21.0)	0.01	0.5 (0.5–0.6)	0.6 (0.6–0.7)
Positive	2,214 (40.8)	1,735 (55.9)	479 (20.6)	0.01	0.2 (0.2–0.2)	0.2 (0.2–0.3)

**Abbreviation:** CI = confidence interval; OR = odds ratio.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

† Decedent had been identified as having a current diagnosis of mental health problem in coroner/medical examiner or law enforcement reports.

§ OR reflects the risk among those without known mental health problem relative to those with known mental health problem.

¶ Logistic regression was used to estimate adjusted OR with 95% CIs after controlling for age, sex, race, and ethnicity. Known mental health problem was used as the reference group.

\*\* Decedents were aged ≥10 years, as per standard in the suicide prevention literature.

†† Denominator is decedents aged ≥18 years with reported military service status.

§§ Denominator is decedents who died by poisoning, including overdose.

¶¶ Denominator is decedents with any toxicology tested.

\*\*\* Denominator for each positive group is the number tested for the substance in that group.

††† Not significant.

**TABLE 2. Circumstances preceding suicide among decedents aged ≥10 years with and without known mental health problems — National Violent Death Reporting System, 27 states,\* 2015**

Characteristic	Total	Known mental health problem <sup>†</sup> no. (%)	No known mental health problem no. (%)	P-value	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>¶</sup> (95% CI)
<b>Suicide with known circumstances</b>	18,764 (91.8)	9,407 (100)	9,357 (84.8)	<0.01	—	—
<b>Mental health</b>						
<b>Any Current Diagnosed Mental Health Problem**</b>						
Depression/Dysthymia		7,076 (75.2)	—	—	—	—
Anxiety disorder		1,579 (16.8)	—	—	—	—
Bipolar disorder		1,431 (15.2)	—	—	—	—
Schizophrenia		509 (5.4)	—	—	—	—
PTSD		424 (4.5)	—	—	—	—
ADD/ADHD		226 (2.4)	—	—	—	—



Unknown		760 (8.1)	—	—	—	—
Current depressed mood		3,962 (42.1)	3,076 (32.9)	<0.01	0.7 (0.6–0.7)	0.7 (0.6–0.7)
<b>Substance problems</b>						
Any Current substance problem	5,319 (28.3)	2,976 (31.6)	2,343 (25.0)	<0.01	0.7 (0.7–0.8)	0.7 (0.7–0.8)
Alcohol problem	3,268 (17.4)	1,862 (19.8)	1,406 (15.0)	<0.01	0.7 (0.7–0.8)	0.7 (0.7–0.8)
Other substance problem	3,084 (16.4)	1,768 (18.8)	1,316 (14.1)	<0.01	0.7 (0.7–0.8)	0.7 (0.7–0.8)
<b>Treatment</b>						
Current mental health/substance abuse treatment	5,141 (27.4)	5,077 (54.0)	64 (0.7)	<0.01	0.01 (0.01–0.01)	0.01 (0.01–0.01)
Ever treated for mental health/substance problem	6,717 (35.8)	6,323 (67.2)	394 (4.2)	<0.01	0.02 (0.02–0.02)	0.02 (0.02–0.03)
<b>Relationship problems/loss</b>						
Any relationship problem/loss	7,948 (42.4)	3,726 (39.6)	4,222 (45.1)	<0.01	1.3 (1.2–1.3)	1.3 (1.2–1.4)
Intimate partner problem	5,098 (27.2)	2,270 (24.1)	2,828 (30.2)	<0.01	1.4 (1.3–1.5)	1.4 (1.3–1.5)
Perpetrator of interpersonal violence in past month	414 (2.2)	131 (1.4)	283 (3.0)	<0.01	2.2 (1.8–2.7)	2.0 (1.6–2.4)
Victim of interpersonal violence in past month	84 (0.4)	53 (0.6)	31 (0.3)	<0.05	0.6 (0.4–0.9)	0.8 (0.5–1.2)
Family relationship problem	1,671 (8.9)	873 (9.3)	798 (8.5)	—††	0.9 (0.8–1.0)	1.0 (0.9–1.1)
Other relationship problem (nonintimate)	403 (2.1)	202 (2.1)	201 (2.1)	—††	1.0 (0.8–1.2)	1.1 (0.9–1.3)
Argument or conflict (not specified)	2,914 (15.5)	1,278 (13.6)	1,636 (17.5)	<0.01	1.3 (1.2–1.5)	1.4 (1.3–1.5)
Death of a loved one (any)	1,497 (8.0)	826 (8.8)	671 (7.2)	<0.01	0.8 (0.7–0.9)	0.9 (0.8–0.9)
Nonsuicide death	1,181 (6.3)	647 (6.9)	534 (5.7)	<0.01	0.8 (0.7–0.9)	0.9 (0.8–1.0)
Suicide of family or friend	379 (2.0)	217 (2.3)	162 (1.7)	<0.01	0.7 (0.6–0.9)	0.8 (0.7–1.0)
<b>Other life stressors</b>						
Any life stressor	9,743 (51.9)	4,675 (49.7)	5,068 (54.2)	<0.01	1.2 (1.1–1.3)	1.1 (1.1–1.2)
Recent criminal legal problem	1,588 (8.5)	586 (6.2)	1,002 (10.7)	<0.01	1.8 (1.6–2.0)	1.7 (1.5–1.9)
Other legal problem	748 (4.0)	378 (4.0)	370 (4.0)	—††	1.0 (0.8–1.1)	1.0 (0.9–1.2)
Physical health problem	4,179 (22.3)	2,012 (21.4)	2,167 (23.2)	<0.01	1.1 (1.0–1.2)	1.0 (1.0–1.1)
Job/Financial problem <sup>§§</sup>	2941 (16.2)	1530 (16.8)	1411 (15.6)	<0.05	0.9 (0.8–1.0)	0.9 (0.8–1.0)
Eviction or loss of home	722 (3.8)	317 (3.4)	405 (4.3)	<0.01	1.3 (1.1–1.5)	1.4 (1.2–1.6)
School problem <sup>††</sup>	162 (19.9)	70 (17.8)	92 (21.9)	—††	1.3 (0.9–1.8)	1.3 (0.9–1.9)
Recent release from an institution <sup>***</sup>	1,412 (7.6)	941 (10.2)	471 (5.1)	<0.01	0.5 (0.4–0.5)	0.5 (0.4–0.5)
Jail/Prison/Detention facility	203 (14.4)	82 (8.7)	121 (25.7)	<0.01	3.6 (2.7–4.9)	4.5 (3.2–6.4)
Hospital	517 (36.6)	311 (33.0)	206 (43.7)	<0.01	1.6 (1.3–2.0)	1.3 (1.0–1.7)
Psychiatric hospital/institution	469 (33.2)	439 (46.7)	30 (6.4)	<0.01	0.1 (0.1–0.1)	0.1 (0.1–0.1)
Other (includes alcohol/SA treatment facilities)	223 (15.8)	109 (11.6)	114 (24.2)	<0.01	2.4 (1.8–3.3)	2.5 (1.8–3.3)
<b>Recent or Impending Crisis</b>						
Crisis within past or upcoming 2 weeks <sup>†††</sup>	5,525 (29.4)	2,444 (26.0)	3,081 (32.9)	<0.01	1.4 (1.3–1.5)	1.4 (1.3–1.5)
Intimate partner problem crisis	1968 (35.6)	854 (34.9)	1114 (36.2)	—††	1.1 (0.9–1.2)	1.1 (0.9–1.2)
Physical health problem crisis	739 (13.4)	315 (12.9)	424 (13.8)	—††	1.1 (0.9–1.3)	1.0 (0.8–1.2)
Criminal legal problem crisis	621 (11.2)	203 (8.3)	418 (13.6)	<0.01	1.7 (1.5–2.1)	1.6 (1.3–1.9)
Family relationship problem crisis	430 (7.8)	212 (8.7)	218 (7.1)	<0.05	0.8 (0.7–1.0)	0.9 (0.7–1.1)
Job problem crisis	354 (6.4)	191 (7.8)	163 (5.3)	<0.01	0.7 (0.5–0.8)	0.7 (0.5–0.8)
<b>Suicide event/history</b>						
Left a note	6,468 (34.5)	3,182 (33.8)	3,286 (35.1)	—††	1.1 (1.0–1.1)	1.2 (1.1–1.2)
Disclosed suicide intent	4,405 (23.5)	2,306 (24.5)	2,099 (22.4)	<0.01	0.9 (0.8–1.0)	0.9 (0.8–0.9)
History of ideation	5,990 (31.9)	3,838 (40.8)	2,152 (23.0)	<0.01	0.4 (0.4–0.5)	0.4 (0.4–0.5)
History of attempts	3,732 (19.9)	2,770 (29.4)	962 (10.3)	<0.01	0.3 (0.3–0.3)	0.3 (0.3–0.3)

**Abbreviations:** ADD/ADHD = attention deficit disorder/attention deficit hyperactivity disorder; OR = odds ratio; PTSD = posttraumatic stress disorder; SA = substance abuse.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

† Decedent had been identified as having a current diagnosis of mental health problem in coroner/medical examiner or law enforcement reports.

§ OR reflects the risk among those without known mental health problem relative to those with known mental health problem.

¶ Logistic regression was used to estimate adjusted OR with 95% CIs after controlling for age, sex, race, and ethnicity. Known mental health problem was the reference group.

\*\* Includes decedents with one or more diagnosed current mental health problems, which are not mutually exclusive. Therefore, sums of percentages for the diagnosed conditions exceed 100%. Denominator includes the number of decedents with one or more current diagnosed mental health problems.

†† Not significant.

§§ Denominator is decedents aged ≥18 years.

¶¶ Denominator is decedents aged 10–18 years.

\*\*\* Denominator of institution subgroup is decedents with recent release from an institution. Recent release from an institution is defined as having occurred within the past month.

††† Denominator of crisis subgroup is decedents with any crisis within past or upcoming 2 weeks. Crises depicted here represent the most commonly occurring categories.

**FIGURE. Percentage change in annual suicide rate,\* by state — United States, from 1999–2001 to 2014–2016<Fig\_Small></Fig\_Small>**

The figure above is a map of the United States showing the percentage change in annual suicide rate, by state, from 1999 to 2016.

\* Per 100,000 population, age-adjusted to the 2000 U.S. standard population.



# Vital Signs: Trends in State Suicide Rates — United States, 1999–2016 and Circumstances Contributing to Suicide — 27 States, 2015

Deborah M. Stone, ScD<sup>1</sup>; Thomas R. Simon PhD<sup>1</sup>; Katherine A. Fowler, PhD<sup>1</sup>; Scott R. Kegler, PhD<sup>2</sup>; Keming Yuan, MS<sup>1</sup>; Kristin M. Holland, PhD<sup>1</sup>; Asha Z. Ivey-Stephenson, PhD<sup>1</sup>; Alex E. Crosby, MD<sup>1</sup>

## Abstract

**Introduction:** Suicide rates in the United States have risen nearly 30% since 1999, and mental health problems are just one factor contributing to suicide. Examining state-level trends in suicide and the multiple circumstances contributing to it can inform comprehensive state suicide prevention planning.

**Methods:** Trends in age-adjusted suicide rates among persons aged  $\geq 10$  years, by state and sex, across six consecutive 3-year periods (1999–2016), were assessed using data from the National Vital Statistics System for 50 states and the District of Columbia (DC). Data from the National Violent Death Reporting System, covering 27 states in 2015, were used to examine contributing circumstances among decedents with and without known mental health problems.

**Results:** During 1999–2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases  $>30\%$ . Rates increased significantly among males and females in 34 and 43 states, respectively. In 2015, a total of 54% of decedents in 27 states did not have a known mental health problem. Among decedents with information on circumstances available, several circumstances were significantly more likely among those without a known mental health problems than among those with mental health problems, including relationship problems/loss (45.1% versus 39.6%), life stressors (54.2% versus 49.7%), and recent/impending crises (32.9% versus 26.0%), but these circumstances were common across groups.

**Conclusions:** Suicide rates increased significantly across most states during 1999–2016. Various circumstances contributed to suicides among persons with and without known mental health problems.

**Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach to prevent suicide risk before it occurs, identify and support persons at risk, prevent reattempts, and help friends and family in the aftermath of a suicide.

## Introduction

In 2016, nearly 45,000 suicides (15.6/100,000 population [age-adjusted]) occurred in the United States among persons aged  $\geq 10$  years (1). From 1999 to 2015, suicide rates increased among both sexes, all racial/ethnic groups, and all urbanization levels (2,3). Suicide is the 10th leading cause of death and is one of just three leading causes that are increasing (1,4). In addition, rates of emergency department visits for nonfatal self-harm, a key risk factor for suicide, increased 42% from 2001 to 2016 (1). Together, suicides and self-harm injuries cost the nation approximately \$69 billion in direct medical and work loss costs (1).

The National Strategy for Suicide Prevention (NSSP) (5) calls for a public health approach to suicide prevention with efforts spanning multiple levels (i.e., individual, family/relationship, community, and societal). Such a comprehensive approach underscores that suicide is rarely caused by any single factor, but rather, is determined by multiple factors. Despite NSSP guidance, suicide prevention largely focuses on identifying suicidal persons, providing treatment for mental health problems, and preventing reattempts (6). In addition to mental health problems and prior attempts, other circumstances contributing to suicide include social and economic problems, access to lethal means (e.g., substances, firearms) among persons at risk, and poor coping and problem-solving skills (5). Expanded awareness of these additional



circumstances contributing to suicide risk and action to address them can help reach the national goal established by the American Foundation for Suicide Prevention and the National Action Alliance of Suicide Prevention of reducing suicide rates by 20% by 2025 (7). To assist states in achieving this goal, CDC analyzed state-specific trends in suicide rates and assessed the multiple contributing factors to suicide; this report presents options for multilevel comprehensive suicide prevention based on the best available evidence.

## Methods

Suicide rates were analyzed for persons aged  $\geq 10$  years only, as determining suicidal intent in younger children can be difficult (8). Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases, Tenth Revision*, underlying-cause-of-death codes X60–X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive 3-year aggregate periods spanning 1999–2016 (1999–2001; 2002–2004; 2005–2007; 2008–2010; 2011–2013; and 2014–2016). Rate estimates were age-adjusted to the U.S. 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same 3-year data aggregates, employing weighted least-squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Characteristics of persons aged  $\geq 10$  years who died by suicide, with and without known mental health problems, and the circumstances surrounding the suicides were compared in the 27 states\* with complete data participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines mental health problems as disorders and syndromes listed in the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (9), with the exception of alcohol and other substance use disorders, which are captured separately in NVDRS. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known mental health problems were compared using Chi-square tests. Logistic regression analyses estimated adjusted odds ratios (aORs) with 95% confidence intervals (CIs), controlling for age group, sex, and race/ethnicity.

## Results

The most recent overall suicide rates (representing 2014–2016) varied fourfold, from 6.9 (DC) to 29.2 (Montana) per 100,000 persons per year (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>). Across the study period, rates increased in all states except Nevada (where the rate was consistently high throughout the study period), with absolute increases ranging from 0.8 per 100,000 (Delaware) to 8.1 (Wyoming). Percentage increases in rates ranged from 5.9% (Delaware) to 57.6% (North Dakota), with increases  $>30\%$  observed in 25 states (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>) (Figure 1).

Modeled suicide rate trends indicated significant increases in 44 states, among males (34 states) and females (43 states), as well as for the United States overall (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>). Nationally, the model-estimated AAPC for the overall suicide rate was an increase of 1.5%. By sex, estimated national rate trends further indicated significant AAPC increases for males (1.1%) and females (2.6%) (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>).

Suicide decedents without known mental health problems (11,039) were compared with those with known mental health problems (9,407) in 27 states. Whereas all decedents were predominately male (76.8%) (Table 1) and non-Hispanic white (83.6%), those without known mental health problems, relative to those with mental health problems, were more likely to be male (83.6% versus 68.8%; odds ratio



(OR) = 2.3, 95% CI = 2.2–2.5) and belong to a racial/ethnic minority (OR range = 1.2–2.0). Suicide decedents without known mental health problems also had significantly higher odds of perpetrating homicide-suicide (aOR = 2.9, 95% CI = 2.2–3.8). Among adult decedents aged  $\geq 18$  years, 20.1% of those without known mental health problems and 15.3% of those with mental health problems had ever served, or were currently serving, in the U.S. military.

Whereas firearms were the most common method of suicide overall (48.5%) and among decedents with and without mental health problems, decedents without known mental health problems, relative to those with known mental health problems, were more likely to die by firearm (55.3% versus 40.6%) and less likely to die by hanging/strangulation/suffocation (26.9% versus 31.3%) or poisoning (10.4% versus 19.8%). These differences remained significant in the adjusted models.

Decedents without known mental health problems were less likely to receive toxicology testing. Among those with toxicology results, decedents without known mental health problems were less likely to test positive for any substance overall (aOR = 0.8, 95% CI = 0.7–0.8), including opioids (aOR = 0.90, 95% CI = 0.81–0.99), but were more likely to test positive for alcohol (aOR = 1.2, 95% CI = 1.1–1.3).

Information on circumstances surrounding suicide were available for all decedents with mental health problems ( $n = 9,407$ ) and approximately 85% of those without known mental health problems ( $n = 9,357$ ) in 27 states (Table 2). Persons without known mental health problems were less likely to have any substance use disorders (aOR = 0.7, 95% CI = 0.7–0.8) than were persons with known mental health problems. Whereas two thirds of decedents with known mental health problems had a history of mental health or substance use treatment (67.2%), just over half (54.0%) were in current treatment.

Decedents without known mental health problems had a significantly higher likelihood of any relationship problem/loss (45.1%) than did those with known mental health problems (39.6%), specifically intimate partner problems (30.2% versus 24.1%), arguments/conflicts (17.5% versus 13.6%), and recently perpetrating interpersonal violence (3.0% versus 1.4%). Decedents without known mental health problems were also more likely than were those with known mental health problems to have experienced any life stressors (54.2% versus 49.7%) such as criminal/legal problems (10.7% versus 6.2%) or eviction/loss of home (4.3% versus 3.4%) and were more likely to have had a recent or impending (within the preceding or upcoming 2 weeks, respectively) crisis (a current or acute event thought to contribute to the suicide) (32.9% versus 26.0%). All of these differences remained significant in the adjusted models. Among all persons with recent crises, intimate partner problems were the most common types and did not differ by group. Similarly, physical health problems and job/financial problems were commonly experienced among both persons without mental health problems (23.2% and 15.6%, respectively) and those with mental health problems (21.4% and 16.8%, respectively).

Decedents without known mental health problems had significantly lower odds of recent release from any institution (aOR = 0.5, 95% CI = 0.4–0.5), but those who were recently released (5.1%), were significantly more likely to have been released from a correctional facility (25.7% versus 8.7%), hospital (43.7% versus 33.0%), or other facility (e.g., alcohol/substance treatment) (aOR = 2.5 95% CI = 1.8–3.3), than were those with a known mental health problem. Among decedents with known mental health problems who were recently released from an institution (10.2%), 46.7% were released from psychiatric facilities.

Decedents without known mental health problems were significantly less likely to have a history of suicidal ideation (23.0%) or prior suicide attempts (10.3%) compared with those with known mental health problems (40.8% and 29.4%, respectively). Suicide intent was disclosed by 22.4% and 24.5% of persons without and with known mental health problems, respectively.

**Comment [HTM()]:** This is the section I found confusing.

**Comment [HTM()]:** So the first number is the % of 5.1% of decedents with no known mental health issue who were recently release.

And, the second number is the % of some % of decedents with a known mental health issue who were recently released, correct?

As I said on the phone, I had to read several times to figure who was who and where the percentages were coming from.

Maybe something along the lines of below:

Decedents without known mental health problems had significantly lower odds of having been recently released from any institution (aOR = 0.5, 95% CI = 0.4–0.5). Among those recently released from an institution, decedents without a known mental health issue (5.1%), when compared with those with a known mental health problem (X%), were significantly more likely to have been released from a correctional facility (25.7% versus 8.7%), hospital (43.7% versus 33.0%), or other facility (e.g., alcohol/substance treatment) (aOR = 2.5 95% CI = 1.8–3.3).



## Conclusions and Comments

During 1999–2016, suicide rates increased significantly in 44 states, and 25 states experienced increases >30%. Rates increased significantly among males in 34 states, and females in 43 states. This finding is consistent with prior research that indicated a decreasing gender gap in male-female suicide rates during 1999–2014 (3). Additional research into the specific causes of these trends is needed. Data from the 27 states participating in NVDRS provide important insight into circumstances surrounding suicide and can help states identify prevention priorities.

Suicidologists regularly state that suicide is not caused by a single factor (5); however, suicide prevention is often oriented toward downstream identification of suicidal persons, treatment of mental health problems, and prevention of reattempts. This study found that approximately half of suicide decedents in NVDRS did not have a known mental health problem, indicating that additional focus on nonmental health factors further upstream could provide important information for a public health approach (10). Those without a known mental health problem suffered more from relationship problems and other life stressors such as criminal/legal matters, eviction/loss of home, and recent or impending crises.

Similarly, persons with mental health problems often experienced relationship problems and other life stressors such as job/financial or physical health problems. These findings point to the need to help persons both manage and prevent the conditions associated with mental health problems in the first place, and to support persons with known mental health problems to decrease their risk for poor outcomes (11). Two thirds of this group with mental health problems had a history of treatment for any mental health or substance use or both, with approximately half in treatment when they died. This finding suggests the need for additional safety supports, including broader implementation of affordable and effective treatment modalities, such as doctor-patient collaborative care models and proven cognitive-behavioral therapies. In addition, increased access to behavioral health providers in underserved areas is needed, as is expansion of health care systems that integrate physical and behavioral health, with a priority on suicide prevention and patient safety, especially through care transitions (12).

Comprehensive statewide suicide prevention activities are needed to address the full range of factors contributing to suicide. Prevention strategies include strengthening economic supports (e.g., housing stabilization policies, household financial support); teaching coping and problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in life; promoting social connectedness to increase a sense of belonging and access to informational, tangible, emotional, and social support; and identifying and better supporting persons at risk (e.g., military veterans, persons with physical/mental health problems) (12). Other strategies include creating protective environments (e.g., reducing access to lethal means among persons at risk, creating organizational and workplace policies to promote help-seeking, easing transitions into and out of work for persons with mental health problems and other life challenges), strengthening access and delivery of care, supporting family and friends after a suicide, and assuring the media follow safe reporting guidelines (12). Some states, such as Colorado, are planning to implement such a comprehensive approach to suicide prevention (10).

The findings in this report are subject to at least three limitations. First, in the state-level analysis, rankings for four states (Maryland, Massachusetts, Rhode Island, and Utah) might have been affected by large proportions of injury deaths of undetermined intent (potentially biasing reported suicide rates downward) or decreased percentages of such deaths over time (potentially biasing estimated rate trends upward). Second, NVDRS is not yet nationally representative; the 27 states included represent 49.6% of the population (<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml>). Finally, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the extent of informant knowledge can affect data completeness and accuracy. Studies that include more in-depth interviews with next-of-kin often identify greater attributions to mental disorders (13); however, many methodological variations across studies exist (14). It is likely that some persons without known



mental health problems in the current study were experiencing mental health challenges that were unknown, and hence underreported by key informants. Nonetheless, the high prevalence of diverse contributing circumstances among those with and without known mental health problems suggests the importance of addressing the broad range of factors that contribute to suicide.

Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are available. States and communities can use data from NVDRS and resources such as CDC's Preventing Suicide: a Technical Package of Policies, Programs, and Practices (12) to better understand their suicide problem, prioritize evidence-based comprehensive suicide prevention, and save lives.

#### Acknowledgments

Robert Anderson, Holly Hedegaard, Margaret Warner, Division of Vital Statistics, National Center for Health Statistics, CDC.

#### Conflict of Interest

No conflicts of interest were reported.

<sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis, Research, and Practice Integration, National Center for Injury Prevention and Control, CDC.

**Corresponding author:** Deborah M. Stone, dstone3@cdc.gov, 770-488-3942.

#### References

1. CDC. Web-based Injury Statistics Query and Reporting System (WISQARS). Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018. In.
2. Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide trends among and within urbanization levels by sex, race/ethnicity, age group, and mechanism of death—United States, 2001–2015. *MMWR Surveill Summ* 2017;66(No. SS-18).
3. Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999–2014. NCHS data brief no 241. Hyattsville, MD: US Department of Health and Human Services, CDC, National Center for Health Statistics; 2016. <https://www.cdc.gov/nchs/data/databriefs/db241.pdf>
4. Kochanek K, Murphy S, Xu J, Arias E. Mortality in the United States, 2016. NCHS data brief no 293. Hyattsville, MD: US Department of Health and Human Services, CDC, National Center for Health Statistics; 2017. <https://www.cdc.gov/nchs/data/databriefs/db293.pdf>
5. Office of the Surgeon General; National Action Alliance for Suicide Prevention. 2012 national strategy for suicide prevention: goals and objectives for action. Washington, DC: US Department of Health and Human Services, Office of the Surgeon General; 2012. <https://www.surgeongeneral.gov/library/reports/national-strategy-suicide-prevention/full-report.pdf>
6. Zalsman G, Hawton K, Wasserman D, et al. Suicide prevention strategies revisited: 10-year systematic review. *Lancet Psychiatry* 2016;3:646–59.
7. Torguson K, O'Brien A. Leading suicide prevention efforts unite to address rising national suicide rate. Washington, DC: American Foundation for Suicide Prevention; 2017. <https://afsp.org/leading-suicide-prevention-efforts-unite-address-rising-national-suicide-rate/>
8. Crepeau-Hobson F. The psychological autopsy and determination of child suicides: a survey of medical examiners. *Arch Suicide Res* 2010;14:24–34.
9. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5). Washington, DC: American Psychiatric Association; 2013.

10. Caine ED, Reed J, Hindman J, Quinlan K. Comprehensive, integrated approaches to suicide prevention: practical guidance. *Inj Prev* 2017. Epub December 20, 2017.
11. World Health Organization. Risks to mental health: an overview of vulnerabilities and risk factors. Geneva, Switzerland: World Health Organization; 2012.
12. Stone DM, Holland KM, Bartholow BN, Crosby AE, Davis SP, Wilkins N. Preventing suicide: a technical package of policies, programs, and practice. Atlanta, GA: US Department of Health and Human Services, CDC; 2017.  
<https://www.cdc.gov/violenceprevention/pdf/suicidetechnicalpackage.pdf>
13. Milner A, Svetcic J, De Leo D. Suicide in the absence of mental disorder? A review of psychological autopsy studies across countries. *Int J Soc Psychiatry* 2013;59:545–54.
14. Pouliot L, De Leo D. Critical issues in psychological autopsy studies. *Suicide Life Threat Behav* 2006;36:491–510.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

## Summary

### What is already known about this topic?

In 2016, nearly 45,000 deaths were caused by suicide in the United States.

### What is added by this report?

During 1999–2016, suicide rates increased in nearly every state, including >30% increases in 25 states. Mental health problems often contribute to suicide; however, 2015 data from the National Violent Death Reporting System (27 states) indicate 54% of suicide decedents were not known to have such problems. Other contributors included relationship, substance use, health, and job/financial problems.

### What are the implications for public health practice?

A comprehensive approach using proven prevention strategies, such as those in CDC's Technical Package for Suicide Prevention, can help reach the national goal of reducing suicide rates 20% by 2025.



TABLE 1. Selected demographic and descriptive characteristics of suicides among persons aged ≥10 years with and without known mental health problems — National Violent Death Reporting System, 27 states,\* 2015

Characteristic	Total (N = 20,446)	Known mental health problem† (n = 9,407)	No known mental health problem (n = 11,039)	P-value	OR‡ (95% CI)	Adjusted OR§ (95% CI)
<b>Sex</b>						
Male	15,702 (76.8)	6,469 (68.8)	9,233 (83.6)	0.01	2.3 (2.2–2.5)	1.1 (1.0–1.1)
Female	4,744 (23.2)	2,938 (31.2)	1,806 (16.4)	0.01	0.4 (0.4–0.5)	0.4 (0.3–0.5)
<b>Age (yrs)**</b>						
10–24	2,804 (13.7)	1,211 (12.9)	1,593 (14.4)	0.01	1.1 (1.1–1.2)	1.1 (1.0–1.1)
25–44	6,456 (31.6)	3,036 (32.3)	3,420 (31.0)	0.05	0.9 (0.9–1.0)	0.9 (0.8–0.9)
45–64	7,718 (37.7)	3,820 (40.6)	3,898 (35.3)	0.01	0.8 (0.8–0.8)	0.8 (0.7–0.8)
≥65	3,468 (17.0)	1,340 (14.2)	2,128 (19.3)	0.01	1.4 (1.3–1.5)	1.4 (1.3–1.5)
<b>Race/Ethnicity</b>						
White, non-Hispanic	17,102 (83.6)	8,165 (86.8)	8,937 (81.0)	0.01	0.6 (0.6–0.7)	0.6 (0.5–0.6)
Black, non-Hispanic	1,228 (6.0)	411 (4.4)	817 (7.4)	0.01	1.7 (1.5–2.0)	1.7 (1.5–2.0)
American Indian/Alaska Native, non-Hispanic	378 (1.8)	112 (1.2)	266 (2.4)	0.01	2.0 (1.6–2.6)	2.0 (1.6–2.6)
Asian, non-Hispanic	576 (2.8)	235 (2.5)	341 (3.1)	0.05	1.2 (1.1–1.5)	1.2 (1.1–1.5)
Hispanic	1,096 (5.4)	463 (4.9)	633 (5.7)	0.05	1.2 (1.0–1.3)	1.2 (1.0–1.3)
Other	66 (0.3)	21 (0.2)	45 (0.4)	0.05	1.8 (1.1–3.1)	1.8 (1.1–3.1)
<b>Extended demographics</b>						
Ever served in military††	3,429 (17.8)	1,354 (15.3)	2,075 (20.1)	0.01	1.4 (1.3–1.5)	1.1 (1.0–1.1)
Homeless	240 (1.2)	104 (1.1)	136 (1.3)		1.1 (0.9–1.5)	1.2 (0.9–1.5)
<b>Incident Type</b>						
Single suicide	20,063 (98.2)	9,318 (99.1)	10,745 (97.4)	0.01	0.3 (0.3–0.4)	0.4 (0.3–0.5)
Homicide followed by suicide	319 (1.6)	64 (0.7)	255 (2.3)	0.01	3.5 (2.6–4.5)	2.9 (2.2–3.8)
Multiple suicides	64 (0.3)	25 (0.3)	39 (0.4)	—	1.3 (0.8–2.2)	1.6 (0.9–2.6)
<b>Method</b>						
Firearm	9,909 (48.5)	3,821 (40.6)	6,088 (55.3)	0.01	1.8 (1.7–1.9)	1.6 (1.5–1.7)
Hanging/Strangulation/Suffocation	5,907 (28.9)	2,940 (31.3)	2,967 (26.9)	0.01	0.8 (0.8–0.9)	0.8 (0.7–0.8)
Poisoning	3,003 (14.7)	1,861 (19.8)	1,142 (10.4)	0.01	0.5 (0.4–0.5)	0.6 (0.6–0.7)
<b>Substance class causing death§§</b>						
Other (e.g., over-the-counter)	1,021 (34.0)	666 (35.8)	355 (31.1)	0.01	0.8 (0.7–0.9)	0.9 (0.7–1.0)
Opioids	944 (31.4)	608 (32.7)	336 (29.4)	—	0.9 (0.7–1.0)	0.9 (0.8–1.1)
Antidepressants	800 (26.6)	644 (34.6)	156 (13.7)	0.01	0.3 (0.2–0.4)	0.3 (0.3–0.4)
Benzodiazepines	624 (20.8)	468 (25.1)	156 (13.7)	0.01	0.5 (0.4–0.6)	0.5 (0.4–0.6)
Antipsychotics	219 (7.3)	195 (10.5)	24 (2.1)	0.01	0.2 (0.1–0.3)	0.2 (0.1–0.3)
Other	1,595 (7.8)	780 (8.3)	815 (7.4)	0.05	0.9 (0.8–1.0)	0.9 (0.8–1.0)
<b>Toxicology Results</b>						
Any toxicology testing	13,317 (65.1)	6,658 (70.8)	6,659 (60.3)	0.01	0.6 (0.6–0.7)	0.7 (0.6–0.7)
Positive for ≥1 substance¶¶	9,913 (74.4)	5,192 (78.0)	4,721 (70.9)	0.01	0.7 (0.6–0.7)	0.8 (0.7–0.8)
<b>Substance detected***</b>						
Alcohol						
Tested	10,950 (53.6)	5,409 (57.5)	5,541 (50.2)	0.01	0.7 (0.7–0.8)	0.8 (0.7–0.8)
Positive	4,442 (40.6)	2,115 (39.1)	2,327 (42.0)	0.01	1.1 (1.0–1.2)	1.2 (1.1–1.3)
Opioids						
Tested	8,554 (41.8)	4,258 (45.3)	4,296 (38.9)	0.01	0.8 (0.7–0.8)	0.8 (0.8–0.9)

Comment [HTM()]: These need to be more specific (e.g., N/A, N/R) or footnoted to explain.

Positive	2,279 (26.6)	1,238 (29.1)	1,041 (24.2)	0.01	0.8 (0.7–0.9)	0.9 (0.8–1.0)
<b>Benzodiazepines</b>						
Tested	8,124 (39.7)	4,226 (44.9)	3,898 (35.3)	0.01	0.7 (0.6–0.7)	0.7 (0.7–0.8)
Positive	2,464 (30.3)	1,639 (38.8)	825 (21.2)	0.01	0.4 (0.4–0.5)	0.5 (0.5–0.6)
<b>Cocaine</b>						
Tested	7,978 (39.0)	3,866 (41.1)	4,112 (37.2)	0.01	0.9 (0.8–0.9)	0.9 (0.9–1.0)
Positive	499 (6.3)	216 (5.6)	283 (6.9)	0.05	1.2 (1.0–1.5)	1.2 (1.0–1.5)
<b>Amphetamines</b>						
Tested	7,615 (37.2)	3,696 (39.3)	3,919 (35.5)	0.01	0.9 (0.8–0.9)	0.9 (0.8–0.9)
Positive	736 (9.7)	376 (10.2)	360 (9.2)	— <sup>†††</sup>	0.9 (0.8–1.0)	1.0 (0.8–1.1)
<b>Marijuana</b>						
Tested	6,569 (32.1)	3,127 (33.2)	3,442 (31.2)	0.01	0.9 (0.9–1.0)	0.9 (0.9–1.0)
Positive	1,471 (22.4)	710 (22.7)	761 (22.1)	— <sup>†††</sup>	1.0 (0.9–1.1)	0.9 (0.8–1.0)
<b>Antidepressants</b>						
Tested	5,425 (26.5)	3,103 (33.0)	2,322 (21.0)	0.01	0.5 (0.5–0.6)	0.6 (0.6–0.7)
Positive	2,214 (40.8)	1,735 (55.9)	479 (20.6)	0.01	0.2 (0.2–0.2)	0.2 (0.2–0.3)

Abbreviation: CI = confidence interval; OR = odds ratio.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

† Decedent had been identified as having a current diagnosis of mental health problem in coroner/medical examiner or law enforcement reports.

‡ OR reflects the risk among those without known mental health problem relative to those with known mental health problem.

§ Logistic regression was used to estimate adjusted OR with 95% CIs after controlling for age, sex, race, and ethnicity. Known mental health problem was used as the reference group.

\*\* Decedents were aged ≥10 years, as per standard in the suicide prevention literature.

†† Denominator is decedents aged ≥18 years with reported military service status.

§§ Denominator is decedents who died by poisoning, including overdose.

¶¶ Denominator is decedents with any toxicology tested.

\*\*\* Denominator for each positive group is the number tested for the substance in that group.

††† Not significant.

**TABLE 2. Circumstances preceding suicide among decedents aged ≥10 years with and without known mental health problems — National Violent Death Reporting System, 27 states,\* 2015**

Characteristic	Total	Known mental health problem <sup>†</sup> no. (%)	No known mental health problem no. (%)	P-value	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>†</sup> (95% CI)
<b>Suicide with known circumstances</b>	18,764 (91.8)	9,407 (100)	9,357 (84.8)	<0.01	—	—
<b>Mental health</b>						
<b>Any Current Diagnosed Mental Health Problem<sup>**</sup></b>						
Depression/Dysthymia		7,076 (75.2)	—	—	—	—
Anxiety disorder		1,579 (16.8)	—	—	—	—
Bipolar disorder		1,431 (15.2)	—	—	—	—
Schizophrenia		509 (5.4)	—	—	—	—
PTSD		424 (4.5)	—	—	—	—
ADD/ADHD		226 (2.4)	—	—	—	—

Comment [HTM()]: ditto above.



Unknown		760 (8.1)	—	—	—	—
Current depressed mood		3,962 (42.1)	3,076 (32.9)	<0.01	0.7 (0.6–0.7)	0.7 (0.6–0.7)
<b>Substance problems</b>						
Any Current substance problem	5,319 (28.3)	2,976 (31.6)	2,343 (25.0)	<0.01	0.7 (0.7–0.8)	0.7 (0.7–0.8)
Alcohol problem	3,268 (17.4)	1,862 (19.8)	1,406 (15.0)	<0.01	0.7 (0.7–0.8)	0.7 (0.7–0.8)
Other substance problem	3,084 (16.4)	1,768 (18.8)	1,316 (14.1)	<0.01	0.7 (0.7–0.8)	0.7 (0.7–0.8)
<b>Treatment</b>						
Current mental health/substance abuse treatment	5,141 (27.4)	5,077 (54.0)	64 (0.7)	<0.01	0.01 (0.01–0.01)	0.01 (0.01–0.01)
Ever treated for mental health/substance problem	6,717 (35.8)	6,323 (67.2)	394 (4.2)	<0.01	0.02 (0.02–0.02)	0.02 (0.02–0.03)
<b>Relationship problems/loss</b>						
Any relationship problem/loss	7,948 (42.4)	3,726 (39.6)	4,222 (45.1)	<0.01	1.3 (1.2–1.3)	1.3 (1.2–1.4)
Intimate partner problem	5,098 (27.2)	2,270 (24.1)	2,828 (30.2)	<0.01	1.4 (1.3–1.5)	1.4 (1.3–1.5)
Perpetrator of interpersonal violence in past month	414 (2.2)	131 (1.4)	283 (3.0)	<0.01	2.2 (1.8–2.7)	2.0 (1.6–2.4)
Victim of interpersonal violence in past month	84 (0.4)	53 (0.6)	31 (0.3)	<0.05	0.6 (0.4–0.9)	0.8 (0.5–1.2)
Family relationship problem	1,671 (8.9)	873 (9.3)	798 (8.5)	—††	0.9 (0.8–1.0)	1.0 (0.9–1.1)
Other relationship problem (nonintimate)	403 (2.1)	202 (2.1)	201 (2.1)	—††	1.0 (0.8–1.2)	1.1 (0.9–1.3)
Argument or conflict (not specified)	2,914 (15.5)	1,278 (13.6)	1,636 (17.5)	<0.01	1.3 (1.2–1.5)	1.4 (1.3–1.5)
Death of a loved one (any)	1,497 (8.0)	826 (8.8)	671 (7.2)	<0.01	0.8 (0.7–0.9)	0.9 (0.8–0.9)
Nonsuicide death	1,181 (6.3)	647 (6.9)	534 (5.7)	<0.01	0.8 (0.7–0.9)	0.9 (0.8–1.0)
Suicide of family or friend	379 (2.0)	217 (2.3)	162 (1.7)	<0.01	0.7 (0.6–0.9)	0.8 (0.7–1.0)
<b>Other life stressors</b>						
Any life stressor	9,743 (51.9)	4,675 (49.7)	5,068 (54.2)	<0.01	1.2 (1.1–1.3)	1.1 (1.1–1.2)
Recent criminal legal problem	1,588 (8.5)	586 (6.2)	1,002 (10.7)	<0.01	1.8 (1.6–2.0)	1.7 (1.5–1.9)
Other legal problem	748 (4.0)	378 (4.0)	370 (4.0)	—††	1.0 (0.8–1.1)	1.0 (0.9–1.2)
Physical health problem	4,179 (22.3)	2,012 (21.4)	2,167 (23.2)	<0.01	1.1 (1.0–1.2)	1.0 (1.0–1.1)
Job/Financial problem <sup>§§</sup>	2941 (16.2)	1530 (16.8)	1411 (15.6)	<0.05	0.9 (0.8–1.0)	0.9 (0.8–1.0)
Eviction or loss of home	722 (3.8)	317 (3.4)	405 (4.3)	<0.01	1.3 (1.1–1.5)	1.4 (1.2–1.6)
School problem <sup>¶¶</sup>	162 (19.9)	70 (17.8)	92 (21.9)	—††	1.3 (0.9–1.8)	1.3 (0.9–1.9)
Recent release from an institution <sup>***</sup>	1,412 (7.6)	941 (10.2)	471 (5.1)	<0.01	0.5 (0.4–0.5)	0.5 (0.4–0.5)
Jail/Prison/Detention facility	203 (14.4)	82 (8.7)	121 (25.7)	<0.01	3.6 (2.7–4.9)	4.5 (3.2–6.4)
Hospital	517 (36.6)	311 (33.0)	206 (43.7)	<0.01	1.6 (1.3–2.0)	1.3 (1.0–1.7)
Psychiatric hospital/institution	469 (33.2)	439 (46.7)	30 (6.4)	<0.01	0.1 (0.1–0.1)	0.1 (0.1–0.1)
Other (includes alcohol/SA treatment facilities)	223 (15.8)	109 (11.6)	114 (24.2)	<0.01	2.4 (1.8–3.3)	2.5 (1.8–3.3)
<b>Recent or Impending Crisis</b>						
Crisis within past or upcoming 2 weeks <sup>†††</sup>	5,525 (29.4)	2,444 (26.0)	3,081 (32.9)	<0.01	1.4 (1.3–1.5)	1.4 (1.3–1.5)
Intimate partner problem crisis	1968 (35.6)	854 (34.9)	1114 (36.2)	—††	1.1 (0.9–1.2)	1.1 (0.9–1.2)
Physical health problem crisis	739 (13.4)	315 (12.9)	424 (13.8)	—††	1.1 (0.9–1.3)	1.0 (0.8–1.2)
Criminal legal problem crisis	621 (11.2)	203 (8.3)	418 (13.6)	<0.01	1.7 (1.5–2.1)	1.6 (1.3–1.9)
Family relationship problem crisis	430 (7.8)	212 (8.7)	218 (7.1)	<0.05	0.8 (0.7–1.0)	0.9 (0.7–1.1)
Job problem crisis	354 (6.4)	191 (7.8)	163 (5.3)	<0.01	0.7 (0.5–0.8)	0.7 (0.5–0.8)
<b>Suicide event/history</b>						
Left a note	6,468 (34.5)	3,182 (33.8)	3,286 (35.1)	—††	1.1 (1.0–1.1)	1.2 (1.1–1.2)
Disclosed suicide intent	4,405 (23.5)	2,306 (24.5)	2,099 (22.4)	<0.01	0.9 (0.8–1.0)	0.9 (0.8–0.9)
History of ideation	5,990 (31.9)	3,838 (40.8)	2,152 (23.0)	<0.01	0.4 (0.4–0.5)	0.4 (0.4–0.5)
History of attempts	3,732 (19.9)	2,770 (29.4)	962 (10.3)	<0.01	0.3 (0.3–0.3)	0.3 (0.3–0.3)

**Abbreviations:** ADD/ADHD = attention deficit disorder/attention deficit hyperactivity disorder; OR = odds ratio; PTSD = posttraumatic stress disorder; SA = substance abuse.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

† Decedent had been identified as having a current diagnosis of mental health problem in coroner/medical examiner or law enforcement reports.

§ OR reflects the risk among those without known mental health problem relative to those with known mental health problem.

¶ Logistic regression was used to estimate adjusted OR with 95% CIs after controlling for age, sex, race, and ethnicity. Known mental health problem was the reference group.

\*\* Includes decedents with one or more diagnosed current mental health problems, which are not mutually exclusive. Therefore, sums of percentages for the diagnosed conditions exceed 100%. Denominator includes the number of decedents with one or more current diagnosed mental health problems.

†† Not significant.

§§ Denominator is decedents aged ≥18 years.

¶¶ Denominator is decedents aged 10–18 years.

\*\*\* Denominator of institution subgroup is decedents with recent release from an institution. Recent release from an institution is defined as having occurred within the past month.

††† Denominator of crisis subgroup is decedents with any crisis within past or upcoming 2 weeks. Crises depicted here represent the most commonly occurring categories.

**FIGURE. Percentage change in annual suicide rate,\* by state — United States, from 1999–2001 to 2014–2016<Fig\_Small></Fig\_Small>**

The figure above is a map of the United States showing the percentage change in annual suicide rate, by state, from 1999 to 2016.

\* Per 100,000 population, age-adjusted to the 2000 U.S. standard population.



# Vital Signs: Trends in State Suicide Rates — United States, 1999–2016 and Circumstances Contributing to Suicide — 27 States, 2015

Deborah M. Stone, ScD<sup>1</sup>; Thomas R. Simon PhD<sup>1</sup>; Katherine A. Fowler, PhD<sup>1</sup>; Scott R. Kegler, PhD<sup>2</sup>; Keming Yuan, MS<sup>1</sup>; Kristin M. Holland, PhD<sup>1</sup>; Asha Z. Ivey-Stephenson, PhD<sup>1</sup>; Alex E. Crosby, MD<sup>1</sup>

## Abstract

**Introduction:** Suicide rates in the United States have risen nearly 30% since 1999, and mental health conditions are just one factor contributing to suicide. Examining state-level trends in suicide and the multiple circumstances contributing to it can inform comprehensive state suicide prevention planning.

**Methods:** Trends in age-adjusted suicide rates among persons aged  $\geq 10$  years, by state and sex, across six consecutive 3-year periods (1999–2016), were assessed using data from the National Vital Statistics System for 50 states and the District of Columbia (DC). Data from the National Violent Death Reporting System, covering 27 states in 2015, were used to examine contributing circumstances among decedents with and without known mental health conditions.

**Results:** During 1999–2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases  $>30\%$ . Rates increased significantly among males and females in 34 and 43 states, respectively. Fifty-four percent of decedents in 27 states in 2015 did not have a known mental health condition. Among decedents with available information, several circumstances were significantly more likely among those without known mental health conditions than among those with mental health conditions, including relationship problems/loss (45.1% versus 39.6%), life stressors (54.2% versus 49.7%), and recent/impending crises (32.9% versus 26.0%), but these circumstances were common across groups.

**Conclusions:** Suicide rates increased significantly across most states during 1999–2016. Various circumstances contributed to suicides among persons with and without known mental health conditions.

**Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach to prevent suicide risk before it occurs, identify and support persons at risk, prevent reattempts, and help friends and family members in the aftermath of a suicide.

## Introduction

In 2016, nearly 45,000 suicides (15.6/100,000 population [age-adjusted]) occurred in the United States among persons aged  $\geq 10$  years (1). From 1999 to 2015, suicide rates increased among both sexes, all racial/ethnic groups, and all urbanization levels (2,3). Suicide rates have also increased among persons in all age groups  $<75$  years, with the highest-largest percent increase (45%; from 13.2 per 100,000 persons [1999] to 19.2 per 100,000 [2016]) and the greatest number of suicides (n=232,108 between 1999 and 2016) occurring among adults aged 45–64 years. s-among those aged 10–14 years (76% increase from 1.2 to 2.1 per 100,000 in 1999 and 2016, respectively) and those aged 45–64 years a(45% increase from 13.2 to 19.2 per 100,000 in 1999 and 2016, respectively) (1,3). Suicide is the 10th leading cause of death and is one of just three leading causes that are increasing (1,4). In addition, rates of emergency department visits for nonfatal self-harm, a main risk factor for suicide, increased 42% from 2001 to 2016 (1). Together, suicides and self-harm injuries cost the nation approximately \$69 billion in direct medical and work loss costs (1).

The National Strategy for Suicide Prevention (NSSP) (5) calls for a public health approach to suicide prevention with efforts spanning multiple levels (i.e., individual, family/relationship, community, and societal). Such a comprehensive approach underscores that suicide is rarely caused by any single factor, but



rather, is determined by multiple factors. Despite NSSP guidance, suicide prevention largely focuses on mental health conditions alone by identifying suicidal persons, providing treatment for mental health conditions, and preventing reattempts (6). In addition to mental health conditions and prior suicide attempts, other contributing circumstances include social and economic problems, access to lethal means (e.g., substances, firearms) among persons at risk, and poor coping and problem-solving skills (5). Expanded awareness of these additional circumstances contributing to suicide risk and action to address them can help reach the national goal, established by the National Action Alliance of Suicide Prevention and the American Foundation for Suicide Prevention, of reducing the annual suicide rate 20% by 2025 (7). To assist states in achieving this goal, CDC analyzed state-specific trends in suicide rates and assessed the multiple contributing factors to suicide; this report presents options for multilevel comprehensive suicide prevention based on the best available evidence.

## Methods

Suicide rates were analyzed for persons aged  $\geq 10$  years ~~only~~, as determining suicidal intent in younger children can be difficult (8). Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases, Tenth Revision*, underlying-cause-of-death codes X60–X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive 3-year aggregate periods spanning 1999–2016 (1999–2001; 2002–2004; 2005–2007; 2008–2010; 2011–2013; and 2014–2016). Rate estimates were age-adjusted to the U.S. 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same 3-year data aggregates, employing weighted least-squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes.

Characteristics of persons aged  $\geq 10$  years who died by suicide, with and without known mental health conditions, and the circumstances surrounding the suicides were compared in the 27 states\* with complete data participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines mental health conditions as disorders and syndromes listed in the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (9), with the exception of alcohol and other substance use disorders, which are captured separately in NVDRS. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. A range of circumstances (*i.e.*, relationship problems, life stressors, and recent or impending crises) ~~has~~ been identified as potential risk factors for suicide. Circumstances captured by NVDRS are those identified by next of kin as having actively contributed to a person's suicide. Decedents could have experienced multiple circumstances. Decedents with and without known mental health conditions were compared using Chi-square tests. Logistic regression analyses estimated adjusted odds ratios (aORs) with 95% confidence intervals (CIs), controlling for age group, sex, and race/ethnicity.

## Results

The most recent overall suicide rates (representing 2014–2016) varied fourfold, from 6.9 (DC) to 29.2 (Montana) per 100,000 persons per year (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>). Across the study period, rates increased in all states except Nevada (where the rate was consistently high throughout the study period), with absolute increases ranging from 0.8 per 100,000 (Delaware) to 8.1 (Wyoming). Percentage increases in rates ranged from 5.9% (Delaware) to 57.6% (North Dakota), with increases  $>30\%$  observed in 25 states (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>) (Figure).



Modeled suicide rate trends indicated significant increases in 44 states, among males (34 states) and females (43 states), as well as for the United States overall (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>). Nationally, the model-estimated average annual percentage change for the overall suicide rate was an increase of 1.5%. By sex, estimated national rate trends further indicated significant average annual percentage change increases for males (1.1%) and females (2.6%) (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>).

Suicide decedents without known mental health conditions (11,039) were compared with those with known mental health conditions (9,407) in 27 states. Whereas all decedents were predominately male (76.8%) (Table 1) and non-Hispanic white (83.6%), those without known mental health conditions, relative to those with mental health conditions, were more likely to be male (83.6% versus 68.8%; odds ratio (OR) = 2.3, 95% CI = 2.2–2.5) and belong to a racial/ethnic minority (OR range = 1.2–2.0). Suicide decedents without known mental health conditions also had significantly higher odds of perpetrating homicide followed by -suicide (aOR = 2.9, 95% CI = 2.2–3.8). Among adult decedents aged ≥18 years, 20.1% of those without known mental health conditions and 15.3% of those with mental health conditions had ever served in the U.S. military or were serving at the time of death.

Whereas firearms were the most common method of suicide overall (48.5%) and among decedents with and without mental health conditions, decedents without known mental health conditions, relative to those with known mental health conditions, were more likely to die by firearm (55.3% versus 40.6%) and less likely to die by hanging/strangulation/suffocation (26.9% versus 31.3%) or poisoning (10.4% versus 19.8%). These differences remained significant in the adjusted models.

Toxicology testing was less likely to be performed for decedents without known mental health conditions. Among those with toxicology results, decedents without known mental health conditions were less likely to test positive for any substance overall (aOR = 0.8, 95% CI = 0.7–0.8), including opioids (aOR = 0.90, 95% CI = 0.81–0.99), but were more likely to test positive for alcohol (aOR = 1.2, 95% CI = 1.1–1.3).

Information on circumstances surrounding suicide were available for all decedents with mental health conditions (n = 9,407) and approximately 85% of those without known mental health conditions (n = 9,357) in 27 states (Table 2). Persons without known mental health conditions were less likely to have any substance use disorders (aOR = 0.7, 95% CI = 0.7–0.8) than were persons with known mental health conditions. Whereas two thirds of decedents with known mental health conditions had a history of mental health or substance use treatment (67.2%), just over half (54.0%) were in treatment at the time of death.

Decedents without known mental health conditions had a significantly higher likelihood of any relationship problem/loss (45.1%) than did those with known mental health conditions (39.6%), specifically intimate partner problems (30.2% versus 24.1%), arguments/conflicts (17.5% versus 13.6%), and recently perpetrating interpersonal violence in the past month (3.0% versus 1.4%). Decedents without known mental health conditions were also more likely than were those with known mental health conditions to have experienced any life stressors (54.2% versus 49.7%) such as criminal/legal problems (10.7% versus 6.2%) or eviction/loss of home (4.3% versus 3.4%) and were more likely to have had a recent or impending (within the preceding or upcoming 2 weeks, respectively) crisis (a current or acute event thought to contribute to the suicide) (32.9% versus 26.0%). All of these differences remained significant in the adjusted models. Physical health problems and ~~job~~ financial problems were commonly contributing stressors among both persons without mental health conditions (23.2% and 15.6%, respectively) and those with mental health conditions (21.4% and 16.8%, respectively). Similarly, among all persons with recent crises, intimate partner problems were the most common types and did not differ by group.

Decedents without known mental health conditions had significantly lower odds of recent release from any institution (aOR = 0.5, 95% CI = 0.4–0.5). Among those recently released, decedents without known mental health conditions were significantly more likely than decedents with mental health conditions to have been released from a correctional facility (25.7% versus 8.7%), hospital (43.7% versus 33.0%), or



other facility (e.g., alcohol/substance treatment) (24.2% versus 11.6%) ~~than were those recently released with a known mental health condition.~~ Among decedents with known mental health conditions who were recently released from an institution, 46.7% were released from psychiatric facilities.

**Comment [za9]:** Should this be two sets of parentheses or just one?

Decedents without known mental health conditions were significantly less likely to have a history of suicidal ideation (23.0%) or prior suicide attempts (10.3%) compared with those with known mental health conditions (40.8% and 29.4%, respectively). Suicide intent was disclosed by 22.4% and 24.5% of persons without and with known mental health conditions, respectively.

## Conclusions and Comments

During 1999–2016, suicide rates increased significantly in 44 states, and 25 states experienced increases >30%. Rates increased significantly among males in 34 states, and females in 43 states. Additional research into the specific causes of these trends is needed. Data from the 27 states participating in NVDRS provide important insight into circumstances surrounding suicide and can help states identify prevention priorities.

Suicidologists regularly state that suicide is not caused by a single factor (5); however, suicide prevention is often oriented toward ~~mental health conditions alone vis-à-vis~~ downstream identification of suicidal persons, treatment of mental health conditions, and prevention of reattempts. This study found that approximately half of suicide decedents in NVDRS did not have a known mental health condition, indicating that additional focus on nonmental health factors further upstream could provide important information for a public health approach (10). Those without a known mental health condition suffered more from relationship problems and other life stressors such as criminal/legal matters, eviction/loss of home, and recent or impending crises.

Similarly, persons with mental health conditions ~~also~~ often experienced ~~nonmental health factors such as~~ relationship problems and other life stressors such as job/financial or physical health problems. These findings point to the need to ~~both help persons manage mental health conditions and to~~ prevent the circumstances associated with their onset ~~of mental health conditions in the first place, as well and~~ support persons with known mental health conditions to decrease their risk for poor outcomes (11). Two thirds of suicide decedents with mental health conditions had a history of treatment for ~~any~~ mental health ~~and/or~~ substance ~~use or both disorders~~, with approximately half in treatment when they died. This finding suggests the need for additional safety supports, including broader implementation of affordable and effective treatment modalities, such as doctor-patient collaborative care models and proven cognitive-behavioral therapies. In addition, increased access to behavioral health providers in underserved areas is needed, as is expansion of health care systems that integrate physical and behavioral health, with a priority on suicide prevention and patient safety, especially through care transitions (12).

Comprehensive statewide suicide prevention activities are needed to address the full range of factors contributing to suicide. Prevention strategies include strengthening economic supports (e.g., housing stabilization policies, household financial support); teaching coping and problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in life; promoting social connectedness to increase a sense of belonging and access to informational, tangible, emotional, and social support; and identifying and better supporting persons at risk (e.g., military veterans, persons with physical/mental health conditions) (12). Other strategies include creating protective environments (e.g., reducing access to lethal means among persons at risk of suicide, creating organizational and workplace policies to promote help-seeking, easing transitions into and out of work for persons with mental health conditions and other life challenges), strengthening access and delivery of care ~~for persons at risk~~, supporting family and friends after a suicide, and assuring the media follow safe reporting recommendations (12). Some states, such as Colorado, are planning to implement such a comprehensive approach to suicide prevention (10).



The findings in this report are subject to at least three limitations. First, in the state-level analysis, rankings for four states (Maryland, Massachusetts, Rhode Island, and Utah) might have been affected by large proportions of injury deaths of undetermined intent (potentially biasing reported suicide rates downward) or decreased percentages of such deaths over time (potentially biasing estimated rate trends upward). Second, NVDRS is not yet nationally representative; the 27 states included represent 49.6% of the population (<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml>). Finally, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the extent of informant knowledge can affect data completeness and accuracy. Studies that include more in-depth interviews with next-of-kin often identify greater attributions to mental disorders (13); however, many methodological variations across studies exist (14). It is likely that some persons without known mental health conditions in the current study were experiencing mental health challenges that were unknown, and hence underreported by key informants. Nonetheless, the high prevalence of diverse contributing circumstances among those with and without known mental health conditions suggests the importance of addressing the broad range of factors that contribute to suicide.

Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are available. States and communities can use data from NVDRS and resources such as CDC's Preventing Suicide: a Technical Package of Policy, Programs, and Practices (12) to better understand suicide in their populations, prioritize evidence-based comprehensive suicide prevention, and save lives.

#### Acknowledgments

Robert Anderson, Holly Hedegaard, Margaret Warner, Division of Vital Statistics, National Center for Health Statistics, CDC.

#### Conflict of Interest

No conflicts of interest were reported.

<sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis, Research, and Practice Integration, National Center for Injury Prevention and Control, CDC.

**Corresponding author:** Deborah M. Stone, [dstone3@cdc.gov](mailto:dstone3@cdc.gov), 770-488-3942.

#### References

1. CDC. Web-based Injury Statistics Query and Reporting System (WISQARS). Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018. In.
2. Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide trends among and within urbanization levels by sex, race/ethnicity, age group, and mechanism of death—United States, 2001–2015. *MMWR Surveill Summ* 2017;66(No. SS-18).
3. Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999–2014. NCHS data brief no 241. Hyattsville, MD: US Department of Health and Human Services, CDC, National Center for Health Statistics; 2016. <https://www.cdc.gov/nchs/data/databriefs/db241.pdf>
4. Kochanek K, Murphy S, Xu J, Arias E. Mortality in the United States, 2016. NCHS data brief no 293. Hyattsville, MD: US Department of Health and Human Services, CDC, National Center for Health Statistics; 2017. <https://www.cdc.gov/nchs/data/databriefs/db293.pdf>
5. Office of the Surgeon General; National Action Alliance for Suicide Prevention. 2012 National strategy for suicide prevention: goals and objectives for action. Washington, DC: US Department of Health and Human Services, Office of the Surgeon General; 2012. <https://www.surgeongeneral.gov/library/reports/national-strategy-suicide-prevention/full-report.pdf>

6. Zalsman G, Hawton K, Wasserman D, et al. Suicide prevention strategies revisited: 10-year systematic review. *Lancet Psychiatry* 2016;3:646–59.
7. Torguson K, O'Brien A. Leading suicide prevention efforts unite to address rising national suicide rate. Washington, DC: American Foundation for Suicide Prevention; 2017. <https://afsp.org/leading-suicide-prevention-efforts-unite-address-rising-national-suicide-rate/>
8. Crepeau-Hobson F. The psychological autopsy and determination of child suicides: a survey of medical examiners. *Arch Suicide Res* 2010;14:24–34.
9. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5). Washington, DC: American Psychiatric Association; 2013.
10. Caine ED, Reed J, Hindman J, Quinlan K. Comprehensive, integrated approaches to suicide prevention: practical guidance. *Inj Prev* 2017. Epub December 20, 2017.
11. World Health Organization. Risks to mental health: an overview of vulnerabilities and risk factors. Geneva, Switzerland: World Health Organization; 2012.
12. Stone DM, Holland KM, Bartholow BN, Crosby AE, Davis SP, Wilkins N. Preventing suicide: a technical package of policy, programs, and practice. Atlanta, GA: US Department of Health and Human Services, CDC; 2017. <https://www.cdc.gov/violenceprevention/pdf/suicidetechnicalpackage.pdf>
13. Milner A, Svetlicic J, De Leo D. Suicide in the absence of mental disorder? A review of psychological autopsy studies across countries. *Int J Soc Psychiatry* 2013;59:545–54.
14. Pouliot L, De Leo D. Critical issues in psychological autopsy studies. *Suicide Life Threat Behav* 2006;36:491–510.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

## Summary

### What is already known about this topic?

In 2016, nearly 45,000 persons died by suicide in the United States. Mental health conditions can contribute to suicide.

### What is added by this report?

During 1999–2016, suicide rates increased in nearly every state, including >30% increases in 25 states. 2015 data from 27 states indicate 54% of suicide decedents were not known to have mental health conditions. Other contributors included relationship, substance use, health, and job or financial problems, among others.

### What are the implications for public health practice?

A comprehensive approach using proven prevention strategies, such as those in CDC's Technical Package for Suicide Prevention, can help reach the national goal of reducing the annual suicide rate 20% by 2025.



**TABLE 1. Selected demographic and descriptive characteristics of suicides among persons aged ≥10 years with and without known mental health conditions — National Violent Death Reporting System, 27 states,\* 2015**

Characteristic	Total (N = 20,446)	Known mental health condition† (n = 9,407)	No known mental health condition (n = 11,039)	P-value	OR‡ (95% CI)	Adjusted OR† (95% CI)
<b>Sex</b>						
Male	15,702 (76.8)	6,469 (68.8)	9,233 (83.6)	<0.01	2.3 (2.2–2.5)	NA
Female	4,744 (23.2)	2,938 (31.2)	1,806 (16.4)	<0.01	0.4 (0.4–0.5)	NA
<b>Age (yrs)**</b>						
10–24	2,804 (13.7)	1,211 (12.9)	1,593 (14.4)	<0.01	1.1 (1.1–1.2)	NA
25–44	6,456 (31.6)	3,036 (32.3)	3,420 (31.0)	<0.05	0.9 (0.9–1.0)	NA
45–64	7,718 (37.7)	3,820 (40.6)	3,898 (35.3)	<0.01	0.8 (0.8–0.8)	NA
≥65	3,468 (17.0)	1,340 (14.2)	2,128 (19.3)	<0.01	1.4 (1.3–1.5)	NA
<b>Race/Ethnicity</b>						
White, non-Hispanic	17,102 (83.6)	8,165 (86.8)	8,937 (81.0)	<0.01	0.6 (0.6–0.7)	NA
Black, non-Hispanic	1,228 (6.0)	411 (4.4)	817 (7.4)	<0.01	1.7 (1.5–2.0)	NA
American Indian/Alaska Native, non-Hispanic	378 (1.8)	112 (1.2)	266 (2.4)	<0.01	2.0 (1.6–2.6)	NA
Asian, non-Hispanic	576 (2.8)	235 (2.5)	341 (3.1)	<0.05	1.2 (1.1–1.5)	NA
Hispanic	1,096 (5.4)	463 (4.9)	633 (5.7)	<0.05	1.2 (1.0–1.3)	NA
Other	66 (0.3)	21 (0.2)	45 (0.4)	<0.05	1.8 (1.1–3.1)	NA
<b>Extended demographics</b>						
Ever served in military††	3,429 (17.8)	1,354 (15.3)	2,075 (20.1)	<0.01	1.4 (1.3–1.5)	1.1 (1.0–1.1)
Homeless	240 (1.2)	104 (1.1)	136 (1.3)		1.1 (0.9–1.5)	1.2 (0.9–1.5)
<b>Incident Type</b>						
Single suicide	20,063 (98.2)	9,318 (99.1)	10,745 (97.4)	<0.01	0.3 (0.3–0.4)	0.4 (0.3–0.5)
Homicide followed by suicide	319 (1.6)	64 (0.7)	255 (2.3)	<0.01	3.5 (2.6–4.5)	2.9 (2.2–3.8)
Multiple suicides	64 (0.3)	25 (0.3)	39 (0.4)	NS	1.3 (0.8–2.2)	1.6 (0.9–2.6)
<b>Method</b>						
Firearm	9,909 (48.5)	3,821 (40.6)	6,088 (55.3)	<0.01	1.8 (1.7–1.9)	1.6 (1.5–1.7)
Hanging/Strangulation/Suffocation	5,907 (28.9)	2,940 (31.3)	2,967 (26.9)	<0.01	0.8 (0.8–0.9)	0.8 (0.7–0.8)
Poisoning	3,003 (14.7)	1,861 (19.8)	1,142 (10.4)	<0.01	0.5 (0.4–0.5)	0.6 (0.6–0.7)
<b>Substance class causing death§§</b>						
Other (e.g., over-the-counter)	1,021 (34.0)	666 (35.8)	355 (31.1)	<0.01	0.8 (0.7–0.9)	0.9 (0.7–1.0)
Opioids	944 (31.4)	608 (32.7)	336 (29.4)	NS	0.9 (0.7–1.0)	0.9 (0.8–1.1)
Antidepressants	800 (26.6)	644 (34.6)	156 (13.7)	<0.01	0.3 (0.2–0.4)	0.3 (0.3–0.4)
Benzodiazepines	624 (20.8)	468 (25.1)	156 (13.7)	<0.01	0.5 (0.4–0.6)	0.5 (0.4–0.6)
Antipsychotics	219 (7.3)	195 (10.5)	24 (2.1)	<0.01	0.2 (0.1–0.3)	0.2 (0.1–0.3)
Other	1,595 (7.8)	780 (8.3)	815 (7.4)	<0.05	0.9 (0.8–1.0)	0.9 (0.8–1.0)
<b>Toxicology Results</b>						
Any toxicology testing	13,317 (65.1)	6,658 (70.8)	6,659 (60.3)	<0.01	0.6 (0.6–0.7)	0.7 (0.6–0.7)
Positive for ≥1 substance¶¶	9,913 (74.4)	5,192 (78.0)	4,721 (70.9)	<0.01	0.7 (0.6–0.7)	0.8 (0.7–0.8)
<b>Substance detected***</b>						
<b>Alcohol</b>						
Tested	10,950 (53.6)	5,409 (57.5)	5,541 (50.2)	<0.01	0.7 (0.7–0.8)	0.8 (0.7–0.8)
Positive	4,442 (40.6)	2,115 (39.1)	2,327 (42.0)	<0.01	1.1 (1.0–1.2)	1.2 (1.1–1.3)
<b>Opioids</b>						
Tested	8,554 (41.8)	4,258 (45.3)	4,296 (38.9)	<0.01	0.8 (0.7–0.8)	0.8 (0.8–0.9)

Positive	2,279 (26.6)	1,238 (29.1)	1,041 (24.2)	<0.01	0.8 (0.7–0.9)	0.9 (0.8–1.0)
Benzodiazepines						
Tested	8,124 (39.7)	4,226 (44.9)	3,898 (35.3)	<0.01	0.7 (0.6–0.7)	0.7 (0.7–0.8)
Positive	2,464 (30.3)	1,639 (38.8)	825 (21.2)	<0.01	0.4 (0.4–0.5)	0.5 (0.5–0.6)
Cocaine						
Tested	7,978 (39.0)	3,866 (41.1)	4,112 (37.2)	<0.01	0.9 (0.8–0.9)	0.9 (0.9–1.0)
Positive	499 (6.3)	216 (5.6)	283 (6.9)	<0.05	1.2 (1.0–1.5)	1.2 (1.0–1.5)
Amphetamines						
Tested	7,615 (37.2)	3,696 (39.3)	3,919 (35.5)	<0.01	0.9 (0.8–0.9)	0.9 (0.8–0.9)
Positive	736 (9.7)	376 (10.2)	360 (9.2)	NS	0.9 (0.8–1.0)	1.0 (0.8–1.1)
Marijuana						
Tested	6,569 (32.1)	3,127 (33.2)	3,442 (31.2)	<0.01	0.9 (0.9–1.0)	0.9 (0.9–1.0)
Positive	1,471 (22.4)	710 (22.7)	761 (22.1)	NS	1.0 (0.9–1.1)	0.9 (0.8–1.0)
Antidepressants						
Tested	5,425 (26.5)	3,103 (33.0)	2,322 (21.0)	<0.01	0.5 (0.5–0.6)	0.6 (0.6–0.7)
Positive	2,214 (40.8)	1,735 (55.9)	479 (20.6)	<0.01	0.2 (0.2–0.2)	0.2 (0.2–0.3)

**Abbreviation:** CI = confidence interval; NA = not adjusted; NS = not significant; OR = odds ratio.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

† Decedent had been identified as having a current diagnosis of mental health condition in coroner/medical examiner or law enforcement reports.

§ OR reflects the risk among those without known mental health condition relative to those with known mental health condition.

¶ Logistic regression was used to estimate adjusted OR with 95% CIs after controlling for age, sex, race, and ethnicity. Known mental health condition was used as the reference group.

\*\* Decedents were aged ≥10 years, as per standard in the suicide prevention literature.

†† Denominator is decedents aged ≥18 years with reported military service status.

§§ Denominator is decedents who died by poisoning, including overdose.

¶¶ Denominator is decedents with any toxicology testing.

\*\*\* Denominator for each positive group is the number tested for the substance in that group.

**TABLE 2. Circumstances preceding suicide among decedents aged ≥10 years with and without known mental health conditions — National Violent Death Reporting System, 27 states,\* 2015**

Characteristic	Total	Known mental health condition† no. (%)	No known mental health condition no. (%)	P-value	OR§ (95% CI)	Adjusted OR¶ (95% CI)
<b>Suicide with known circumstances</b>	18,764 (91.8)	9,407 (100)	9,357 (84.8)	<0.01	NA	NA
<b>Mental health</b>						
<b>Any Current Diagnosed Mental Health Condition**</b>						
Depression/Dysthymia		7,076 (75.2)	NA	NA	NA	NA
Anxiety disorder		1,579 (16.8)	NA	NA	NA	NA
Bipolar disorder		1,431 (15.2)	NA	NA	NA	NA
Schizophrenia		509 (5.4)	NA	NA	NA	NA
PTSD		424 (4.5)	NA	NA	NA	NA
ADD/ADHD		226 (2.4)	NA	NA	NA	NA



Not specified		760 (8.1)	NA	NA	NA	NA
Current depressed mood		3,962 (42.1)	3,076 (32.9)	<0.01	0.7 (0.6–0.7)	0.7 (0.6–0.7)
<b>Substance problems</b>						
Any Current substance problem	5,319 (28.3)	2,976 (31.6)	2,343 (25.0)	<0.01	0.7 (0.7–0.8)	0.7 (0.7–0.8)
Alcohol problem	3,268 (17.4)	1,862 (19.8)	1,406 (15.0)	<0.01	0.7 (0.7–0.8)	0.7 (0.7–0.8)
Other substance problem	3,084 (16.4)	1,768 (18.8)	1,316 (14.1)	<0.01	0.7 (0.7–0.8)	0.7 (0.7–0.8)
<b>Treatment</b>						
Current mental health/substance abuse treatment	5,141 (27.4)	5,077 (54.0)	64 (0.7)	<0.01	0.01 (0.01–0.01)	0.01 (0.01–0.01)
Ever treated for mental health/substance problem	6,717 (35.8)	6,323 (67.2)	394 (4.2)	<0.01	0.02 (0.02–0.02)	0.02 (0.02–0.03)
<b>Relationship problems/loss</b>						
Any relationship problem/loss	7,948 (42.4)	3,726 (39.6)	4,222 (45.1)	<0.01	1.3 (1.2–1.3)	1.3 (1.2–1.4)
Intimate partner problem	5,098 (27.2)	2,270 (24.1)	2,828 (30.2)	<0.01	1.4 (1.3–1.5)	1.4 (1.3–1.5)
Perpetrator of interpersonal violence in past month	414 (2.2)	131 (1.4)	283 (3.0)	<0.01	2.2 (1.8–2.7)	2.0 (1.6–2.4)
Victim of interpersonal violence in past month	84 (0.4)	53 (0.6)	31 (0.3)	<0.05	0.6 (0.4–0.9)	0.8 (0.5–1.2)
Family relationship problem	1,671 (8.9)	873 (9.3)	798 (8.5)	NS	0.9 (0.8–1.0)	1.0 (0.9–1.1)
Other relationship problem (nonintimate)	403 (2.1)	202 (2.1)	201 (2.1)	NS	1.0 (0.8–1.2)	1.1 (0.9–1.3)
Argument or conflict (not specified)	2,914 (15.5)	1,278 (13.6)	1,636 (17.5)	<0.01	1.3 (1.2–1.5)	1.4 (1.3–1.5)
Death of a loved one (any)	1,497 (8.0)	826 (8.8)	671 (7.2)	<0.01	0.8 (0.7–0.9)	0.9 (0.8–0.9)
Nonsuicide death	1,181 (6.3)	647 (6.9)	534 (5.7)	<0.01	0.8 (0.7–0.9)	0.9 (0.8–1.0)
Suicide of family or friend	379 (2.0)	217 (2.3)	162 (1.7)	<0.01	0.7 (0.6–0.9)	0.8 (0.7–1.0)
<b>Other life stressors</b>						
Any life stressor	9,743 (51.9)	4,675 (49.7)	5,068 (54.2)	<0.01	1.2 (1.1–1.3)	1.1 (1.1–1.2)
Recent criminal legal problem	1,588 (8.5)	586 (6.2)	1,002 (10.7)	<0.01	1.8 (1.6–2.0)	1.7 (1.5–1.9)
Other legal problem	748 (4.0)	378 (4.0)	370 (4.0)	NS	1.0 (0.8–1.1)	1.0 (0.9–1.2)
Physical health problem	4,179 (22.3)	2,012 (21.4)	2,167 (23.2)	<0.01	1.1 (1.0–1.2)	1.0 (1.0–1.1)
Job/Financial problem <sup>††</sup>	2941 (16.2)	1530 (16.8)	1411 (15.6)	<0.05	0.9 (0.8–1.0)	0.9 (0.8–1.0)
Eviction or loss of home	722 (3.8)	317 (3.4)	405 (4.3)	<0.01	1.3 (1.1–1.5)	1.4 (1.2–1.6)
School problem <sup>§§</sup>	162 (19.9)	70 (17.8)	92 (21.9)	NS	1.3 (0.9–1.8)	1.3 (0.9–1.9)
Recent release from an institution <sup>¶¶</sup>	1,412 (7.6)	941 (10.2)	471 (5.1)	<0.01	0.5 (0.4–0.5)	0.5 (0.4–0.5)
Jail/Prison/Detention facility	203 (14.4)	82 (8.7)	121 (25.7)	<0.01	3.6 (2.7–4.9)	4.5 (3.2–6.4)
Hospital	517 (36.6)	311 (33.0)	206 (43.7)	<0.01	1.6 (1.3–2.0)	1.3 (1.0–1.7)
Psychiatric hospital/institution	469 (33.2)	439 (46.7)	30 (6.4)	<0.01	0.1 (0.1–0.1)	0.1 (0.1–0.1)
Other (includes alcohol/SA treatment facilities)	223 (15.8)	109 (11.6)	114 (24.2)	<0.01	2.4 (1.8–3.3)	2.5 (1.8–3.3)
<b>Crisis within past or upcoming 2 weeks<sup>***</sup></b>	5,525 (29.4)	2,444 (26.0)	3,081 (32.9)	<0.01	1.4 (1.3–1.5)	1.4 (1.3–1.5)
Intimate partner problem crisis	1968 (35.6)	854 (34.9)	1114 (36.2)	NS	1.1 (0.9–1.2)	1.1 (0.9–1.2)
Physical health problem crisis	739 (13.4)	315 (12.9)	424 (13.8)	NS	1.1 (0.9–1.3)	1.0 (0.8–1.2)
Criminal legal problem crisis	621 (11.2)	203 (8.3)	418 (13.6)	<0.01	1.7 (1.5–2.1)	1.6 (1.3–1.9)
Family relationship problem crisis	430 (7.8)	212 (8.7)	218 (7.1)	<0.05	0.8 (0.7–1.0)	0.9 (0.7–1.1)
Job problem crisis	354 (6.4)	191 (7.8)	163 (5.3)	<0.01	0.7 (0.5–0.8)	0.7 (0.5–0.8)
<b>Suicide event/history</b>						
Left a note	6,468 (34.5)	3,182 (33.8)	3,286 (35.1)	NS	1.1 (1.0–1.1)	1.2 (1.1–1.2)
Disclosed suicide intent	4,405 (23.5)	2,306 (24.5)	2,099 (22.4)	<0.01	0.9 (0.8–1.0)	0.9 (0.8–0.9)
History of ideation	5,990 (31.9)	3,838 (40.8)	2,152 (23.0)	<0.01	0.4 (0.4–0.5)	0.4 (0.4–0.5)
History of attempts	3,732 (19.9)	2,770 (29.4)	962 (10.3)	<0.01	0.3 (0.3–0.3)	0.3 (0.3–0.3)

**Abbreviations:** ADD/ADHD = attention deficit disorder/attention deficit hyperactivity disorder; N/A = not applicable; OR = odds ratio; PTSD = posttraumatic stress disorder; SA = substance abuse.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

**Comment [zaf9]:** Teresa, I think all of the diagnoses need to be indented to better indicate that 'current depressed mood' is not a diagnosis (but it still falls under mental health more broadly).

† Decedent had been identified as having a current diagnosis of mental health condition in coroner/medical examiner or law enforcement reports.

§ OR reflects the risk among those without known mental health condition relative to those with known mental health condition.

¶ Logistic regression was used to estimate adjusted OR with 95% CIs after controlling for age, sex, race, and ethnicity. Known mental health condition was the reference group.

\*\* Includes decedents with one or more diagnosed current mental health conditions, which are not mutually exclusive. Therefore, sums of percentages for the diagnosed conditions exceed 100%. Denominator includes the number of decedents with one or more current diagnosed mental health conditions.

†† Denominator is decedents aged  $\geq 18$  years.

§§ Denominator is decedents aged 10–18 years.

¶¶ Denominator of institution subgroup is decedents with recent release from an institution. Recent release from an institution is defined as having occurred within the past month.

\*\*\* Denominator of crisis subgroup is decedents with any crisis within past or upcoming 2 weeks. Crises depicted here represent the most commonly occurring categories.

**FIGURE. Percentage change in annual suicide rate,\* by state — United States, from 1999–2001 to 2014–2016<Fig\_Small></Fig\_Small>**

The figure above is a map of the United States showing the percentage change in annual suicide rate, by state, from 1999 to 2016.

\* Per 100,000 population, age-adjusted to the 2000 U.S. standard population.



# Vital Signs: Trends in State Suicide Rates — United States, 1999–2016 and Circumstances Contributing to Suicide — 27 States, 2015

Deborah M. Stone, ScD<sup>1</sup>; Thomas R. Simon PhD<sup>1</sup>; Katherine A. Fowler, PhD<sup>1</sup>; Scott R. Kegler, PhD<sup>2</sup>; Keming Yuan, MS<sup>1</sup>; Kristin M. Holland, PhD<sup>1</sup>; Asha Z. Ivey-Stephenson, PhD<sup>1</sup>; Alex E. Crosby, MD<sup>1</sup>

## Abstract

**Introduction:** Suicide rates in the United States have risen nearly 30% since 1999, and mental health conditions are just one factor contributing to suicide. Examining state-level trends in suicide and the multiple circumstances contributing to it can inform comprehensive state suicide prevention planning.

**Methods:** Trends in age-adjusted suicide rates among persons aged  $\geq 10$  years, by state and sex, across six consecutive 3-year periods (1999–2016), were assessed using data from the National Vital Statistics System for 50 states and the District of Columbia (DC). Data from the National Violent Death Reporting System, covering 27 states in 2015, were used to examine contributing circumstances among decedents with and without known mental health conditions.

**Results:** During 1999–2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases  $>30\%$ . Rates increased significantly among males and females in 34 and 43 states, respectively. Fifty-four percent of decedents in 27 states in 2015 did not have a known mental health condition. Among decedents with available information, several circumstances were significantly more likely among those without known mental health conditions than among those with mental health condition, including relationship problems/loss (45.1% versus 39.6%), life stressors (54.2% versus 49.7%), and recent/impending crises (32.9% versus 26.0%), but these circumstances were common across groups.

**Conclusions:** Suicide rates increased significantly across most states during 1999–2016. Various circumstances contributed to suicides among persons with and without known mental health conditions.

**Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach to prevent suicide risk before it occurs, identify and support persons at risk, prevent reattempts, and help friends and family members in the aftermath of a suicide.

## Introduction

In 2016, nearly 45,000 suicides (15.6/100,000 population [age-adjusted]) occurred in the United States among persons aged  $\geq 10$  years (1). From 1999 to 2015, suicide rates increased among both sexes, all racial/ethnic groups, and all urbanization levels (2,3). Suicide rates have also increased among persons in all age groups  $<75$  years, with the highest percent increases among those aged 10–14 years (76% increase from 1.2 to 2.1 per 100,000 in 1999 and 2016, respectively) and those aged 45–64 years (45% increase from 13.2 to 19.2 per 100,000 in 1999 and 2016, respectively) (1,3). Suicide is the 10th leading cause of death and is one of just three leading causes that are increasing (1,4). In addition, rates of emergency department visits for nonfatal self-harm, a main risk factor for suicide, increased 42% from 2001 to 2016 (1). Together, suicides and self-harm injuries cost the nation approximately \$69 billion in direct medical and work loss costs (1).

The National Strategy for Suicide Prevention (NSSP) (5) calls for a public health approach to suicide prevention with efforts spanning multiple levels (i.e., individual, family/relationship, community, and societal). Such a comprehensive approach underscores that suicide is rarely caused by any single factor, but rather, is determined by multiple factors. Despite NSSP guidance, suicide prevention largely focuses on



identifying suicidal persons, providing treatment for mental health conditions, and preventing reattempts (6). In addition to mental health conditions and prior suicide attempts, other contributing circumstances include social and economic problems, access to lethal means (e.g., substances, firearms) among persons at risk, and poor coping and problem-solving skills (5). Expanded awareness of these additional circumstances contributing to suicide risk and action to address them can help reach the national goal, established by the National Action Alliance of Suicide Prevention and the American Foundation for Suicide Prevention, of reducing the annual suicide rate 20% by 2025 (7). To assist states in achieving this goal, CDC analyzed state-specific trends in suicide rates and assessed the multiple contributing factors to suicide; this report presents options for multilevel comprehensive suicide prevention based on the best available evidence.

## Methods

Suicide rates were analyzed for persons aged  $\geq 10$  years only, as determining suicidal intent in younger children can be difficult (8). Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases, Tenth Revision*, underlying-cause-of-death codes X60–X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive 3-year aggregate periods spanning 1999–2016 (1999–2001; 2002–2004; 2005–2007; 2008–2010; 2011–2013; and 2014–2016). Rate estimates were age-adjusted to the U.S. 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same 3-year data aggregates, employing weighted least-squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes.

Characteristics of persons aged  $\geq 10$  years who died by suicide, with and without known mental health conditions, and the circumstances surrounding the suicides were compared in the 27 states\* with complete data participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines mental health conditions as disorders and syndromes listed in the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (9), with the exception of alcohol and other substance use disorders, which are captured separately in NVDRS. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. A range of circumstances (relationship problems, life stressors, and recent or impending crises) have been identified as potential risk factors for suicide. Circumstances captured by NVDRS are those identified by next of kin as having actively contributed to a person's suicide. Decedents could have experienced multiple circumstances. Decedents with and without known mental health conditions were compared using Chi-square tests. Logistic regression analyses estimated adjusted odds ratios (aORs) with 95% confidence intervals (CIs), controlling for age group, sex, and race/ethnicity.

## Results

The most recent overall suicide rates (representing 2014–2016) varied fourfold, from 6.9 (DC) to 29.2 (Montana) per 100,000 persons per year (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>). Across the study period, rates increased in all states except Nevada (where the rate was consistently high throughout the study period), with absolute increases ranging from 0.8 per 100,000 (Delaware) to 8.1 (Wyoming). Percentage increases in rates ranged from 5.9% (Delaware) to 57.6% (North Dakota), with increases  $>30\%$  observed in 25 states (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>) (Figure).



Modeled suicide rate trends indicated significant increases in 44 states, among males (34 states) and females (43 states), as well as for the United States overall (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>). Nationally, the model-estimated average annual percentage change for the overall suicide rate was an increase of 1.5%. By sex, estimated national rate trends further indicated significant average annual percentage change increases for males (1.1%) and females (2.6%) (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>).

Suicide decedents without known mental health conditions (11,039) were compared with those with known mental health conditions (9,407) in 27 states. Whereas all decedents were predominately male (76.8%) (Table 1) and non-Hispanic white (83.6%), those without known mental health conditions, relative to those with mental health conditions, were more likely to be male (83.6% versus 68.8%; odds ratio (OR) = 2.3, 95% CI = 2.2–2.5) and belong to a racial/ethnic minority (OR range = 1.2–2.0). Suicide decedents without known mental health conditions also had significantly higher odds of perpetrating homicide-suicide (aOR = 2.9, 95% CI = 2.2–3.8). Among adult decedents aged  $\geq 18$  years, 20.1% of those without known mental health conditions and 15.3% of those with mental health conditions had ever served in the U.S. military or were serving at the time of death.

Whereas firearms were the most common method of suicide overall (48.5%) and among decedents with and without mental health conditions, decedents without known mental health conditions, relative to those with known mental health conditions, were more likely to die by firearm (55.3% versus 40.6%) and less likely to die by hanging/strangulation/suffocation (26.9% versus 31.3%) or poisoning (10.4% versus 19.8%). These differences remained significant in the adjusted models.

Toxicology testing was less likely to be performed for decedents without known mental health conditions. Among those with toxicology results, decedents without known mental health conditions were less likely to test positive for any substance overall (aOR = 0.8, 95% CI = 0.7–0.8), including opioids (aOR = 0.90, 95% CI = 0.81–0.99), but were more likely to test positive for alcohol (aOR = 1.2, 95% CI = 1.1–1.3).

Information on circumstances surrounding suicide were available for all decedents with mental health conditions ( $n = 9,407$ ) and approximately 85% of those without known mental health conditions ( $n = 9,357$ ) in 27 states (Table 2). Persons without known mental health conditions were less likely to have any substance use disorders (aOR = 0.7, 95% CI = 0.7–0.8) than were persons with known mental health conditions. Whereas two thirds of decedents with known mental health conditions had a history of mental health or substance use treatment (67.2%), just over half (54.0%) were in treatment at the time of death.

Decedents without known mental health conditions had a significantly higher likelihood of any relationship problem/loss (45.1%) than did those with known mental health conditions (39.6%), specifically intimate partner problems (30.2% versus 24.1%), arguments/conflicts (17.5% versus 13.6%), and recently perpetrating interpersonal violence (3.0% versus 1.4%). Decedents without known mental health conditions were also more likely than were those with known mental health conditions to have experienced any life stressors (54.2% versus 49.7%) such as criminal/legal problems (10.7% versus 6.2%) or eviction/loss of home (4.3% versus 3.4%) and were more likely to have had a recent or impending (within the preceding or upcoming 2 weeks, respectively) crisis (a current or acute event thought to contribute to the suicide) (32.9% versus 26.0%). All of these differences remained significant in the adjusted models. Physical health problems and job or financial problems were commonly contributing stressors among both persons without mental health conditions (23.2% and 15.6%, respectively) and those with mental health conditions (21.4% and 16.8%, respectively). Similarly, among all persons with recent crises, intimate partner problems were the most common types and did not differ by group.

Decedents without known mental health conditions had significantly lower odds of recent release from any institution (aOR = 0.5, 95% CI = 0.4–0.5). Among those recently released, decedents without known mental health conditions were significantly more likely to have been released from a correctional facility (25.7% versus 8.7%), hospital (43.7% versus 33.0%), or other facility (e.g., alcohol/substance treatment)

(24.2% versus 11.6%), than were those recently released with a known mental health condition. Among decedents with known mental health conditions who were recently released from an institution, 46.7% were released from psychiatric facilities.

Decedents without known mental health conditions were significantly less likely to have a history of suicidal ideation (23.0%) or prior suicide attempts (10.3%) compared with those with known mental health conditions (40.8% and 29.4%, respectively). Suicide intent was disclosed by 22.4% and 24.5% of persons without and with known mental health conditions, respectively.

## Conclusions and Comments

During 1999–2016, suicide rates increased significantly in 44 states, and 25 states experienced increases >30%. Rates increased significantly among males in 34 states, and females in 43 states. Additional research into the specific causes of these trends is needed. Data from the 27 states participating in NVDRS provide important insight into circumstances surrounding suicide and can help states identify prevention priorities.

Suicidologists regularly state that suicide is not caused by a single factor (5); however, suicide prevention is often oriented toward downstream identification of suicidal persons, treatment of mental health conditions, and prevention of reattempts. This study found that approximately half of suicide decedents in NVDRS did not have a known mental health condition, indicating that additional focus on nonmental health factors further upstream could provide important information for a public health approach (10). Those without a known mental health condition suffered more from relationship problems and other life stressors such as criminal/legal matters, eviction/loss of home, and recent or impending crises.

Similarly, persons with mental health conditions often experienced relationship problems and other life stressors such as job/financial or physical health problems. These findings point to the need to help persons manage mental health conditions and to prevent the circumstances associated with their onset, as well support persons with known mental health conditions to decrease their risk for poor outcomes (11). Two thirds of suicide decedents with mental health conditions had a history of treatment for any mental health or substance use or both, with approximately half in treatment when they died. This finding suggests the need for additional safety supports, including broader implementation of affordable and effective treatment modalities, such as doctor-patient collaborative care models and proven cognitive-behavioral therapies. In addition, increased access to behavioral health providers in underserved areas is needed, as is expansion of health care systems that integrate physical and behavioral health, with a priority on suicide prevention and patient safety, especially through care transitions (12).

Comprehensive statewide suicide prevention activities are needed to address the full range of factors contributing to suicide. Prevention strategies include strengthening economic supports (e.g., housing stabilization policies, household financial support); teaching coping and problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in life; promoting social connectedness to increase a sense of belonging and access to informational, tangible, emotional, and social support; and identifying and better supporting persons at risk (e.g., military veterans, persons with physical/mental health conditions) (12). Other strategies include creating protective environments (e.g., reducing access to lethal means among persons at risk of suicide, creating organizational and workplace policies to promote help-seeking, easing transitions into and out of work for persons with mental health conditions and other life challenges), strengthening access and delivery of care for persons at risk, supporting family and friends after a suicide, and assuring the media follow safe reporting recommendations (12). Some states, such as Colorado, are planning to implement such a comprehensive approach to suicide prevention (10).

The findings in this report are subject to at least three limitations. First, in the state-level analysis, rankings for four states (Maryland, Massachusetts, Rhode Island, and Utah) might have been affected by large



proportions of injury deaths of undetermined intent (potentially biasing reported suicide rates downward) or decreased percentages of such deaths over time (potentially biasing estimated rate trends upward). Second, NVDRS is not yet nationally representative; the 27 states included represent 49.6% of the population (<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml>). Finally, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the extent of informant knowledge can affect data completeness and accuracy. Studies that include more in-depth interviews with next-of-kin often identify greater attributions to mental disorders (13); however, many methodological variations across studies exist (14). It is likely that some persons without known mental health conditions in the current study were experiencing mental health challenges that were unknown, and hence underreported by key informants. Nonetheless, the high prevalence of diverse contributing circumstances among those with and without known mental health conditions suggests the importance of addressing the broad range of factors that contribute to suicide.

Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are available. States and communities can use data from NVDRS and resources such as CDC's Preventing Suicide: a Technical Package of Policy, Programs, and Practices (12) to better understand suicide in their populations, prioritize evidence-based comprehensive suicide prevention, and save lives.

#### Acknowledgments

Robert Anderson, Holly Hedegaard, Margaret Warner, Division of Vital Statistics, National Center for Health Statistics, CDC.

#### Conflict of Interest

No conflicts of interest were reported.

<sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis, Research, and Practice Integration, National Center for Injury Prevention and Control, CDC.

**Corresponding author:** Deborah M. Stone, [dstone3@cdc.gov](mailto:dstone3@cdc.gov), 770-488-3942.

#### References

1. CDC. Web-based Injury Statistics Query and Reporting System (WISQARS). Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018. In.
2. Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide trends among and within urbanization levels by sex, race/ethnicity, age group, and mechanism of death—United States, 2001–2015. *MMWR Surveill Summ* 2017;66(No. SS-18).
3. Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999–2014. NCHS data brief no 241. Hyattsville, MD: US Department of Health and Human Services, CDC, National Center for Health Statistics; 2016. <https://www.cdc.gov/nchs/data/databriefs/db241.pdf>
4. Kochanek K, Murphy S, Xu J, Arias E. Mortality in the United States, 2016. NCHS data brief no 293. Hyattsville, MD: US Department of Health and Human Services, CDC, National Center for Health Statistics; 2017. <https://www.cdc.gov/nchs/data/databriefs/db293.pdf>
5. Office of the Surgeon General; National Action Alliance for Suicide Prevention. 2012 National strategy for suicide prevention: goals and objectives for action. Washington, DC: US Department of Health and Human Services, Office of the Surgeon General; 2012. <https://www.surgeongeneral.gov/library/reports/national-strategy-suicide-prevention/full-report.pdf>
6. Zalsman G, Hawton K, Wasserman D, et al. Suicide prevention strategies revisited: 10-year systematic review. *Lancet Psychiatry* 2016;3:646–59.

7. Torguson K, O'Brien A. Leading suicide prevention efforts unite to address rising national suicide rate. Washington, DC: American Foundation for Suicide Prevention; 2017.  
<https://afsp.org/leading-suicide-prevention-efforts-unite-address-rising-national-suicide-rate/>
8. Crepeau-Hobson F. The psychological autopsy and determination of child suicides: a survey of medical examiners. *Arch Suicide Res* 2010;14:24–34.
9. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5). Washington, DC: American Psychiatric Association; 2013.
10. Caine ED, Reed J, Hindman J, Quinlan K. Comprehensive, integrated approaches to suicide prevention: practical guidance. *Inj Prev* 2017. Epub December 20, 2017.
11. World Health Organization. Risks to mental health: an overview of vulnerabilities and risk factors. Geneva, Switzerland: World Health Organization; 2012.
12. Stone DM, Holland KM, Bartholow BN, Crosby AE, Davis SP, Wilkins N. Preventing suicide: a technical package of policy, programs, and practice. Atlanta, GA: US Department of Health and Human Services, CDC; 2017.  
<https://www.cdc.gov/violenceprevention/pdf/suicidetechnicalpackage.pdf>
13. Milner A, Svetlicic J, De Leo D. Suicide in the absence of mental disorder? A review of psychological autopsy studies across countries. *Int J Soc Psychiatry* 2013;59:545–54.
14. Pouliot L, De Leo D. Critical issues in psychological autopsy studies. *Suicide Life Threat Behav* 2006;36:491–510.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

## Summary

### What is already known about this topic?

In 2016, nearly 45,000 persons died by suicide in the United States. Mental health conditions can contribute to suicide.

### What is added by this report?

During 1999–2016, suicide rates increased in nearly every state, including >30% increases in 25 states. 2015 data from 27 states indicate 54% of suicide decedents were not known to have mental health conditions. Other contributors included relationship, substance use, health, and job or financial problems, among others.

### What are the implications for public health practice?

A comprehensive approach using proven prevention strategies, such as those in CDC's Technical Package for Suicide Prevention, can help reach the national goal of reducing the annual suicide rate 20% by 2025.



**TABLE 1. Selected demographic and descriptive characteristics of suicides among persons aged ≥10 years with and without known mental health conditions — National Violent Death Reporting System, 27 states,\* 2015**

Characteristic	Total (N = 20,446)	Known mental health condition† (n = 9,407)	No known mental health condition (n = 11,039)	P-value	OR‡ (95% CI)	Adjusted OR† (95% CI)
<b>Sex</b>						
Male	15,702 (76.8)	6,469 (68.8)	9,233 (83.6)	<0.01	2.3 (2.2–2.5)	NA
Female	4,744 (23.2)	2,938 (31.2)	1,806 (16.4)	<0.01	0.4 (0.4–0.5)	NA
<b>Age (yrs)**</b>						
10–24	2,804 (13.7)	1,211 (12.9)	1,593 (14.4)	<0.01	1.1 (1.1–1.2)	NA
25–44	6,456 (31.6)	3,036 (32.3)	3,420 (31.0)	<0.05	0.9 (0.9–1.0)	NA
45–64	7,718 (37.7)	3,820 (40.6)	3,898 (35.3)	<0.01	0.8 (0.8–0.8)	NA
≥65	3,468 (17.0)	1,340 (14.2)	2,128 (19.3)	<0.01	1.4 (1.3–1.5)	NA
<b>Race/Ethnicity</b>						
White, non-Hispanic	17,102 (83.6)	8,165 (86.8)	8,937 (81.0)	<0.01	0.6 (0.6–0.7)	NA
Black, non-Hispanic	1,228 (6.0)	411 (4.4)	817 (7.4)	<0.01	1.7 (1.5–2.0)	NA
American Indian/Alaska Native, non-Hispanic	378 (1.8)	112 (1.2)	266 (2.4)	<0.01	2.0 (1.6–2.6)	NA
Asian, non-Hispanic	576 (2.8)	235 (2.5)	341 (3.1)	<0.05	1.2 (1.1–1.5)	NA
Hispanic	1,096 (5.4)	463 (4.9)	633 (5.7)	<0.05	1.2 (1.0–1.3)	NA
Other	66 (0.3)	21 (0.2)	45 (0.4)	<0.05	1.8 (1.1–3.1)	NA
<b>Extended demographics</b>						
Ever served in military††	3,429 (17.8)	1,354 (15.3)	2,075 (20.1)	<0.01	1.4 (1.3–1.5)	1.1 (1.0–1.1)
Homeless	240 (1.2)	104 (1.1)	136 (1.3)		1.1 (0.9–1.5)	1.2 (0.9–1.5)
<b>Incident Type</b>						
Single suicide	20,063 (98.2)	9,318 (99.1)	10,745 (97.4)	<0.01	0.3 (0.3–0.4)	0.4 (0.3–0.5)
Homicide followed by suicide	319 (1.6)	64 (0.7)	255 (2.3)	<0.01	3.5 (2.6–4.5)	2.9 (2.2–3.8)
Multiple suicides	64 (0.3)	25 (0.3)	39 (0.4)	NS	1.3 (0.8–2.2)	1.6 (0.9–2.6)
<b>Method</b>						
Firearm	9,909 (48.5)	3,821 (40.6)	6,088 (55.3)	<0.01	1.8 (1.7–1.9)	1.6 (1.5–1.7)
Hanging/Strangulation/Suffocation	5,907 (28.9)	2,940 (31.3)	2,967 (26.9)	<0.01	0.8 (0.8–0.9)	0.8 (0.7–0.8)
Poisoning	3,003 (14.7)	1,861 (19.8)	1,142 (10.4)	<0.01	0.5 (0.4–0.5)	0.6 (0.6–0.7)
<b>Substance class causing death§§</b>						
Other (e.g., over-the-counter)	1,021 (34.0)	666 (35.8)	355 (31.1)	<0.01	0.8 (0.7–0.9)	0.9 (0.7–1.0)
Opioids	944 (31.4)	608 (32.7)	336 (29.4)	NS	0.9 (0.7–1.0)	0.9 (0.8–1.1)
Antidepressants	800 (26.6)	644 (34.6)	156 (13.7)	<0.01	0.3 (0.2–0.4)	0.3 (0.3–0.4)
Benzodiazepines	624 (20.8)	468 (25.1)	156 (13.7)	<0.01	0.5 (0.4–0.6)	0.5 (0.4–0.6)
Antipsychotics	219 (7.3)	195 (10.5)	24 (2.1)	<0.01	0.2 (0.1–0.3)	0.2 (0.1–0.3)
Other	1,595 (7.8)	780 (8.3)	815 (7.4)	<0.05	0.9 (0.8–1.0)	0.9 (0.8–1.0)
<b>Toxicology Results</b>						
Any toxicology testing	13,317 (65.1)	6,658 (70.8)	6,659 (60.3)	<0.01	0.6 (0.6–0.7)	0.7 (0.6–0.7)
Positive for ≥1 substance¶¶	9,913 (74.4)	5,192 (78.0)	4,721 (70.9)	<0.01	0.7 (0.6–0.7)	0.8 (0.7–0.8)
<b>Substance detected***</b>						
<b>Alcohol</b>						
Tested	10,950 (53.6)	5,409 (57.5)	5,541 (50.2)	<0.01	0.7 (0.7–0.8)	0.8 (0.7–0.8)
Positive	4,442 (40.6)	2,115 (39.1)	2,327 (42.0)	<0.01	1.1 (1.0–1.2)	1.2 (1.1–1.3)
<b>Opioids</b>						
Tested	8,554 (41.8)	4,258 (45.3)	4,296 (38.9)	<0.01	0.8 (0.7–0.8)	0.8 (0.8–0.9)

Positive	2,279 (26.6)	1,238 (29.1)	1,041 (24.2)	<0.01	0.8 (0.7–0.9)	0.9 (0.8–1.0)
Benzodiazepines						
Tested	8,124 (39.7)	4,226 (44.9)	3,898 (35.3)	<0.01	0.7 (0.6–0.7)	0.7 (0.7–0.8)
Positive	2,464 (30.3)	1,639 (38.8)	825 (21.2)	<0.01	0.4 (0.4–0.5)	0.5 (0.5–0.6)
Cocaine						
Tested	7,978 (39.0)	3,866 (41.1)	4,112 (37.2)	<0.01	0.9 (0.8–0.9)	0.9 (0.9–1.0)
Positive	499 (6.3)	216 (5.6)	283 (6.9)	<0.05	1.2 (1.0–1.5)	1.2 (1.0–1.5)
Amphetamines						
Tested	7,615 (37.2)	3,696 (39.3)	3,919 (35.5)	<0.01	0.9 (0.8–0.9)	0.9 (0.8–0.9)
Positive	736 (9.7)	376 (10.2)	360 (9.2)	NS	0.9 (0.8–1.0)	1.0 (0.8–1.1)
Marijuana						
Tested	6,569 (32.1)	3,127 (33.2)	3,442 (31.2)	<0.01	0.9 (0.9–1.0)	0.9 (0.9–1.0)
Positive	1,471 (22.4)	710 (22.7)	761 (22.1)	NS	1.0 (0.9–1.1)	0.9 (0.8–1.0)
Antidepressants						
Tested	5,425 (26.5)	3,103 (33.0)	2,322 (21.0)	<0.01	0.5 (0.5–0.6)	0.6 (0.6–0.7)
Positive	2,214 (40.8)	1,735 (55.9)	479 (20.6)	<0.01	0.2 (0.2–0.2)	0.2 (0.2–0.3)

**Abbreviation:** CI = confidence interval; NA = not adjusted; NS = not significant; OR = odds ratio.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

† Decedent had been identified as having a current diagnosis of mental health condition in coroner/medical examiner or law enforcement reports.

§ OR reflects the risk among those without known mental health condition relative to those with known mental health condition.

¶ Logistic regression was used to estimate adjusted OR with 95% CIs after controlling for age, sex, race, and ethnicity. Known mental health condition was used as the reference group.

\*\* Decedents were aged ≥10 years, as per standard in the suicide prevention literature.

†† Denominator is decedents aged ≥18 years with reported military service status.

§§ Denominator is decedents who died by poisoning, including overdose.

¶¶ Denominator is decedents with any toxicology testing.

\*\*\* Denominator for each positive group is the number tested for the substance in that group.

**TABLE 2. Circumstances preceding suicide among decedents aged ≥10 years with and without known mental health conditions — National Violent Death Reporting System, 27 states,\* 2015**

Characteristic	Total	Known mental health condition† no. (%)	No known mental health condition no. (%)	P-value	OR§ (95% CI)	Adjusted OR¶ (95% CI)
<b>Suicide with known circumstances</b>	18,764 (91.8)	9,407 (100)	9,357 (84.8)	<0.01	NA	NA
<b>Mental health</b>						
<b>Any Current Diagnosed Mental Health Condition**</b>						
Depression/Dysthymia		7,076 (75.2)	NA	NA	NA	NA
Anxiety disorder		1,579 (16.8)	NA	NA	NA	NA
Bipolar disorder		1,431 (15.2)	NA	NA	NA	NA
Schizophrenia		509 (5.4)	NA	NA	NA	NA
PTSD		424 (4.5)	NA	NA	NA	NA
ADD/ADHD		226 (2.4)	NA	NA	NA	NA



Not specified		760 (8.1)	NA	NA	NA	NA
Current depressed mood		3,962 (42.1)	3,076 (32.9)	<0.01	0.7 (0.6–0.7)	0.7 (0.6–0.7)
<b>Substance problems</b>						
Any Current substance problem	5,319 (28.3)	2,976 (31.6)	2,343 (25.0)	<0.01	0.7 (0.7–0.8)	0.7 (0.7–0.8)
Alcohol problem	3,268 (17.4)	1,862 (19.8)	1,406 (15.0)	<0.01	0.7 (0.7–0.8)	0.7 (0.7–0.8)
Other substance problem	3,084 (16.4)	1,768 (18.8)	1,316 (14.1)	<0.01	0.7 (0.7–0.8)	0.7 (0.7–0.8)
<b>Treatment</b>						
Current mental health/substance abuse treatment	5,141 (27.4)	5,077 (54.0)	64 (0.7)	<0.01	0.01 (0.01–0.01)	0.01 (0.01–0.01)
Ever treated for mental health/substance problem	6,717 (35.8)	6,323 (67.2)	394 (4.2)	<0.01	0.02 (0.02–0.02)	0.02 (0.02–0.03)
<b>Relationship problems/loss</b>						
Any relationship problem/loss	7,948 (42.4)	3,726 (39.6)	4,222 (45.1)	<0.01	1.3 (1.2–1.3)	1.3 (1.2–1.4)
Intimate partner problem	5,098 (27.2)	2,270 (24.1)	2,828 (30.2)	<0.01	1.4 (1.3–1.5)	1.4 (1.3–1.5)
Perpetrator of interpersonal violence in past month	414 (2.2)	131 (1.4)	283 (3.0)	<0.01	2.2 (1.8–2.7)	2.0 (1.6–2.4)
Victim of interpersonal violence in past month	84 (0.4)	53 (0.6)	31 (0.3)	<0.05	0.6 (0.4–0.9)	0.8 (0.5–1.2)
Family relationship problem	1,671 (8.9)	873 (9.3)	798 (8.5)	NS	0.9 (0.8–1.0)	1.0 (0.9–1.1)
Other relationship problem (nonintimate)	403 (2.1)	202 (2.1)	201 (2.1)	NS	1.0 (0.8–1.2)	1.1 (0.9–1.3)
Argument or conflict (not specified)	2,914 (15.5)	1,278 (13.6)	1,636 (17.5)	<0.01	1.3 (1.2–1.5)	1.4 (1.3–1.5)
Death of a loved one (any)	1,497 (8.0)	826 (8.8)	671 (7.2)	<0.01	0.8 (0.7–0.9)	0.9 (0.8–0.9)
Nonsuicide death	1,181 (6.3)	647 (6.9)	534 (5.7)	<0.01	0.8 (0.7–0.9)	0.9 (0.8–1.0)
Suicide of family or friend	379 (2.0)	217 (2.3)	162 (1.7)	<0.01	0.7 (0.6–0.9)	0.8 (0.7–1.0)
<b>Other life stressors</b>						
Any life stressor	9,743 (51.9)	4,675 (49.7)	5,068 (54.2)	<0.01	1.2 (1.1–1.3)	1.1 (1.1–1.2)
Recent criminal legal problem	1,588 (8.5)	586 (6.2)	1,002 (10.7)	<0.01	1.8 (1.6–2.0)	1.7 (1.5–1.9)
Other legal problem	748 (4.0)	378 (4.0)	370 (4.0)	NS	1.0 (0.8–1.1)	1.0 (0.9–1.2)
Physical health problem	4,179 (22.3)	2,012 (21.4)	2,167 (23.2)	<0.01	1.1 (1.0–1.2)	1.0 (1.0–1.1)
Job/Financial problem <sup>††</sup>	2941 (16.2)	1530 (16.8)	1411 (15.6)	<0.05	0.9 (0.8–1.0)	0.9 (0.8–1.0)
Eviction or loss of home	722 (3.8)	317 (3.4)	405 (4.3)	<0.01	1.3 (1.1–1.5)	1.4 (1.2–1.6)
School problem <sup>§§</sup>	162 (19.9)	70 (17.8)	92 (21.9)	NS	1.3 (0.9–1.8)	1.3 (0.9–1.9)
Recent release from an institution <sup>¶¶</sup>	1,412 (7.6)	941 (10.2)	471 (5.1)	<0.01	0.5 (0.4–0.5)	0.5 (0.4–0.5)
Jail/Prison/Detention facility	203 (14.4)	82 (8.7)	121 (25.7)	<0.01	3.6 (2.7–4.9)	4.5 (3.2–6.4)
Hospital	517 (36.6)	311 (33.0)	206 (43.7)	<0.01	1.6 (1.3–2.0)	1.3 (1.0–1.7)
Psychiatric hospital/institution	469 (33.2)	439 (46.7)	30 (6.4)	<0.01	0.1 (0.1–0.1)	0.1 (0.1–0.1)
Other (includes alcohol/SA treatment facilities)	223 (15.8)	109 (11.6)	114 (24.2)	<0.01	2.4 (1.8–3.3)	2.5 (1.8–3.3)
<b>Crisis within past or upcoming 2 weeks<sup>***</sup></b>	5,525 (29.4)	2,444 (26.0)	3,081 (32.9)	<0.01	1.4 (1.3–1.5)	1.4 (1.3–1.5)
Intimate partner problem crisis	1968 (35.6)	854 (34.9)	1114 (36.2)	NS	1.1 (0.9–1.2)	1.1 (0.9–1.2)
Physical health problem crisis	739 (13.4)	315 (12.9)	424 (13.8)	NS	1.1 (0.9–1.3)	1.0 (0.8–1.2)
Criminal legal problem crisis	621 (11.2)	203 (8.3)	418 (13.6)	<0.01	1.7 (1.5–2.1)	1.6 (1.3–1.9)
Family relationship problem crisis	430 (7.8)	212 (8.7)	218 (7.1)	<0.05	0.8 (0.7–1.0)	0.9 (0.7–1.1)
Job problem crisis	354 (6.4)	191 (7.8)	163 (5.3)	<0.01	0.7 (0.5–0.8)	0.7 (0.5–0.8)
<b>Suicide event/history</b>						
Left a note	6,468 (34.5)	3,182 (33.8)	3,286 (35.1)	NS	1.1 (1.0–1.1)	1.2 (1.1–1.2)
Disclosed suicide intent	4,405 (23.5)	2,306 (24.5)	2,099 (22.4)	<0.01	0.9 (0.8–1.0)	0.9 (0.8–0.9)
History of ideation	5,990 (31.9)	3,838 (40.8)	2,152 (23.0)	<0.01	0.4 (0.4–0.5)	0.4 (0.4–0.5)
History of attempts	3,732 (19.9)	2,770 (29.4)	962 (10.3)	<0.01	0.3 (0.3–0.3)	0.3 (0.3–0.3)

**Abbreviations:** ADD/ADHD = attention deficit disorder/attention deficit hyperactivity disorder; N/A = not applicable; OR = odds ratio; PTSD = posttraumatic stress disorder; SA = substance abuse.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

† Decedent had been identified as having a current diagnosis of mental health condition in coroner/medical examiner or law enforcement reports.

§ OR reflects the risk among those without known mental health condition relative to those with known mental health condition.

¶ Logistic regression was used to estimate adjusted OR with 95% CIs after controlling for age, sex, race, and ethnicity. Known mental health condition was the reference group.

\*\* Includes decedents with one or more diagnosed current mental health conditions, which are not mutually exclusive. Therefore, sums of percentages for the diagnosed conditions exceed 100%. Denominator includes the number of decedents with one or more current diagnosed mental health conditions.

†† Denominator is decedents aged  $\geq 18$  years.

§§ Denominator is decedents aged 10–18 years.

¶¶ Denominator of institution subgroup is decedents with recent release from an institution. Recent release from an institution is defined as having occurred within the past month.

\*\*\* Denominator of crisis subgroup is decedents with any crisis within past or upcoming 2 weeks. Crises depicted here represent the most commonly occurring categories.

**FIGURE. Percentage change in annual suicide rate,\* by state — United States, from 1999–2001 to 2014–2016<Fig\_Small></Fig\_Small>**

The figure above is a map of the United States showing the percentage change in annual suicide rate, by state, from 1999 to 2016.

\* Per 100,000 population, age-adjusted to the 2000 U.S. standard population.



## **Vital Signs: Trends in State Suicide Rates — United States, 1999–2016 and Circumstances Contributing to Suicide — 27 States, 2015**

Deborah M. Stone, ScD<sup>1</sup>; Thomas R. Simon PhD<sup>1</sup>; Katherine A. Fowler, PhD<sup>1</sup>; Scott R. Kegler, PhD<sup>2</sup>; Keming Yuan, MS<sup>1</sup>; Kristin M. Holland, PhD<sup>1</sup>; Asha Z. Ivey-Stephenson, PhD<sup>1</sup>; Alex E. Crosby, MD<sup>1</sup>

**Background:** Suicide rates in the United States have risen nearly 30% since 1999, and mental health problems are just one factor contributing to suicide. Examining state-level trends in, and the multiple circumstances contributing to, suicide can inform comprehensive state suicide prevention planning.

**Methods:** Trends in age-adjusted suicide rates among persons aged  $\geq 10$  years, by state and sex, across six consecutive three-year periods (1999–2016), were assessed using data from the National Vital Statistics System for 50 states and the District of Columbia (DC). Data from the National Violent Death Reporting System, covering 27 states in 2015, were used to examine contributing circumstances among decedents with and without known mental health problems.

**Results:** During 1999–2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases of more than 30%. Rates increased significantly among males and females in 34 and 43 states, respectively. In 2015, more than half (54%) of decedents in 27 states did not have a known mental health problem. Among decedents with circumstance information available, several circumstances were significantly more likely among those without a known mental health problems than among those with mental health problems, including relationship problems/loss (45.1% versus 39.6%), life stressors (54.2% versus 49.7%), and recent/impending crises (32.9% versus 26.0%), but these circumstances were common across groups.

**Conclusions:** Suicide rates increased significantly across most states during 1999–2016. Various circumstances contributed to suicides among persons with and without known mental health problems.

**Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach to prevent suicide risk before it occurs, identify and support persons at risk, prevent reattempts, and help friends and family in the aftermath of a suicide.

## **Introduction**

### **Background and Purpose**

In 2016, nearly 45,000 suicides (15.6/100,000 population [age-adjusted]) occurred in the United States among persons aged  $\geq 10$  years (1). Between 1999 and 2015, suicide rates increased among both sexes, all racial/ethnic groups, and all urbanization levels (2,3). Suicide is the 10<sup>th</sup> leading cause of death and is one of just three leading causes that are increasing (1,4).

Additionally, rates of emergency department visits for nonfatal self-harm, a key risk factor for suicide, increased 42% between 2001 and 2016 (1). Together, suicides and self-harm injuries cost the nation more than \$69 billion in direct medical and work loss costs (1).

The *National Strategy for Suicide Prevention (NSSP)* (5) calls for a public health approach to suicide prevention with efforts spanning multiple levels (i.e., individual, family/relationship, community, and societal). Such a comprehensive approach underscores that suicide is rarely caused by any single factor, but rather, is determined by multiple factors. Despite the NSSP guidance, suicide prevention largely focuses on identifying suicidal persons, providing treatment for mental health problems, and preventing reattempts (6). In addition to mental health problems and prior attempts, other circumstances contributing to suicide include social and economic



problems, access to lethal means (e.g., substances, firearms) among persons at risk, and poor coping and problem-solving skills (5). Expanded awareness of these additional circumstances contributing to suicide risk and action to address them can help reach the nation's goal of reducing suicide rates by 20% by 2025 (7). To assist states in achieving this goal, CDC analyzed state-specific trends in suicide rates and assessed the multiple contributing factors to suicide; this report presents options for multi-level comprehensive suicide prevention based on the best available evidence.

## Methods

Suicide rates were analyzed for persons aged  $\geq 10$  years only, as determining suicidal intent in younger children can be difficult (8). Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases 10<sup>th</sup> Revision*, underlying-cause-of death codes X60–X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods spanning 1999–2016 (1999–2001, 2002–2004; 2005–2007; 2008–2010; 2011–2013; and 2014–2016). Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Characteristics of persons aged  $\geq 10$  years who died by suicide, with and without known mental health problems, and the circumstances surrounding the suicides were compared in the 27 states

**Comment [OADS]:** Please identify the agency, organization, or other source for this national goal, e.g. Healthy People 2020, NSSP, other.  
Level 1

**Comment [OADS]:** Please correct error: should be 2010.  
Level 1.

**Comment [HTM():]** I have already corrected.

with complete data participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines mental health problems as disorders and syndromes listed in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (9), with the exception of alcohol and other substance use disorders, which are captured separately in NVDRS. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known mental health problems were compared using Chi-square tests. Logistic regression analyses estimated adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and race/ethnicity.

## **Results**

The most recent overall suicide rates (representing 2014–2016) varied four-fold, from 6.9 (DC) to 29.2 (Montana) per 100,000 persons per year (Supplementary Table). Across the study period, rates increased in all states except Nevada (where the rate was consistently high throughout the study period), with absolute increases ranging from +0.8 per 100,000 (Delaware) to +8.1 (Wyoming). Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with increases of more than 30% observed in 25 states (Supplementary Table) (Figure 1).

Modeled suicide rate trends indicated significant increases in 44 states, among males (34 states) and females (43 states), as well as for the United States overall (Supplementary Table).

Nationally, the model-estimated AAPC for the overall suicide rate was +1.5%. By sex, estimated national rate trends further indicated significant increases for males (AAPC +1.1%) and females (AAPC +2.6%) (Supplementary Table).



Suicide decedents without known mental health problems (N = 11,039) were compared with those with known mental health problems (N = 9,407) in 27 states. Whereas all decedents were predominately male (76.8%) (Table 1) and non-Hispanic white (83.6%), those without known mental health problems, relative to those with mental health problems, were more likely male (83.6% versus 68.8%; odds ratio (OR) = 2.3, 95% CI = 2.2–2.5) and racial/ethnic minorities (OR range: 1.2–2.0). Suicide decedents without known mental health problems also had significantly higher odds of perpetrating homicide-suicide (adjusted odds ratio (aOR) = 2.9, 95% CI = 2.2–3.8). Among adult decedents aged  $\geq 18$  years, 20.1% of those without known mental health problems and 15.3% of those with mental health problems had ever served, or were currently serving, in the U.S. military.

Whereas firearms were the most common method of suicide overall (48.5%) and among decedents with and without mental health problems, decedents without known mental health problems, relative to those with known mental health problems, were more likely to die by firearm (55.3% versus 40.6%) and less likely to die by hanging/strangulation/suffocation (26.9% versus 31.3%) or poisoning (10.4% versus 19.8%). These differences remained significant in the adjusted models.

Decedents without known mental health problems were less likely to receive toxicology testing. Among those with toxicology results, decedents without known mental health problems were less likely to test positive for any substance overall (aOR = 0.8, 95% CI = 0.7–0.8), including opioids (aOR = 0.90 95% CI = 0.81–0.99), but were more likely to test positive for alcohol (aOR = 1.2, 95% CI = 1.1–1.3).

Information on circumstances surrounding suicide were available for all decedents with mental health problems (N = 9,407) and approximately 85% of those without known mental health

problems (N = 9,357) in 27 states (Table 2). Persons without known mental health problems were less likely to have any substance use disorders (aOR = 0.7, 95% CI = 0.7–0.8) than were persons with known mental health problems. Whereas two thirds of decedents with known mental health problems had a history of mental health or substance use treatment (67.2%), just over half (54.0%) were in current treatment.

Decedents without known mental health problems had a significantly higher likelihood of any relationship problem/loss (45.1%) than did those with known mental health problems (39.6%), specifically intimate partner problems (30.2% versus 24.1%), arguments/conflicts (17.5% versus 13.6%), and recently perpetrating interpersonal violence (3.0% versus 1.4%). Decedents without known mental health problems were also more likely than were those with known mental health problems to have experienced any life stressors (54.2% versus 49.7%) such as criminal-legal problems (10.7% versus 6.2%) or eviction/loss of home (4.3% versus 3.4%) and were more likely to have had a recent or impending (within the preceding or upcoming 2 weeks, respectively) crisis (a current or acute event thought to contribute to the suicide) (32.9% versus 26.0%). All of these differences remained significant in the adjusted models. Among all persons with recent crises, intimate partner problems were the most common types and did not differ by group. Similarly, physical health problems and job/financial problems were commonly experienced among both persons without mental health problems (23.2% and 15.6%, respectively) and those with mental health problems (21.4% and 16.8%, respectively).

Decedents without known mental health problems had significantly lower odds of recent release from any institution (aOR = 0.5, 95% CI = 0.4–0.5), but those who were recently released (5.1%), were significantly more likely to have been released from a correctional facility (25.7% versus 8.7%), hospital (43.7% versus 33.0%), or other facility (e.g., alcohol/substance treatment)



(aOR = 2.5 95% CI = 1.8–3.3), than were those with a known mental health problem. Among decedents with known mental health problems who were recently released from an institution (10.2%), 46.7% of were released from psychiatric facilities.

**Comment [OADS]:** Please delete the extra preposition. Level 3.

**Comment [HTM():]** I have already corrected.

Decedents without known mental health problems were significantly less likely to have a history of suicidal ideation (23.0%) or prior suicide attempts (10.3%) compared with those with known mental health problems (40.8% and 29.4%, respectively). Suicide intent was disclosed by 22.4% and 24.5% of persons without and with known mental health problems, respectively.

### Conclusions and Comments

During 1999–2016, suicide rates increased significantly in 44 states, and 25 states experienced increases of more than 30%. Rates increased significantly among males in 34 states, and females, in 43 states. This finding is consistent with prior research showing a decreasing gender gap in male-female suicide rates during 1999–2014 (3). Additional research into the specific causes of these trends is necessary. Data from the 27 states participating in NVDRS provides important insight into circumstances surrounding suicide and can help states identify prevention priorities. Suicidologists regularly state that suicide is not caused by a single factor (5); however, suicide prevention is often oriented toward downstream identification of suicidal persons, treatment of mental health problems and prevention of reattempts. This study found that more than half of suicide decedents in NVDRS did not have a known mental health problems, indicating that additional focus on non-mental health factors, further upstream, is essential to a public health approach (10). This group suffered more from relationship problems and other life stressors such as criminal-legal matters, eviction/loss of home, and recent or impending crises.

Similarly, persons with mental health problems often experienced relationship problems and other life stressors such as job/financial and/or physical health problems. These findings point to the need to both help persons manage and prevent the conditions associated with mental health problems in the first place, and to support persons with known mental health problems to decrease their risk of poor outcomes (11). Two thirds of this group had a history of any mental health and/or substance use treatment, with over half in treatment when they died. This suggests the need for additional safety supports, including broader implementation of affordable and effective treatment modalities such as doctor-patient collaborative care models and proven cognitive-behavioral therapies. Additionally, increased access to behavioral health providers in underserved areas is needed, as is expansion of health care systems that integrate physical and behavioral health, with a priority on suicide prevention and patient safety, especially through care transitions (12).

Comprehensive statewide suicide prevention activities are needed to address the full range of factors contributing to suicide. Prevention strategies include strengthening economic supports (e.g., housing stabilization policies, household financial support); teaching coping and problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in life; promoting social connectedness to increase a sense of belonging and access to informational, tangible, emotional, and social support; and identifying and better supporting persons at risk (e.g., military veterans, persons with physical/mental health problems) (12). Other strategies include creating protective environments (e.g., reducing access to lethal means among persons at risk, creating organizational and workplace policies to promote help-seeking, easing transitions into and out of work for persons with mental health problems and other life challenges), supporting family and friends after a suicide, and assuring safe reporting by the



media in order to prevent suicide contagion (12). Some states, such as Colorado, are planning to implement such a comprehensive approach to suicide prevention (10).

**Comment [OADS]:** Please elaborate to explain this strategy, e.g. the meaning of "safe reporting" and "suicide contagion." Please revise or respond.  
Level 2

The findings in this report are subject to at least three limitations. In the state-level analysis, rankings for four states (Maryland, Massachusetts, Rhode Island, and Utah) might have been affected by large proportions of injury deaths of undetermined intent (potentially biasing reported suicide rates downward), or decreased percentages of such deaths over time (potentially biasing estimated rate trends upward). Second, NVDRS is not yet nationally representative; the 27 states included represent 49.6% of the population

(<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml>). Finally,

abstractors of NVDRS data are limited to information contained in investigative reports.

Therefore, the extent of informant knowledge can affect data completeness and accuracy. Studies including more in-depth interviews with next-of-kin often identify greater attributions to mental disorders (13); however, many methodological variations across studies exist (14). It is likely that some persons without known mental health problems in the current study were experiencing mental health challenges that were unknown, and hence underreported by key informants.

Nonetheless, the high prevalence of diverse contributing circumstances among those with and without known mental health problems suggests the importance of addressing the broad range of factors that contribute to suicide.

Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are available. States and communities can use data from NVDRS and resources such as CDC's *Preventing Suicide: a Technical Package of Policies, Programs, and Practices* (12) to better understand their suicide problem, prioritize evidence-based comprehensive suicide prevention, and save lives.

## Acknowledgments

Robert Anderson, Holly Hedegaard, and Margaret Warner, Division of Vital Statistics, National Center for Health Statistics, CDC.

## Conflict of Interest

No conflicts of interest were reported.

<sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC;

<sup>2</sup>Division of Analysis, Research, and Practice Integration, National Center for Injury Prevention and Control, CDC.

Corresponding author: Deborah M. Stone, dstone3@cdc.gov , 770-488-3942.

## References

1. CDC. Web-based Injury Statistics Query and Reporting System (WISQARS). Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018. In.
2. Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide Trends Among and Within Urbanization Levels by Sex, Race/Ethnicity, Age Group, and Mechanism of Death—United States, 2001–2015. *MMWR Surveill Summ* 2017;66:1–16.
3. Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999–2014. In: US Department of Health and Human Services, CDC, National Center for Health Statistics Hyattsville, MD; 2016.
4. Kochanek K, Murphy S, Xu J, Arias E. Mortality in the United States, 2016. NCHS Data Brief, no 293. National Center for Health Statistics 2017.

**Comment [OADS]:** Some references seem incomplete, i.e., lacking hyperlinks or detailed source/journal information.

**Comment [HTM():** Deb, I have already corrected/completed all the references.



5. Office of the Surgeon General, National Action Alliance for Suicide Prevention. 2012  
National strategy for suicide prevention: Goals and objectives for action: a report of the US Surgeon General and of the National Action Alliance for Suicide Prevention. 2012.
6. Zalsman G, Hawton K, Wasserman D, et al. Suicide prevention strategies revisited: 10-year systematic review. *Lancet Psychiatry* 2016;3:646–59.
7. Torguson K, O'Brien A. Leading Suicide Prevention Efforts Unite to Address Rising National Suicide Rate. In. Washington, D.C.; 2017.
8. Crepeau-Hobson F. The psychological autopsy and determination of child suicides: a survey of medical examiners. *Arch Suicide Res* 2010;14:24–34.
9. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5®): American Psychiatric Pub; 2013.
10. Caine ED, Reed J, Hindman J, Quinlan K. Comprehensive, integrated approaches to suicide prevention: practical guidance. *Inj Prev* 2017;injuryprev-2017-042366.
11. World Health Organization. Risks to mental health: An overview of vulnerabilities and risk factors. Geneva: WHO 2012.
12. Stone DM, Holland KM, Bartholow BN, Crosby AE, Davis SP, Wilkins N. Preventing suicide: A technical package of policies, programs, and practice. 2017.
13. Milner A, Svetlicic J, De Leo D. Suicide in the absence of mental disorder? A review of psychological autopsy studies across countries. *Int J Soc Psychiatry* 2013;59:545–54.
14. Pouliot L, De Leo D. Critical issues in psychological autopsy studies. *Suicide Life Threat Behav* 2006;36:491–510.

## **Summary**

### **What is already known about this topic?**

In 2016, nearly 45,000 deaths were caused by suicide in the United States.

### **What is added by this report?**

During 1999–2016, suicide rates increased in nearly every state, including >30% increases in 25 states. Mental health problems often contribute to suicide; however, 2015 data from the National Violent Death Reporting System (27 states) indicate 54% of suicide decedents were not known to have such problems. Other contributors included relationship, substance use, health, and job/financial problems.

### **What are the implications for public health practice?**

A comprehensive approach using proven prevention strategies, such as those in CDC's Technical Package for Suicide Prevention, can help reach the national goal of reducing suicide rates 20% by 2025.



**TABLE 1. Selected demographic and descriptive characteristics of suicides aged ≥10 years with and without known mental health problems — National Violent Death Reporting System, 27 states,\* 2015**

Characteristic	Total (n = 20,446)	Known mental health problem† (n = 9,407)	No known mental health problem (n = 11,039)	Chi-Square	OR§ (95% CI)	Adjusted OR¶ (95% CI)
<b>Sex</b>						
Male	15,702 (76.8)	6,469 (68.8)	9,233 (83.6)	p<0.01	2.3 (2.2–2.5)	—
Female	4,744 (23.2)	2,938 (31.2)	1,806 (16.4)	p<0.01	0.4 (0.4–0.5)	—
<b>Age (yrs)**</b>						
10–24	2,804 (13.7)	1,211 (12.9)	1,593 (14.4)	p<0.01	1.1 (1.1–1.2)	—
25–44	6,456 (31.6)	3,036 (32.3)	3,420 (31.0)	p<0.05	0.9 (0.9–1.0)	—
45–64	7,718 (37.7)	3,820 (40.6)	3,898 (35.3)	p<0.01	0.8 (0.8–0.8)	—
≥65	3,468 (17.0)	1,340 (14.2)	2,128 (19.3)	p<0.01	1.4 (1.3–1.5)	—
<b>Race/ethnicity</b>						
White, non-Hispanic	17,102 (83.6)	8,165 (86.8)	8,937 (81.0)	p<0.01	0.6 (0.6–0.7)	—
Black, non-Hispanic	1,228 (6.0)	411 (4.4)	817 (7.4)	p<0.01	1.7 (1.5–2.0)	—
American Indian/Alaska Native, non-Hispanic	378 (1.8)	112 (1.2)	266 (2.4)	p<0.01	2.0 (1.6–2.6)	—
Asian, non-Hispanic	576 (2.8)	235 (2.5)	341 (3.1)	p<0.05	1.2 (1.1–1.5)	—
Hispanic	1,096 (5.4)	463 (4.9)	633 (5.7)	p<0.05	1.2 (1.0–1.3)	—
Other	66 (0.3)	21 (0.2)	45 (0.4)	p<0.05	1.8 (1.1–3.1)	—
<b>Extended demographics</b>						
Ever served in military††	3,429 (17.8)	1,354 (15.3)	2,075 (20.1)	p<0.01	1.4 (1.3–1.5)	1.1 (1.0–1.1)
Homeless	240 (1.2)	104 (1.1)	136 (1.3)		1.1 (0.9–1.5)	1.2 (0.9–1.5)
<b>Incident Type</b>						
Single suicide	20,063 (98.2)	9,318 (99.1)	10,745 (97.4)	p<0.01	0.3 (0.3–0.4)	0.4 (0.3–0.5)
Homicide followed by suicide	319 (1.6)	64 (0.7)	255 (2.3)	p<0.01	3.5 (2.6–4.5)	2.9 (2.2–3.8)
Multiple suicides	64 (0.3)	25 (0.3)	39 (0.4)	—	1.3 (0.8–2.2)	1.6 (0.9–2.6)
<b>Method</b>						
Firearm	9,909 (48.5)	3,821 (40.6)	6,088 (55.3)	p<0.01	1.8 (1.7–1.9)	1.6 (1.5–1.7)
Hanging/Strangulation/Suffocation	5,907 (28.9)	2,940 (31.3)	2,967 (26.9)	p<0.01	0.8 (0.8–0.9)	0.8 (0.7–0.8)
Poisoning	3,003 (14.7)	1,861 (19.8)	1,142 (10.4)	p<0.01	0.5 (0.4–0.5)	0.6 (0.6–0.7)
<b>Substance class causing death§§</b>						
Other (e.g., over-the-counter)	1,021 (34.0)	666 (35.8)	355 (31.1)	p<0.01	0.8 (0.7–0.9)	0.9 (0.7–1.0)
Opioids	944 (31.4)	608 (32.7)	336 (29.4)	—	0.9 (0.7–1.0)	0.9 (0.8–1.1)
Antidepressants	800 (26.6)	644 (34.6)	156 (13.7)	p<0.01	0.3 (0.2–0.4)	0.3 (0.3–0.4)
Benzodiazepines	624 (20.8)	468 (25.1)	156 (13.7)	p<0.01	0.5 (0.4–0.6)	0.5 (0.4–0.6)
Antipsychotics	219 (7.3)	195 (10.5)	24 (2.1)	p<0.01	0.2 (0.1–0.3)	0.2 (0.1–0.3)
Other	1,595 (7.8)	780 (8.3)	815 (7.4)	p<0.05	0.9 (0.8–1.0)	0.9 (0.8–1.0)
<b>Toxicology Results</b>						
Any toxicology testing	13,317 (65.1)	6,658 (70.8)	6,659 (60.3)	p<0.01	0.6 (0.6–0.7)	0.7 (0.6–0.7)
<b>Positive for ≥1 substance¶¶</b>	9,913 (74.4)	5,192 (78.0)	4,721 (70.9)	p<0.01	0.7 (0.6–0.7)	0.8 (0.7–0.8)
<b>Substance detected***</b>						
<b>Alcohol</b>						
Tested	10,950 (53.6)	5,409 (57.5)	5,541 (50.2)	p<0.01	0.7 (0.7–0.8)	0.8 (0.7–0.8)
Positive	4,442 (40.6)	2,115 (39.1)	2,327 (42.0)	p<0.01	1.1 (1.0–1.2)	1.2 (1.1–1.3)
<b>Opioids</b>						

Tested	8,554 (41.8)	4,258 (45.3)	4,296 (38.9)	p<0.01	0.8 (0.7–0.8)	0.8 (0.8–0.9)
Positive	2,279 (26.6)	1,238 (29.1)	1,041 (24.2)	p<0.01	0.8 (0.7–0.9)	0.9 (0.8–1.0)
Benzodiazepines						
Tested	8,124 (39.7)	4,226 (44.9)	3,898 (35.3)	p<0.01	0.7 (0.6–0.7)	0.7 (0.7–0.8)
Positive	2,464 (30.3)	1,639 (38.8)	825 (21.2)	p<0.01	0.4 (0.4–0.5)	0.5 (0.5–0.6)
Cocaine						
Tested	7,978 (39.0)	3,866 (41.1)	4,112 (37.2)	p<0.01	0.9 (0.8–0.9)	0.9 (0.9–1.0)
Positive	499 (6.3)	216 (5.6)	283 (6.9)	p<0.05	1.2 (1.0–1.5)	1.2 (1.0–1.5)
Amphetamines						
Tested	7,615 (37.2)	3,696 (39.3)	3,919 (35.5)	p<0.01	0.9 (0.8–0.9)	0.9 (0.8–0.9)
Positive	736 (9.7)	376 (10.2)	360 (9.2)	—	0.9 (0.8–1.0)	1.0 (0.8–1.1)
Marijuana						
Tested	6,569 (32.1)	3,127 (33.2)	3,442 (31.2)	p<0.01	0.9 (0.9–1.0)	0.9 (0.9–1.0)
Positive	1,471 (22.4)	710 (22.7)	761 (22.1)	—	1.0 (0.9–1.1)	0.9 (0.8–1.0)
Antidepressants						
Tested	5,425 (26.5)	3,103 (33.0)	2,322 (21.0)	p<0.01	0.5 (0.5–0.6)	0.6 (0.6–0.7)
Positive	2,214 (40.8)	1,735 (55.9)	479 (20.6)	p<0.01	0.2 (0.2–0.2)	0.2 (0.2–0.3)

**Abbreviation:** CI = confidence interval.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

<sup>†</sup> Decedent had been identified as having a current diagnosis of mental health problem in coroner/medical examiner or law enforcement reports.

<sup>§</sup> Odds ratio reflects the risk among those without known mental health problem relative to those with known mental health problem.

<sup>¶</sup> Logistic regression was used to estimate adjusted odds ratio with 95% CIs after controlling for age, sex, race and ethnicity. Known mental health problem was used as the reference group.

<sup>\*\*</sup> Decedents were aged ≥10 years, as per standard in the suicide prevention literature.

<sup>††</sup> Denominator is decedents aged ≥18 years with reported military service status.

<sup>§§</sup> Denominator is decedents who died by poisoning, including overdose.

<sup>¶¶</sup> Denominator is decedents with any toxicology tested.

<sup>\*\*\*</sup> Denominator for each positive group is the number tested for the substance in that group.



TABLE 2. Circumstances Preceding Suicide among Decedents Aged ≥10 years with and without known mental health problems — National Violent Death Reporting System, 27 states,\* 2015

Characteristics	Total	Known mental health problem†, no. (%)	No known mental health problem, no. (%)	Chi-Square	OR§ (95% CI)	Adjusted OR¶ (95% CI)
Suicide with known circumstances	18,764 (91.8)	9,407 (100)	9,357 (84.8)	p<0.01	—	—
<b>Mental Health</b>						
Any Current Diagnosed Mental Health Problem**						
Depression/dysthymia		7,076 (75.2)	—	—	—	—
Anxiety disorder		1,579 (16.8)	—	—	—	—
Bipolar disorder		1,431 (15.2)	—	—	—	—
Schizophrenia		509 (5.4)	—	—	—	—
PTSD		424 (4.5)	—	—	—	—
ADD/ADHD		226 (2.4)	—	—	—	—
Unknown		760 (8.1)	—	—	—	—
Current depressed mood		3,962 (42.1)	3,076 (32.9)	p<0.01	0.7 (0.6–0.7)	0.7 (0.6–0.7)
<b>Substance Problems</b>						
Any Current substance problem	5,319 (28.3)	2,976 (31.6)	2,343 (25.0)	p<0.01	0.7 (0.7–0.8)	0.7 (0.7–0.8)
Alcohol problem	3,268 (17.4)	1,862 (19.8)	1,406 (15.0)	p<0.01	0.7 (0.7–0.8)	0.7 (0.7–0.8)
Other substance problem	3,084 (16.4)	1,768 (18.8)	1,316 (14.1)	p<0.01	0.7 (0.7–0.8)	0.7 (0.7–0.8)
<b>Treatment</b>						
Current mental health/substance abuse treatment	5,141 (27.4)	5,077 (54.0)	64 (0.7)	p<0.01	0.01 (0.01–0.01)	0.01 (0.01–0.01)
Ever treated for mental health/substance problem	6,717 (35.8)	6,323 (67.2)	394 (4.2)	p<0.01	0.02 (0.02–0.02)	0.02 (0.02–0.03)
<b>Relationship Problems/Loss</b>						
Any relationship problem/loss	7,948 (42.4)	3,726 (39.6)	4,222 (45.1)	p<0.01	1.3 (1.2–1.3)	1.3 (1.2–1.4)
Intimate partner problem	5,098 (27.2)	2,270 (24.1)	2,828 (30.2)	p<0.01	1.4 (1.3–1.5)	1.4 (1.3–1.5)
Perpetrator of interpersonal violence in past month	414 (2.2)	131 (1.4)	283 (3.0)	p<0.01	2.2 (1.8–2.7)	2.0 (1.6–2.4)
Victim of interpersonal violence in past month	84 (0.4)	53 (0.6)	31 (0.3)	p<0.05	0.6 (0.4–0.9)	0.8 (0.5–1.2)
Family relationship problem	1,671 (8.9)	873 (9.3)	798 (8.5)	—	0.9 (0.8–1.0)	1.0 (0.9–1.1)
Other relationship problem (non-intimate)	403 (2.1)	202 (2.1)	201 (2.1)	—	1.0 (0.8–1.2)	1.1 (0.9–1.3)
Argument or conflict (not specified)	2,914 (15.5)	1,278 (13.6)	1,636 (17.5)	p<0.01	1.3 (1.2–1.5)	1.4 (1.3–1.5)
Death of a loved one (any)	1,497 (8.0)	826 (8.8)	671 (7.2)	p<0.01	0.8 (0.7–0.9)	0.9 (0.8–0.9)
Non-suicide death	1,181 (6.3)	647 (6.9)	534 (5.7)	p<0.01	0.8 (0.7–0.9)	0.9 (0.8–1.0)
Suicide of family or friend	379 (2.0)	217 (2.3)	162 (1.7)	p<0.01	0.7 (0.6–0.9)	0.8 (0.7–1.0)
<b>Other Life Stressors</b>						
Any life stressor	9,743 (51.9)	4,675 (49.7)	5,068 (54.2)	p<0.01	1.2 (1.1–1.3)	1.1 (1.1–1.2)
Recent criminal legal problem	1,588 (8.5)	586 (6.2)	1,002 (10.7)	p<0.01	1.8 (1.6–2.0)	1.7 (1.5–1.9)
Other legal problem	748 (4.0)	378 (4.0)	370 (4.0)	—	1.0 (0.8–1.1)	1.0 (0.9–1.2)
Physical health problem	4,179 (22.3)	2,012 (21.4)	2,167 (23.2)	p<0.01	1.1 (1.0–1.2)	1.0 (1.0–1.1)
Job/Financial problem††	2941 (16.2)	1530 (16.8)	1411 (15.6)	p<0.05	0.9 (0.8–1.0)	0.9 (0.8–1.0)
Eviction or loss of home	722 (3.8)	317 (3.4)	405 (4.3)	p<0.01	1.3 (1.1–1.5)	1.4 (1.2–1.6)
School problem§§	162 (0.9)	70 (0.7)	92 (1.0)	—	1.3 (0.9–1.8)	1.3 (0.9–1.9)
Recent release from an institution¶¶	1,412 (7.6)	941 (10.2)	471 (5.1)	p<0.01	0.5 (0.4–0.5)	0.5 (0.4–0.5)

**Comment [OADS]:** Please consider revising or elaborating on what is meant in this context by, “unknown” to distinguish it from, “no known” e.g. “not reported” or “not documented” or other. Level 3

Jail/prison/detention facility	203 (14.4)	82 (8.7)	121 (25.7)	p<0.01	3.6 (2.7–4.9)	4.5 (3.2–6.4)
Hospital	517 (36.6)	311 (33.0)	206 (43.7)	p<0.01	1.6 (1.3–2.0)	1.3 (1.0–1.7)
Psychiatric hospital/institution	469 (33.2)	439 (46.7)	30 (6.4)	p<0.01	0.1 (0.1–0.1)	0.1 (0.1–0.1)
Other (includes alcohol/SA treatment facilities)	223 (15.8)	109 (11.6)	114 (24.2)	p<0.01	2.4 (1.8–3.3)	2.5 (1.8–3.3)
<b>Recent or Impending Crisis</b>						
Crisis within past or upcoming 2 weeks***	5,525 (29.4)	2,444 (26.0)	3,081 (32.9)	p<0.01	1.4 (1.3–1.5)	1.4 (1.3–1.5)
Intimate partner problem crisis	1968 (35.6)	854 (34.9)	1114 (36.2)	—	1.1 (0.9–1.2)	1.1 (0.9–1.2)
Physical health problem crisis	739 (13.4)	315 (12.9)	424 (13.8)	—	1.1 (0.9–1.3)	1.0 (0.8–1.2)
Criminal legal problem crisis	621 (11.2)	203 (8.3)	418 (13.6)	p<0.01	1.7 (1.5–2.1)	1.6 (1.3–1.9)
Family relationship problem crisis	430 (7.8)	212 (8.7)	218 (7.1)	p<0.05	0.8 (0.7–1.0)	0.9 (0.7–1.1)
Job problem crisis	354 (6.4)	191 (7.8)	163 (5.3)	p<0.01	0.7 (0.5–0.8)	0.7 (0.5–0.8)
<b>Suicide event/history</b>						
Left a note	6,468 (34.5)	3,182 (33.8)	3,286 (35.1)	—	1.1 (1.0–1.1)	1.2 (1.1–1.2)
Disclosed suicide intent	4,405 (23.5)	2,306 (24.5)	2,099 (22.4)	p<0.01	0.9 (0.8–1.0)	0.9 (0.8–0.9)
History of ideation	5,990 (31.9)	3,838 (40.8)	2,152 (23.0)	p<0.01	0.4 (0.4–0.5)	0.4 (0.4–0.5)
History of attempts	3,732 (19.9)	2,770 (29.4)	962 (10.3)	p<0.01	0.3 (0.3–0.3)	0.3 (0.3–0.3)

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

<sup>†</sup> Decedent had been identified as having a current diagnosis of mental health problem in coroner/medical examiner or law enforcement reports.

<sup>‡</sup> Odds ratio reflects the risk among those without known mental health problem relative to those with known mental health problem.

<sup>§</sup> Logistic regression was used to estimate adjusted odds ratio with 95% CIs after controlling for age, sex, race and ethnicity. Known mental health problem was the reference group.

<sup>\*\*</sup> Includes decedents with one or more diagnosed current mental health problems, which are not mutually exclusive. Therefore, sums of percentages for the diagnosed conditions exceed 100%.

Denominator includes the number of decedents with one or more current diagnosed mental health problems.

<sup>††</sup> Denominator is decedents aged ≥18 years.

<sup>§§</sup> Denominator is decedents aged 10–18 years.

<sup>†††</sup> Denominator of institution subgroup is decedents with recent release from an institution. Recent release from an institution is defined as having occurred within the past month.

<sup>\*\*\*</sup> Denominator of crisis subgroup is decedents with any crisis within past or upcoming 2 weeks. Crises depicted here represent the most commonly occurring categories.

**FIGURE. Percentage change in annual suicide rate,\* by state — United States, 2014–2016**

\* Per 100,000 population, age-adjusted to the 2000 U.S. standard population.

<sup>†</sup> Compared with 1999–2001.

**Comment [OADS]:** Please consider revising the Figure title for clarity. As written, it may be misread as the change in rate from 2014 to 2016 (even with the footnote).

Level 2

**Comment [HTM():]** Deb, I took that out of title and put as a footnote, but will replace in title



## Vital Signs: Trends in State Suicide Rates — United States, 1999–2016 and Circumstances Contributing to Suicide — 27 States, 2015

Deborah M. Stone, ScD<sup>1</sup>; Thomas R. Simon PhD<sup>1</sup>; Katherine A. Fowler, PhD<sup>1</sup>; Scott R. Kegler, PhD<sup>2</sup>; Keming Yuan, MS<sup>1</sup>; Kristin M. Holland, PhD<sup>1</sup>; Asha Z. Ivey-Stephenson, PhD<sup>1</sup>; Alex E. Crosby, MD<sup>1</sup>

### Abstract

**Introduction:** Suicide rates in the United States have risen nearly 30% since 1999, and mental health conditions are one of several factors contributing to suicide. Examining state-level trends in suicide and the multiple circumstances contributing to it can inform comprehensive state suicide prevention planning.

**Methods:** Trends in age-adjusted suicide rates among persons aged  $\geq 10$  years, by state and sex, across six consecutive 3-year periods (1999–2016), were assessed using data from the National Vital Statistics System for 50 states and the District of Columbia. Data from the National Violent Death Reporting System, covering 27 states in 2015, were used to examine contributing circumstances among decedents with and without known mental health conditions.

**Results:** During 1999–2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases  $>30\%$ . Rates increased significantly among males and females in 34 and 43 states, respectively. Fifty-four percent of decedents in 27 states in 2015 did not have a known mental health condition.

Among decedents with available information, several circumstances were significantly more likely among those without known mental health conditions than among those with mental health conditions, including relationship problems/loss (45.1% versus 39.6%), life stressors (50.5% versus 47.2%), and recent/impending crises (32.9% versus 26.0%), but these circumstances were common across groups.

**Conclusions:** Suicide rates increased significantly across most states during 1999–2016. Various circumstances contributed to suicides among persons with and without known mental health conditions.

**Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach to prevent suicide risk before it occurs, identify and support persons at risk, prevent reattempts, and help friends and family members in the aftermath of a suicide.

### INSIDE

7 QuickStats

Continuing Education examination available at  
[https://www.cdc.gov/mmwr/cme/conted\\_info.html#weekly](https://www.cdc.gov/mmwr/cme/conted_info.html#weekly).



U.S. Department of Health and Human Services  
Centers for Disease Control and Prevention



## Introduction

In 2016, nearly 45,000 suicides (15.6/100,000 population [age-adjusted]) occurred in the United States among persons aged  $\geq 10$  years (1). From 1999 to 2015, suicide rates increased among both sexes, all racial/ethnic groups, and all urbanized areas (2,3). Suicide rates have also increased among persons in all age groups  $< 75$  years, with adults aged 45–64 having the largest percent increase (45%; from 13.2 per 100,000 persons [1999] to 19.2 per 100,000 [2016]) and the greatest number of suicides (232,108 from 1999 to 2016) (1,3). Suicide is the 10th leading cause of death and is one of just three leading causes that are increasing (1,4). In addition, rates of emergency department visits for nonfatal self-harm, a main risk factor for suicide, increased 42% from 2001 to 2016 (1). Together, suicides and self-harm injuries cost the nation approximately \$70 billion in direct medical and work loss costs (1).

The National Strategy for Suicide Prevention (NSSP) (5) calls for a public health approach to suicide prevention with efforts spanning multiple levels (individual, family/relationship, community, and societal). Such a comprehensive approach underscores that suicide is rarely caused by any single factor, but rather, is determined by multiple factors. Despite NSSP guidance, suicide prevention largely focuses on mental health conditions alone by identifying suicidal persons, providing treatment for mental health conditions, and preventing reattempts (6). In addition to mental health conditions and prior suicide attempts, other contributing circumstances

include social and economic problems, access to lethal means (e.g., substances, firearms) among persons at risk, and poor coping and problem-solving skills (5). Expanded awareness of these additional circumstances contributing to suicide risk and action to address them can help reach the national goal, established by the National Action Alliance of Suicide Prevention and the American Foundation for Suicide Prevention, of reducing the annual suicide rate 20% by 2025 (7). To assist states in achieving this goal, CDC analyzed state-specific trends in suicide rates and assessed the multiple contributing factors to suicide; this report presents options for strategies to include in comprehensive suicide prevention efforts that are based on the best available evidence.

## Methods

Suicide rates were analyzed for persons aged  $\geq 10$  years because determining suicidal intent in younger children can be difficult (8). Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases, Tenth Revision*, underlying-cause-of-death codes X60–X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive 3-year aggregate periods spanning 1999–2016 (1999–2001; 2002–2004; 2005–2007;

The *MMWR* series of publications is published by the Center for Surveillance, Epidemiology, and Laboratory Services, Centers for Disease Control and Prevention (CDC), U.S. Department of Health and Human Services, Atlanta, GA 30329-4027.

**Suggested citation:** [Author names; first three, then et al., if more than six.] [Report title]. *MMWR Morb Mortal Wkly Rep* 2018;67:[inclusive page numbers].

### Centers for Disease Control and Prevention

Robert R. Redfield, MD, *Director*  
Anne Schuchat, MD, *Principal Deputy Director*  
Leslie Dauphin, PhD, *Acting Associate Director for Science*  
Joanne Cono, MD, ScM, *Director, Office of Science Quality*  
Chesley L. Richards, MD, MPH, *Deputy Director for Public Health Scientific Services*  
Michael F. Iademarco, MD, MPH, *Director, Center for Surveillance, Epidemiology, and Laboratory Services*

### MMWR Editorial and Production Staff (Weekly)

Charlotte K. Kent, PhD, MPH, *Acting Editor in Chief, Executive Editor*  
Jacqueline Gindler, MD, *Editor*  
Mary Dott, MD, MPH, *Online Editor*  
Teresa F. Rutledge, *Managing Editor*  
Douglas W. Weatherwax, *Lead Technical Writer-Editor*  
Glenn Damon, Soumya Dunworth, PhD, Teresa M. Hood, MS, *Technical Writer-Editors*

Martha F. Boyd, *Lead Visual Information Specialist*  
Maureen A. Leahy, Julia C. Martinroe,  
Stephen R. Spriggs, Tong Yang, *Visual Information Specialists*  
Quang M. Doan, MBA, Phyllis H. King,  
Terraye M. Starr, Moua Yang, *Information Technology Specialists*

### MMWR Editorial Board

Timothy F. Jones, MD, *Chairman*  
Matthew L. Boulton, MD, MPH  
Virginia A. Caine, MD  
Katherine Lyon Daniel, PhD  
Jonathan E. Fielding, MD, MPH, MBA  
David W. Fleming, MD

William E. Halperin, MD, DrPH, MPH  
King K. Holmes, MD, PhD  
Robin Ikeda, MD, MPH  
Rima F. Khabbaz, MD  
Phyllis Meadows, PhD, MSN, RN  
Jewel Mullen, MD, MPH, MPA

Jeff Niederdeppe, PhD  
Patricia Quinlisk, MD, MPH  
Patrick L. Remington, MD, MPH  
Carlos Roig, MS, MA  
William L. Roper, MD, MPH  
William Schaffner, MD



2008–2010; 2011–2013; and 2014–2016). Rate estimates were age-adjusted to the U.S. 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same 3-year data aggregates, employing weighted least-squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes.

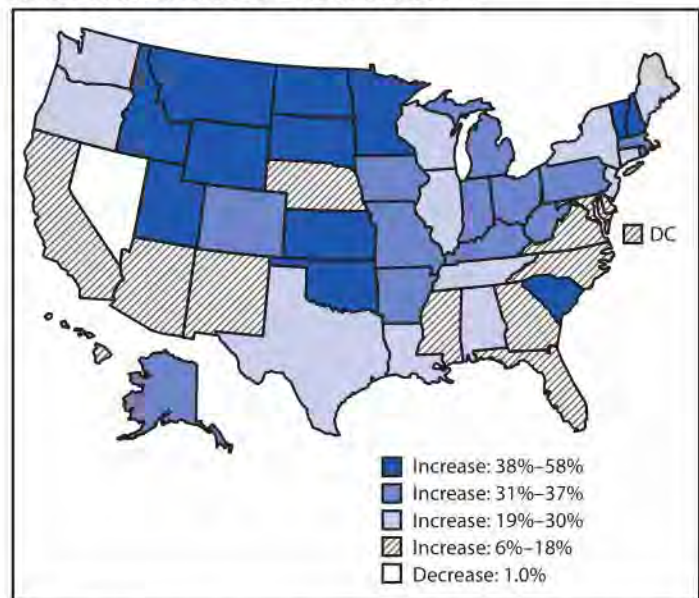
Characteristics of persons aged  $\geq 10$  years who died by suicide, with and without known mental health conditions, and the circumstances surrounding the suicides were compared in the 27 states\* with complete data participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines mental health conditions as disorders and syndromes listed in the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (9), with the exception of problematic alcohol and other substance use that is captured separately in NVDRS. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. A range of circumstances (relationship problems, life stressors, and recent or impending crises) have been identified as potential risk factors for suicide. Circumstances captured by NVDRS are those identified as contributing to suicide in coroner/medical examiner or law enforcement reports, which reflect information provided by family and friends. Decedents could have experienced multiple circumstances. Decedents with and without known mental health conditions were compared using Chi-square tests. Logistic regression analyses estimated adjusted odds ratios (aORs) with 95% confidence intervals (CIs), controlling for age group, sex, and race/ethnicity.

## Results

The most recent overall suicide rates (representing 2014–2016) varied fourfold, from 6.9 (District of Columbia) to 29.2 (Montana) per 100,000 persons per year (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>). Across the study period, rates increased in all states except Nevada (where the rate was consistently high throughout the study period), with absolute increases ranging from 0.8 per 100,000 (Delaware) to 8.1 (Wyoming). Percentage increases in rates ranged from 5.9% (Delaware) to 57.6% (North Dakota), with increases  $>30\%$  observed in 25 states (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>) (Figure).

Modeled suicide rate trends indicated significant increases in 44 states, among males (34 states) and females (43 states), as well as for the United States overall (Supplementary Table;

**FIGURE. Percent change in annual suicide rate,\* by state — United States, from 1999–2001 to 2014–2016**



\* Per 100,000 population, age-adjusted to the 2000 U.S. standard population.

<https://stacks.cdc.gov/view/cdc/53785>). Nationally, the model-estimated average annual percentage change for the overall suicide rate was an increase of 1.5%. By sex, estimated national rate trends further indicated significant average annual percentage change increases for males (1.1%) and females (2.6%) (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>).

Suicide decedents without known mental health conditions (11,039; 54%) were compared with those with known mental health conditions (9,407; 46%) in 27 states. Whereas all decedents were predominately male (76.8%) (Table 1) and non-Hispanic white (83.6%), those without known mental health conditions, relative to those with mental health conditions, were more likely to be male (83.6% versus 68.8%; odds ratio [OR] = 2.3, 95% CI = 2.2–2.5) and belong to a racial/ethnic minority (OR range = 1.2–2.0). Suicide decedents without known mental health conditions also had significantly higher odds of perpetrating homicide followed by suicide (aOR = 2.9, 95% CI = 2.2–3.8). Among decedents aged  $\geq 18$  years, 20.1% of those without known mental health conditions and 15.3% of those with mental health conditions had ever served in the U.S. military or were serving at the time of death.

Whereas firearms were the most common method of suicide overall (48.5%), decedents without known mental health conditions were more likely to die by firearm (55.3%) and less likely to die by hanging/strangulation/suffocation (26.9%) or poisoning (10.4%) than were those with known mental health conditions (40.6%, 31.3%, and 19.8%, respectively). These differences remained significant in the adjusted models.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.



**TABLE 1. Selected demographic and descriptive characteristics of suicides among persons aged  $\geq 10$  years with and without known mental health conditions — National Violent Death Reporting System, 27 states,\* 2015**

Characteristic	Total (N = 20,446)	Known mental health condition <sup>†</sup> (n = 9,407)	No known mental health condition (n = 11,039)	P-value	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>¶</sup> (95% CI)
<b>Sex</b>						
Male	15,702 (76.8)	6,469 (68.8)	9,233 (83.6)	<0.01	2.3 (2.2–2.5)	NA
Female	4,744 (23.2)	2,938 (31.2)	1,806 (16.4)	<0.01	0.4 (0.4–0.5)	NA
<b>Age (yrs)**</b>						
10–24	2,804 (13.7)	1,211 (12.9)	1,593 (14.4)	<0.01	1.1 (1.1–1.2)	NA
25–44	6,456 (31.6)	3,036 (32.3)	3,420 (31.0)	<0.05	0.9 (0.9–1.0)	NA
45–64	7,718 (37.7)	3,820 (40.6)	3,898 (35.3)	<0.01	0.8 (0.8–0.8)	NA
$\geq 65$	3,468 (17.0)	1,340 (14.2)	2,128 (19.3)	<0.01	1.4 (1.3–1.5)	NA
<b>Race/Ethnicity</b>						
White, non-Hispanic	17,102 (83.6)	8,165 (86.8)	8,937 (81.0)	<0.01	0.6 (0.6–0.7)	NA
Black, non-Hispanic	1,228 (6.0)	411 (4.4)	817 (7.4)	<0.01	1.7 (1.5–2.0)	NA
American Indian/Alaska Native, non-Hispanic	378 (1.8)	112 (1.2)	266 (2.4)	<0.01	2.0 (1.6–2.6)	NA
Asian, non-Hispanic	576 (2.8)	235 (2.5)	341 (3.1)	<0.05	1.2 (1.1–1.5)	NA
Hispanic	1,096 (5.4)	463 (4.9)	633 (5.7)	<0.05	1.2 (1.0–1.3)	NA
Other	66 (0.3)	21 (0.2)	45 (0.4)	<0.05	1.8 (1.1–3.1)	NA
<b>Extended demographics</b>						
Ever served in military <sup>††</sup>	3,429 (17.8)	1,354 (15.3)	2,075 (20.1)	<0.01	1.4 (1.3–1.5)	1.1 (1.0–1.1)
Homeless	240 (1.2)	104 (1.1)	136 (1.3)	<0.01	1.1 (0.9–1.5)	1.2 (0.9–1.5)
<b>Incident type</b>						
Single suicide	20,063 (98.2)	9,318 (99.1)	10,745 (97.4)	<0.01	0.3 (0.3–0.4)	0.4 (0.3–0.5)
Homicide followed by suicide	319 (1.6)	64 (0.7)	255 (2.3)	<0.01	3.5 (2.6–4.5)	2.9 (2.2–3.8)
Multiple suicides	64 (0.3)	25 (0.3)	39 (0.4)	NS	1.3 (0.8–2.2)	1.6 (0.9–2.6)
<b>Method</b>						
Firearm	9,909 (48.5)	3,821 (40.6)	6,088 (55.3)	<0.01	1.8 (1.7–1.9)	1.6 (1.5–1.7)
Hanging/Strangulation/Suffocation	5,907 (28.9)	2,940 (31.3)	2,967 (26.9)	<0.01	0.8 (0.8–0.9)	0.8 (0.7–0.8)
Poisoning	3,003 (14.7)	1,861 (19.8)	1,142 (10.4)	<0.01	0.5 (0.4–0.5)	0.6 (0.6–0.7)
<b>Substance class causing death<sup>§§</sup></b>						
Other (e.g., over-the-counter)	1,021 (34.0)	666 (35.8)	355 (31.1)	<0.01	0.8 (0.7–0.9)	0.9 (0.7–1.0)
Opioids	944 (31.4)	608 (32.7)	336 (29.4)	NS	0.9 (0.7–1.0)	0.9 (0.8–1.1)
Antidepressants	800 (26.6)	644 (34.6)	156 (13.7)	<0.01	0.3 (0.2–0.4)	0.3 (0.3–0.4)
Benzodiazepines	624 (20.8)	468 (25.1)	156 (13.7)	<0.01	0.5 (0.4–0.6)	0.5 (0.4–0.6)
Antipsychotics	219 (7.3)	195 (10.5)	24 (2.1)	<0.01	0.2 (0.1–0.3)	0.2 (0.1–0.3)
Other	1,595 (7.8)	780 (8.3)	815 (7.4)	<0.05	0.9 (0.8–1.0)	0.9 (0.8–1.0)

See table footnotes on next page.

Toxicology testing was less likely to be performed for decedents without known mental health conditions. Among those with toxicology results, decedents without known mental health conditions were less likely to test positive for any substance overall (aOR = 0.8, 95% CI = 0.7–0.8), including opioids (aOR = 0.90, 95% CI = 0.81–0.99), but were more likely to test positive for alcohol (aOR = 1.2, 95% CI = 1.1–1.3).

Information on circumstances surrounding suicide were available for all decedents with mental health conditions (n = 9,407) and approximately 85% of those without known mental health conditions (n = 9,357) in 27 states (Table 2). Persons without known mental health conditions were less likely to have any problematic substance use (aOR = 0.7, 95% CI = 0.7–0.8) than were persons with known mental health conditions. Whereas two thirds of decedents with known mental health conditions had a history of mental health or substance use treatment (67.2%), just over half (54.0%) were in treatment at the time of death.

Decedents without known mental health conditions had a significantly higher likelihood of any relationship problem/loss (45.1%) than did those with known mental health conditions (39.6%), specifically intimate partner problems (30.2% versus 24.1%), arguments/conflicts (17.5% versus 13.6%), and perpetrating interpersonal violence in the past month (3.0% versus 1.4%). Decedents without known mental health conditions were also more likely than were those with known mental health conditions to have experienced any life stressors (50.5% versus 47.2%) such as criminal legal problems (10.7% versus 6.2%) or eviction/loss of home (4.3% versus 3.4%) and were more likely to have had a recent or impending (within the preceding or upcoming 2 weeks, respectively) crisis (a current or acute event thought to contribute to the suicide) (32.9% versus 26.0%). All of these differences remained significant in the adjusted models. Physical health problems and job/financial problems were commonly contributing stressors among both persons without mental health conditions (23.2% and



**TABLE 1. (Continued) Selected demographic and descriptive characteristics of suicides among persons aged ≥10 years with and without known mental health conditions — National Violent Death Reporting System, 27 states,\* 2015**

Characteristic	Total (N = 20,446)	Known mental health condition† (n = 9,407)	No known mental health condition (n = 11,039)	P-value	OR§ (95% CI)	Adjusted OR¶ (95% CI)
<b>Toxicology results</b>						
Any toxicology testing	13,317 (65.1)	6,658 (70.8)	6,659 (60.3)	<0.01	0.6 (0.6–0.7)	0.7 (0.6–0.7)
Positive for ≥1 substance¶¶	9,913 (74.4)	5,192 (78.0)	4,721 (70.9)	<0.01	0.7 (0.6–0.7)	0.8 (0.7–0.8)
<b>Substance detected***</b>						
Alcohol						
Tested	10,950 (53.6)	5,409 (57.5)	5,541 (50.2)	<0.01	0.7 (0.7–0.8)	0.8 (0.7–0.8)
Positive	4,442 (40.6)	2,115 (39.1)	2,327 (42.0)	<0.01	1.1 (1.0–1.2)	1.2 (1.1–1.3)
Opioids						
Tested	8,554 (41.8)	4,258 (45.3)	4,296 (38.9)	<0.01	0.8 (0.7–0.8)	0.8 (0.8–0.9)
Positive	2,279 (26.6)	1,238 (29.1)	1,041 (24.2)	<0.01	0.8 (0.7–0.9)	0.9 (0.8–1.0)
Benzodiazepines						
Tested	8,124 (39.7)	4,226 (44.9)	3,898 (35.3)	<0.01	0.7 (0.6–0.7)	0.7 (0.7–0.8)
Positive	2,464 (30.3)	1,639 (38.8)	825 (21.2)	<0.01	0.4 (0.4–0.5)	0.5 (0.5–0.6)
Cocaine						
Tested	7,978 (39.0)	3,866 (41.1)	4,112 (37.2)	<0.01	0.9 (0.8–0.9)	0.9 (0.9–1.0)
Positive	499 (6.3)	216 (5.6)	283 (6.9)	<0.05	1.2 (1.0–1.5)	1.2 (1.0–1.5)
Amphetamines						
Tested	7,615 (37.2)	3,696 (39.3)	3,919 (35.5)	<0.01	0.9 (0.8–0.9)	0.9 (0.8–0.9)
Positive	736 (9.7)	376 (10.2)	360 (9.2)	NS	0.9 (0.8–1.0)	1.0 (0.8–1.1)
Marijuana						
Tested	6,569 (32.1)	3,127 (33.2)	3,442 (31.2)	<0.01	0.9 (0.9–1.0)	0.9 (0.9–1.0)
Positive	1,471 (22.4)	710 (22.7)	761 (22.1)	NS	1.0 (0.9–1.1)	0.9 (0.8–1.0)
Antidepressants						
Tested	5,425 (26.5)	3,103 (33.0)	2,322 (21.0)	<0.01	0.5 (0.5–0.6)	0.6 (0.6–0.7)
Positive	2,214 (40.8)	1,735 (55.9)	479 (20.6)	<0.01	0.2 (0.2–0.2)	0.2 (0.2–0.3)

**Abbreviations:** CI = confidence interval; NA = not adjusted; NS = not significant; OR = odds ratio.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

† Decedent had been identified as having a current diagnosis of mental health condition in coroner/medical examiner or law enforcement reports.

§ OR reflects the risk among those without known mental health condition relative to those with known mental health condition.

¶ Logistic regression was used to estimate adjusted OR with 95% CIs after controlling for age, sex, race, and ethnicity. Known mental health condition was used as the reference group.

\*\* Decedents were aged ≥10 years, as per standard in the suicide prevention literature.

†† Denominator is decedents aged ≥18 years with reported military service status.

§§ Denominator is decedents who died by poisoning, including overdose.

¶¶ Denominator is decedents with any toxicology testing.

\*\*\* Denominator for each positive group is the number tested for the substance in that group.

15.6%, respectively) and those with mental health conditions (21.4% and 16.8%, respectively). Similarly, among all persons with recent crises, intimate partner problems were the most common types and did not differ by group.

Decedents without known mental health conditions had significantly lower odds of recent release from any institution (aOR = 0.5, 95% CI = 0.4–0.5). Among those recently released, decedents without known mental health conditions were significantly more likely than decedents with mental health problems to have been released from a correctional facility (25.7% versus 8.7%), hospital (43.7% versus 33.0%), or other facility, such as an alcohol/substance use treatment facility (24.2% versus 11.6%). Among decedents with known mental health conditions who were recently released from an institution, 46.7% were released from psychiatric facilities.

Decedents without known mental health conditions were significantly less likely to have a history of suicidal ideation

(23.0%) or prior suicide attempts (10.3%) compared with those with known mental health conditions (40.8% and 29.4%, respectively). Suicide intent was disclosed by 22.4% and 24.5% of persons without and with known mental health conditions, respectively.

## Conclusions and Comments

During 1999–2016, suicide rates increased significantly in 44 states, and 25 states experienced increases >30%. Rates increased significantly among males in 34 states, and females in 43 states. Additional research into the specific causes of these trends is needed. Data from the 27 states participating in NVDRS provide important insight into circumstances surrounding suicide and can help states identify prevention priorities.

Suicidologists regularly state that suicide is not caused by a single factor (5); however, suicide prevention is often



**TABLE 2. Circumstances preceding suicide among decedents aged ≥10 years with and without known mental health conditions — National Violent Death Reporting System, 27 states,\* 2015**

Characteristic	Total	Known mental health condition <sup>†</sup> no. (%)	No known mental health condition no. (%)	P-value	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>¶</sup> (95% CI)
<b>Suicide with known circumstances</b>	<b>18,764 (91.8)</b>	<b>9,407 (100)</b>	<b>9,357 (84.8)</b>	<b>&lt;0.01</b>	<b>N/A</b>	<b>N/A</b>
<b>Mental health</b>						
Any current diagnosed mental health condition**						
Depression/Dysthymia	—††	7,076 (75.2)	N/A	N/A	N/A	N/A
Anxiety disorder	—††	1,579 (16.8)	N/A	N/A	N/A	N/A
Bipolar disorder	—††	1,431 (15.2)	N/A	N/A	N/A	N/A
Schizophrenia	—††	509 (5.4)	N/A	N/A	N/A	N/A
PTSD	—††	424 (4.5)	N/A	N/A	N/A	N/A
ADD/ADHD	—††	226 (2.4)	N/A	N/A	N/A	N/A
Not specified	—††	760 (8.1)	N/A	N/A	N/A	N/A
Current depressed mood <sup>§§</sup>	<b>7,038 (37.5)</b>	<b>3,962 (42.1)</b>	<b>3,076 (32.9)</b>	<b>&lt;0.01</b>	<b>0.7 (0.6–0.7)</b>	<b>0.7 (0.6–0.7)</b>
<b>Problematic substance use</b>						
Any	<b>5,319 (28.3)</b>	<b>2,976 (31.6)</b>	<b>2,343 (25.0)</b>	<b>&lt;0.01</b>	<b>0.7 (0.7–0.8)</b>	<b>0.7 (0.7–0.8)</b>
Alcohol	<b>3,268 (17.4)</b>	<b>1,862 (19.8)</b>	<b>1,406 (15.0)</b>	<b>&lt;0.01</b>	<b>0.7 (0.7–0.8)</b>	<b>0.7 (0.7–0.8)</b>
Other	<b>3,084 (16.4)</b>	<b>1,768 (18.8)</b>	<b>1,316 (14.1)</b>	<b>&lt;0.01</b>	<b>0.7 (0.7–0.8)</b>	<b>0.7 (0.7–0.8)</b>
<b>Treatment</b>						
Current mental health/substance use treatment	<b>5,141 (27.4)</b>	<b>5,077 (54.0)</b>	<b>64 (0.7)</b>	<b>&lt;0.01</b>	<b>0.01 (0.01–0.01)</b>	<b>0.01 (0.01–0.01)</b>
Ever treated for mental health/substance disorder	<b>6,717 (35.8)</b>	<b>6,323 (67.2)</b>	<b>394 (4.2)</b>	<b>&lt;0.01</b>	<b>0.02 (0.02–0.02)</b>	<b>0.02 (0.02–0.03)</b>
<b>Relationship problems/loss</b>						
Any relationship problem/loss	<b>7,948 (42.4)</b>	<b>3,726 (39.6)</b>	<b>4,222 (45.1)</b>	<b>&lt;0.01</b>	<b>1.3 (1.2–1.3)</b>	<b>1.3 (1.2–1.4)</b>
Intimate partner problem	<b>5,098 (27.2)</b>	<b>2,270 (24.1)</b>	<b>2,828 (30.2)</b>	<b>&lt;0.01</b>	<b>1.4 (1.3–1.5)</b>	<b>1.4 (1.3–1.5)</b>
Perpetrator of interpersonal violence in past month	<b>414 (2.2)</b>	<b>131 (1.4)</b>	<b>283 (3.0)</b>	<b>&lt;0.01</b>	<b>2.2 (1.8–2.7)</b>	<b>2.0 (1.6–2.4)</b>
Victim of interpersonal violence in past month	<b>84 (0.4)</b>	<b>53 (0.6)</b>	<b>31 (0.3)</b>	<b>&lt;0.05</b>	<b>0.6 (0.4–0.9)</b>	<b>0.8 (0.5–1.2)</b>
Family relationship problem	<b>1,671 (8.9)</b>	<b>873 (9.3)</b>	<b>798 (8.5)</b>	<b>NS</b>	<b>0.9 (0.8–1.0)</b>	<b>1.0 (0.9–1.1)</b>
Other relationship problem (nonintimate)	<b>403 (2.1)</b>	<b>202 (2.1)</b>	<b>201 (2.1)</b>	<b>NS</b>	<b>1.0 (0.8–1.2)</b>	<b>1.1 (0.9–1.3)</b>
Argument or conflict (not specified)	<b>2,914 (15.5)</b>	<b>1,278 (13.6)</b>	<b>1,636 (17.5)</b>	<b>&lt;0.01</b>	<b>1.3 (1.2–1.5)</b>	<b>1.4 (1.3–1.5)</b>
Death of a loved one (any)	<b>1,497 (8.0)</b>	<b>826 (8.8)</b>	<b>671 (7.2)</b>	<b>&lt;0.01</b>	<b>0.8 (0.7–0.9)</b>	<b>0.9 (0.8–0.9)</b>
Nonsuicide death	<b>1,181 (6.3)</b>	<b>647 (6.9)</b>	<b>534 (5.7)</b>	<b>&lt;0.01</b>	<b>0.8 (0.7–0.9)</b>	<b>0.9 (0.8–1.0)</b>
Suicide of family or friend	<b>379 (2.0)</b>	<b>217 (2.3)</b>	<b>162 (1.7)</b>	<b>&lt;0.01</b>	<b>0.7 (0.6–0.9)</b>	<b>0.8 (0.7–1.0)</b>
<b>Other life stressors</b>						
Any life stressor	<b>9,171 (48.9)</b>	<b>4,442 (47.2)</b>	<b>4,729 (50.5)</b>	<b>&lt;0.01</b>	<b>1.1 (1.1–1.2)</b>	<b>1.1 (1.0–1.2)</b>
Recent criminal legal problem	<b>1,588 (8.5)</b>	<b>586 (6.2)</b>	<b>1,002 (10.7)</b>	<b>&lt;0.01</b>	<b>1.8 (1.6–2.0)</b>	<b>1.7 (1.5–1.9)</b>
Other legal problem	<b>748 (4.0)</b>	<b>378 (4.0)</b>	<b>370 (4.0)</b>	<b>NS</b>	<b>1.0 (0.8–1.1)</b>	<b>1.0 (0.9–1.2)</b>
Physical health problem	<b>4,179 (22.3)</b>	<b>2,012 (21.4)</b>	<b>2,167 (23.2)</b>	<b>&lt;0.01</b>	<b>1.1 (1.0–1.2)</b>	<b>1.0 (1.0–1.1)</b>
Job/Financial problem <sup>¶¶</sup>	<b>2,941 (16.2)</b>	<b>1,530 (16.8)</b>	<b>1,411 (15.6)</b>	<b>&lt;0.05</b>	<b>0.9 (0.8–1.0)</b>	<b>0.9 (0.8–1.0)</b>
Eviction or loss of home	<b>722 (3.8)</b>	<b>317 (3.4)</b>	<b>405 (4.3)</b>	<b>&lt;0.01</b>	<b>1.3 (1.1–1.5)</b>	<b>1.4 (1.2–1.6)</b>
School problem <sup>***</sup>	<b>162 (19.9)</b>	<b>70 (17.8)</b>	<b>92 (21.9)</b>	<b>NS</b>	<b>1.3 (0.9–1.8)</b>	<b>1.3 (0.9–1.9)</b>
Recent release from an institution <sup>†††</sup>	<b>1,412 (7.6)</b>	<b>941 (10.2)</b>	<b>471 (5.1)</b>	<b>&lt;0.01</b>	<b>0.5 (0.4–0.5)</b>	<b>0.5 (0.4–0.5)</b>
Jail/Prison/Detention facility	<b>203 (14.4)</b>	<b>82 (8.7)</b>	<b>121 (25.7)</b>	<b>&lt;0.01</b>	<b>3.6 (2.7–4.9)</b>	<b>4.5 (3.2–6.4)</b>
Hospital	<b>517 (36.6)</b>	<b>311 (33.0)</b>	<b>206 (43.7)</b>	<b>&lt;0.01</b>	<b>1.6 (1.3–2.0)</b>	<b>1.3 (1.0–1.7)</b>
Psychiatric hospital/institution	<b>469 (33.2)</b>	<b>439 (46.7)</b>	<b>30 (6.4)</b>	<b>&lt;0.01</b>	<b>0.1 (0.1–0.1)</b>	<b>0.1 (0.1–0.1)</b>
Other (includes alcohol/SU treatment facilities)	<b>223 (15.8)</b>	<b>109 (11.6)</b>	<b>114 (24.2)</b>	<b>&lt;0.01</b>	<b>2.4 (1.8–3.3)</b>	<b>2.5 (1.8–3.3)</b>

See table footnotes on next page.

oriented toward mental health conditions alone with regard to downstream identification of suicidal persons, treatment of mental health conditions, and prevention of reattempts. This study found that approximately half of suicide decedents in NVDRS did not have a known mental health condition, indicating that additional focus on nonmental health factors further upstream could provide important information for a public health approach (10). Those without a known mental health condition suffered more from relationship problems and other life stressors such as criminal/legal matters, eviction/loss of home, and recent or impending crises.

Similarly, persons with mental health conditions also often experienced other factors such as relationship problems and other life stressors such as job/financial or physical health problems that contributed to their suicide. These findings point to the need to both prevent the circumstances associated with the onset of mental health conditions in the first place and support persons with known mental health conditions to decrease their risk for poor outcomes (11). Two thirds of suicide decedents with mental health conditions had a history of treatment for mental health or substance use disorders, with approximately half in treatment when they died. This finding suggests the



**TABLE 2. (Continued) Circumstances preceding suicide among decedents aged  $\geq 10$  years with and without known mental health conditions — National Violent Death Reporting System, 27 states,\* 2015**

Characteristic	Total	Known mental health condition <sup>†</sup> no. (%)	No known mental health condition no. (%)	P-value	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>¶</sup> (95% CI)
<b>Crisis within past or upcoming 2 weeks<sup>§§§</sup></b>	<b>5,525 (29.4)</b>	<b>2,444 (26.0)</b>	<b>3,081 (32.9)</b>	<b>&lt;0.01</b>	<b>1.4 (1.3–1.5)</b>	<b>1.4 (1.3–1.5)</b>
Intimate partner problem	1,968 (35.6)	854 (34.9)	1,114 (36.2)	NS	1.1 (0.9–1.2)	1.1 (0.9–1.2)
Physical health problem	739 (13.4)	315 (12.9)	424 (13.8)	NS	1.1 (0.9–1.3)	1.0 (0.8–1.2)
Criminal legal problem	621 (11.2)	203 (8.3)	418 (13.6)	<0.01	1.7 (1.5–2.1)	1.6 (1.3–1.9)
Family relationship problem	430 (7.8)	212 (8.7)	218 (7.1)	<0.05	0.8 (0.7–1.0)	0.9 (0.7–1.1)
Job problem	354 (6.4)	191 (7.8)	163 (5.3)	<0.01	0.7 (0.5–0.8)	0.7 (0.5–0.8)
<b>Suicide event/history</b>						
Left a note	6,468 (34.5)	3,182 (33.8)	3,286 (35.1)	NS	1.1 (1.0–1.1)	1.2 (1.1–1.2)
Disclosed suicide intent	4,405 (23.5)	2,306 (24.5)	2,099 (22.4)	<0.01	0.9 (0.8–1.0)	0.9 (0.8–0.9)
History of ideation	5,990 (31.9)	3,838 (40.8)	2,152 (23.0)	<0.01	0.4 (0.4–0.5)	0.4 (0.4–0.5)
History of attempts	3,732 (19.9)	2,770 (29.4)	962 (10.3)	<0.01	0.3 (0.3–0.3)	0.3 (0.3–0.3)

**Abbreviations:** ADD/ADHD = attention deficit disorder/attention deficit hyperactivity disorder; CI = confidence interval; N/A = not applicable; NS = not significant; OR = odds ratio; PTSD = posttraumatic stress disorder; SU = substance use.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

<sup>†</sup> Decedent had been identified as having a current diagnosis of mental health condition in coroner/medical examiner or law enforcement reports.

<sup>§</sup> OR reflects the risk among those without known mental health condition relative to those with known mental health condition.

<sup>¶</sup> Logistic regression was used to estimate adjusted OR with 95% CIs after controlling for age, sex, race, and ethnicity. Known mental health condition was the reference group.

\*\* Includes decedents with one or more diagnosed current mental health conditions, which are not mutually exclusive. Therefore, sums of percentages for the diagnosed conditions exceed 100%. Denominator includes the number of decedents with one or more current diagnosed mental health conditions.

†† Decedents with no known mental health conditions do not have mental health conditions; therefore total values are equal to the known mental health condition values.

<sup>§§</sup> Not a diagnosis.

<sup>¶¶</sup> Denominator is decedents aged  $\geq 18$  years.

\*\*\* Denominator is decedents aged 10–18 years.

††† Denominator of institution subgroup is decedents with recent release from an institution. Recent release from an institution is defined as having occurred within the past month.

<sup>§§§</sup> Denominator of crisis subgroup is decedents with any crisis within past or upcoming 2 weeks. Crises depicted here represent the most commonly occurring categories.

need for additional safety supports, including broader implementation of affordable and effective treatment modalities, such as doctor-patient collaborative care models and proven cognitive-behavioral therapies. In addition, increased access to behavioral health providers in underserved areas is needed, as is expansion of health care systems that integrate physical and behavioral health, with a priority on suicide prevention and patient safety, especially through care transitions (12).

Comprehensive statewide suicide prevention activities are needed to address the full range of factors contributing to suicide. Prevention strategies include strengthening economic supports (e.g., housing stabilization policies, household financial support); teaching coping and problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in life; promoting social connectedness to increase a sense of belonging and access to informational, tangible, emotional, and social support; and identifying and better supporting persons at risk (e.g., military veterans, persons with physical/mental health conditions) (12). Other strategies include creating protective environments (e.g., reducing access to lethal means among persons at risk for suicide, creating organizational and workplace policies to promote help-seeking, easing transitions

into and out of work for persons with mental health conditions and other life challenges), strengthening access and delivery of care, supporting family and friends after a suicide, and assuring the media follow safe reporting recommendations (12). Some states, such as Colorado, are planning to implement such a comprehensive approach to suicide prevention (10).

The findings in this report are subject to at least three limitations. First, in the state-level analysis, rankings for four states (Maryland, Massachusetts, Rhode Island, and Utah) might have been affected by large proportions of injury deaths of undetermined intent (potentially biasing reported suicide rates downward) or decreased percentages of such deaths over time (potentially biasing estimated rate trends upward). Second, NVDRS is not yet nationally representative; the 27 states included represent 49.6% of the population (<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml>). Finally, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the extent of informant knowledge can affect data completeness and accuracy. Studies that include more in-depth interviews with next-of-kin often identify greater attributions to mental disorders (13); however, many methodological variations



## References

## Summary

## What is already known about this topic?

In 2016, nearly 45,000 persons died by suicide in the United States. Mental health conditions are one of several contributors to suicide.

## What is added by this report?

During 1999–2016, suicide rates increased in nearly every state, including >30% increases in 25 states. 2015 data from 27 states indicate 54% of suicide decedents were not known to have mental health conditions. ~~Other contributors included relationship, substance use, health, and job or financial problems; among others.~~

## What are the implications for public health practice?

A comprehensive approach using proven prevention strategies, such as those in CDC's Technical Package for Suicide Prevention, can help reach the national goal of reducing the annual suicide rate 20% by 2025.

across studies exist (14). It is likely that some persons without known mental health conditions in the current study were experiencing mental health challenges that were unknown, and hence underreported by key informants. Nonetheless, the high prevalence of diverse contributing circumstances among those with and without known mental health conditions suggests the importance of addressing the broad range of factors that contribute to suicide.

Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are available. States and communities can use data from NEDRS and resources such as CDC's Preventing Suicide: A Technical Package of Policy, Programs, and Practices (12) to better understand suicide in their populations, prioritize evidence-based comprehensive suicide prevention, and save lives.

## Acknowledgments

Robert Anderson, Holly Hedegaard, Margaret Warner, Division of Vital Statistics, National Center for Health Statistics, CDC.

## Conflict of Interest

No conflicts of interest were reported.

<sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis, Research, and Practice Integration, National Center for Injury Prevention and Control, CDC.

Corresponding author: Deborah M. Stone, dstone3@cdc.gov, 770-488-3942.

1. CDC. Web-based Injury Statistics Query and Reporting System (WISQARS). Atlanta, GA: National Center for Injury Prevention and Control; 2018. <https://www.cdc.gov/injury/wisqars/index.html>
2. Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide trends among and within urbanization levels by sex, race/ethnicity, age group, and mechanism of death—United States, 2001–2015. *MMWR Surveill Summ* 2017;66(No. SS-18). <https://doi.org/10.15585/mmwr.ss6618a1>
3. Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999–2014. NCHS data brief no 241. Hyattsville, MD: US Department of Health and Human Services, CDC, National Center for Health Statistics; 2016. <https://www.cdc.gov/nchs/data/databriefs/db241.pdf>
4. Kochanek K, Murphy S, Xu J, Arias E. Mortality in the United States, 2016. NCHS data brief no 293. Hyattsville, MD: US Department of Health and Human Services, CDC, National Center for Health Statistics; 2017. <https://www.cdc.gov/nchs/data/databriefs/db293.pdf>
5. Office of the Surgeon General; National Action Alliance for Suicide Prevention. 2012 National strategy for suicide prevention: goals and objectives for action. Washington, DC: US Department of Health and Human Services, Office of the Surgeon General; 2012. <https://www.surgeongeneral.gov/library/reports/national-strategy-suicide-prevention/full-report.pdf>
6. Zalsman G, Hawton K, Wasserman D, et al. Suicide prevention strategies revisited: 10-year systematic review. *Lancet Psychiatry* 2016;3:646–59. [https://doi.org/10.1016/S2215-0366\(16\)30030-X](https://doi.org/10.1016/S2215-0366(16)30030-X)
7. Torguson K, O'Brien A. Leading suicide prevention efforts unite to address rising national suicide rate. Washington, DC: American Foundation for Suicide Prevention; 2017. <https://afsp.org/leading-suicide-prevention-efforts-unite-address-rising-national-suicide-rate/>
8. Crepeau-Hobson F. The psychological autopsy and determination of child suicides: a survey of medical examiners. *Arch Suicide Res* 2010;14:24–34. <https://doi.org/10.1080/13811110903479011>
9. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5). Washington, DC: American Psychiatric Association; 2013.
10. Caine ED, Reed J, Hindman J, Quinlan K. Comprehensive, integrated approaches to suicide prevention: practical guidance. *Inj Prev* 2017. Epub December 20, 2017. <https://doi.org/10.1136/injuryprev-2017-042366>
11. World Health Organization. Risks to mental health: an overview of vulnerabilities and risk factors. Geneva, Switzerland: World Health Organization; 2012.
12. Stone DM, Holland KM, Bartholow BN, Crosby AE, Davis SP, Wilkins N. Preventing suicide: technical package of policy, programs, and practice. Atlanta, GA: US Department of Health and Human Services, CDC; 2017. <https://www.cdc.gov/violenceprevention/pdf/suicidetechnicalpackage.pdf>
13. Milner A, Svetlicic J, De Leo D. Suicide in the absence of mental disorder? A review of psychological autopsy studies across countries. *Int J Soc Psychiatry* 2013;59:545–54. <https://doi.org/10.1177/0020764012444259>
14. Pouliot L, De Leo D. Critical issues in psychological autopsy studies. *Suicide Life Threat Behav* 2006;36:491–510. <https://doi.org/10.1521/suli.2006.36.5.491>




## Vital Signs: Trends in State Suicide Rates — United States, 1999–2016 and Circumstances Contributing to Suicide — 27 States, 2015

Deborah M. Stone, ScD<sup>1</sup>; Thomas R. Simon PhD<sup>1</sup>; Katherine A. Fowler, PhD<sup>1</sup>; Scott R. Kegler, PhD<sup>2</sup>; Keming Yuan, MS<sup>1</sup>; Kristin M. Holland, PhD<sup>1</sup>; Asha Z. Ivey-Stephenson, PhD<sup>1</sup>; Alex E. Crosby, MD<sup>1</sup>

### Abstract

**Introduction:** Suicide rates in the United States have risen nearly 30% since 1999, and mental health conditions are ~~just~~ one factor contributing to suicide. Examining state-level trends in suicide and the multiple circumstances contributing to it can inform comprehensive state suicide prevention planning.

**Methods:** Trends in age-adjusted suicide rates among persons aged  $\geq 10$  years, by state and sex, across six consecutive 3-year periods (1999–2016), were assessed using data from the National Vital Statistics System for 50 states and the District of Columbia. Data from the National Violent Death Reporting System, covering 27 states in 2015, were used to examine contributing circumstances among decedents with and without known mental health conditions.

**Results:** During 1999–2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases  $>30\%$ . Rates increased significantly among males and females in 34  43 states, respectively. Fifty-four percent of decedents in 27 states in 2015 did not have a known mental health condition.

Among decedents with available information, several circumstances were significantly more likely among those without known mental health conditions than among those with mental health conditions, including relationship problems/loss (45.1% versus 39.6%), life stressors (54.2% versus 49.7%), and recent/impending crises (32.9% versus 26.0%), but these circumstances were common across groups.

**Conclusions:** Suicide rates increased significantly across most states during 1999–2016. Various circumstances contributed to suicides among persons with and without known mental health conditions.

**Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach to prevent suicide risk before it occurs, identify and support persons at risk, prevent reattempts, and help friends and family members in the aftermath of a suicide.

### INSIDE

7 QuickStats

Continuing Education examination available at  
[https://www.cdc.gov/mmwr/cme/conted\\_info.html#weekly](https://www.cdc.gov/mmwr/cme/conted_info.html#weekly).



U.S. Department of Health and Human Services  
Centers for Disease Control and Prevention



## Introduction

In 2016, nearly 45,000 suicides (15.6/100,000 population [age-adjusted]) occurred in the United States among persons aged  $\geq 10$  years (1). From 1999 to 2015, suicide rates increased among both sexes, all racial/ethnic groups, and all urbanization levels (2,3). Suicide rates have also increased among persons in all age groups  $< 75$  years, with the largest percent increase (45%; from 13.2 per 100,000 persons [1999] to 19.2 per 100,000 [2016]) and the greatest number of suicides (232,108 from 1999 to 2016) occurring among adults age 45–65 years (1,3). Suicide is the 10th leading cause of death and is one of just three leading causes that are increasing (1,4). In addition, rates of emergency department visits for nonfatal self-harm, a main risk factor for suicide, increased 42% from 2001 to 2016 (1). Together, suicides and self-harm injuries cost the nation approximately \$69 billion in direct medical and work loss costs (1).

The National Strategy for Suicide Prevention (NSSP) (5) calls for a public health approach to suicide prevention with efforts spanning multiple levels (individual, family/relationship, community, and societal). Such a comprehensive approach underscores that suicide is rarely caused by any single factor, but rather, is determined by multiple factors. Despite NSSP guidance, suicide prevention largely focuses on mental health conditions alone by identifying suicidal persons, providing treatment for mental health conditions, and preventing reattempts (6). In addition to mental health conditions and

prior suicide attempts, other contributing circumstances include social and economic problems, access to lethal means (e.g., substances, firearms) among persons at risk, and poor coping and problem-solving skills (5). Expanded awareness of these additional circumstances contributing to suicide risk and action to address them can help reach the national goal, established by the National Action Alliance of Suicide Prevention and the American Foundation for Suicide Prevention, of reducing the annual suicide rate 20% by 2025 (7). To assist states in achieving this goal, CDC analyzed state-specific trends in suicide rates and assessed the multiple contributing factors to suicide; this report presents options for multilevel, comprehensive suicide prevention based on the best available evidence.

## Methods

Suicide rates were analyzed for persons aged  $\geq 10$  years because determining suicidal intent in younger children can be difficult (8). Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases, Tenth Revision*, underlying-cause-of-death codes X60–X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive 3-year aggregate periods spanning 1999–2016 (1999–2001; 2002–2004; 2005–2007;

The *MMWR* series of publications is published by the Center for Surveillance, Epidemiology, and Laboratory Services, Centers for Disease Control and Prevention (CDC), U.S. Department of Health and Human Services, Atlanta, GA 30329-4027.

**Suggested citation:** [Author names; first three, then et al., if more than six.] [Report title]. *MMWR Morb Mortal Wkly Rep* 2018;67:[inclusive page numbers].

### Centers for Disease Control and Prevention

Robert R. Redfield, MD, *Director*  
 Anne Schuchat, MD, *Principal Deputy Director*  
 Leslie Dauphin, PhD, *Acting Associate Director for Science*  
 Joanne Cono, MD, ScM, *Director, Office of Science Quality*  
 Chesley L. Richards, MD, MPH, *Deputy Director for Public Health Scientific Services*  
 Michael F. Iademarco, MD, MPH, *Director, Center for Surveillance, Epidemiology, and Laboratory Services*

### MMWR Editorial and Production Staff (Weekly)

Charlotte K. Kent, PhD, MPH, *Acting Editor in Chief, Executive Editor*  
 Jacqueline Gindler, MD, *Editor*  
 Mary Dott, MD, MPH, *Online Editor*  
 Teresa F. Rutledge, *Managing Editor*  
 Douglas W. Weatherwax, *Lead Technical Writer-Editor*  
 Glenn Damon, Soumya Dunworth, PhD, Teresa M. Hood, MS,  
*Technical Writer-Editors*

Martha F. Boyd, *Lead Visual Information Specialist*  
 Maureen A. Leahy, Julia C. Martinroe,  
 Stephen R. Spriggs, Tong Yang,  
*Visual Information Specialists*  
 Quang M. Doan, MBA, Phyllis H. King,  
 Terraye M. Starr, Moua Yang,  
*Information Technology Specialists*

### MMWR Editorial Board

Timothy F. Jones, MD, *Chairman*  
 Matthew L. Boulton, MD, MPH  
 Virginia A. Caine, MD  
 Katherine Lyon Daniel, PhD  
 Jonathan E. Fielding, MD, MPH, MBA  
 David W. Fleming, MD

William E. Halperin, MD, DrPH, MPH  
 King K. Holmes, MD, PhD  
 Robin Ikeda, MD, MPH  
 Rima F. Khabbaz, MD  
 Phyllis Meadows, PhD, MSN, RN  
 Jewel Mullen, MD, MPH, MPA

Jeff Niederdeppe, PhD  
 Patricia Quinlisk, MD, MPH  
 Patrick L. Remington, MD, MPH  
 Carlos Roig, MS, MA  
 William L. Roper, MD, MPH  
 William Schaffner, MD



2008–2010; 2011–2013; and 2014–2016). Rate estimates were age-adjusted to the U.S. 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same 3-year data aggregates, employing weighted least-squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes.

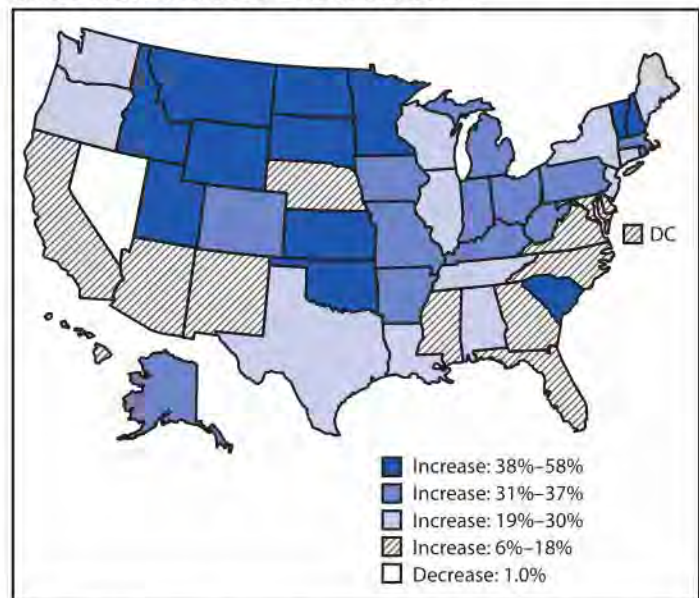
Characteristics of persons aged  $\geq 10$  years who died by suicide, with and without known mental health conditions, and the circumstances surrounding the suicides were compared in the 27 states\* with complete data participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines mental health conditions as disorders and syndromes listed in the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (9), with the exception of alcohol and other substance use disorders, which are captured separately in NVDRS. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. A range of circumstances (relationship problems, life stressors, and recent or impending crises) have been identified as potential risk factors for suicide. Circumstances captured by NVDRS are those identified by next of kin as having actively contributed to a person's suicide. Decedents could have experienced multiple circumstances. Decedents with and without known mental health conditions were compared using Chi-square tests. Logistic regression analyses estimated adjusted odds ratios (aORs) with 95% confidence intervals (CIs), controlling for age group, sex, and race/ethnicity.

## Results

The most recent overall suicide rates (representing 2014–2016) varied fourfold, from 6.9 (District of Columbia) to 29.2 (Montana) per 100,000 persons per year (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>). Across the study period, rates increased in all states except Nevada (where the rate was consistently high throughout the study period), with absolute increases ranging from 0.8 per 100,000 (Delaware) to 8.1 (Wyoming). Percentage increases in rates ranged from 5.9% (Delaware) to 57.6% (North Dakota), with increases  $>30\%$  observed in 25 states (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>) (Figure).

Modeled suicide rate trends indicated significant increases in 44 states, among males (34 states) and females (43 states), as well as for the United States overall (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>). Nationally, the

**FIGURE. Percent change in annual suicide rate,\* by state — United States, from 1999–2001 to 2014–2016**



\* Per 100,000 population, age-adjusted to the 2000 U.S. standard population.

model-estimated average annual percentage change for the overall suicide rate was an increase of 1.5%. By sex, estimated national rate trends further indicated significant average annual percentage change increases for males (1.1%) and females (2.6%) (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>).

Suicide decedents without known mental health conditions (11,039) were compared with those with known mental health conditions (9,407) in 27 states. Whereas all decedents were predominately male (76.8%) (Table 1) and non-Hispanic white (83.6%), those without known mental health conditions, relative to those with mental health conditions, were more likely to be male (83.6% versus 68.8%; odds ratio [OR] = 2.3, 95% CI = 2.2–2.5) and belong to a racial/ethnic minority (OR range = 1.2–2.0). Suicide decedents without known mental health conditions also had significantly higher odds of perpetrating homicide followed by suicide (aOR = 2.9, 95% CI = 2.2–3.8). Among adult decedents aged  $\geq 18$  years, 20.1% of those without known mental health conditions and 15.3% of those with mental health conditions had ever served in the U.S. military or were serving at the time of death.

Whereas firearms were the most common method of suicide overall (48.5%) and among decedents with and without mental health conditions, decedents without known mental health conditions, relative to those with known mental health conditions, were more likely to die by firearm (55.3% versus 40.6%) and less likely to die by hanging/strangulation/suffocation (26.9% versus 31.3%) or poisoning (10.4% versus 19.8%). These differences remained significant in the adjusted models.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.



**TABLE 1. Selected demographic and descriptive characteristics of suicides among persons aged ≥10 years with and without known mental health conditions — National Violent Death Reporting System, 27 states,\* 2015**

Characteristic	Total (N = 20,446)	Known mental health condition <sup>†</sup> (n = 9,407)	No known mental health condition (n = 11,039)	P-value	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>¶</sup> (95% CI)
<b>Sex</b>						
Male	15,702 (76.8)	6,469 (68.8)	9,233 (83.6)	<0.01	2.3 (2.2–2.5)	NA
Female	4,744 (23.2)	2,938 (31.2)	1,806 (16.4)	<0.01	0.4 (0.4–0.5)	NA
<b>Age (yrs)**</b>						
10–24	2,804 (13.7)	1,211 (12.9)	1,593 (14.4)	<0.01	1.1 (1.1–1.2)	NA
25–44	6,456 (31.6)	3,036 (32.3)	3,420 (31.0)	<0.05	0.9 (0.9–1.0)	NA
45–64	7,718 (37.7)	3,820 (40.6)	3,898 (35.3)	<0.01	0.8 (0.8–0.8)	NA
≥65	3,468 (17.0)	1,340 (14.2)	2,128 (19.3)	<0.01	1.4 (1.3–1.5)	NA
<b>Race/Ethnicity</b>						
White, non-Hispanic	17,102 (83.6)	8,165 (86.8)	8,937 (81.0)	<0.01	0.6 (0.6–0.7)	NA
Black, non-Hispanic	1,228 (6.0)	411 (4.4)	817 (7.4)	<0.01	1.7 (1.5–2.0)	NA
American Indian/Alaska Native, non-Hispanic	378 (1.8)	112 (1.2)	266 (2.4)	<0.01	2.0 (1.6–2.6)	NA
Asian, non-Hispanic	576 (2.8)	235 (2.5)	341 (3.1)	<0.05	1.2 (1.1–1.5)	NA
Hispanic	1,096 (5.4)	463 (4.9)	633 (5.7)	<0.05	1.2 (1.0–1.3)	NA
Other	66 (0.3)	21 (0.2)	45 (0.4)	<0.05	1.8 (1.1–3.1)	NA
<b>Extended demographics</b>						
Ever served in military <sup>††</sup>	3,429 (17.8)	1,354 (15.3)	2,075 (20.1)	<0.01	1.4 (1.3–1.5)	1.1 (1.0–1.1)
Homeless	240 (1.2)	104 (1.1)	136 (1.3)		1.1 (0.9–1.5)	1.2 (0.9–1.5)
<b>Incident type</b>						
Single suicide	20,063 (98.2)	9,318 (99.1)	10,745 (97.4)	<0.01	0.3 (0.3–0.4)	0.4 (0.3–0.5)
Homicide followed by suicide	319 (1.6)	64 (0.7)	255 (2.3)	<0.01	3.5 (2.6–4.5)	2.9 (2.2–3.8)
Multiple suicides	64 (0.3)	25 (0.3)	39 (0.4)	NS	1.3 (0.8–2.2)	1.6 (0.9–2.6)
<b>Method</b>						
Firearm	9,909 (48.5)	3,821 (40.6)	6,088 (55.3)	<0.01	1.8 (1.7–1.9)	1.6 (1.5–1.7)
Hanging/Strangulation/Suffocation	5,907 (28.9)	2,940 (31.3)	2,967 (26.9)	<0.01	0.8 (0.8–0.9)	0.8 (0.7–0.8)
Poisoning	3,003 (14.7)	1,861 (19.8)	1,142 (10.4)	<0.01	0.5 (0.4–0.5)	0.6 (0.6–0.7)
<b>Substance class causing death<sup>§</sup></b>						
Other (e.g., over-the-counter)	1,021 (34.0)	666 (35.8)	355 (31.1)	<0.01	0.8 (0.7–0.9)	0.9 (0.7–1.0)
Opioids	944 (31.4)	608 (32.7)	336 (29.4)	NS	0.9 (0.7–1.0)	0.9 (0.8–1.1)
Antidepressants	800 (26.6)	644 (34.6)	156 (13.7)	<0.01	0.3 (0.2–0.4)	0.3 (0.3–0.4)
Benzodiazepines	624 (20.8)	468 (25.1)	156 (13.7)	<0.01	0.5 (0.4–0.6)	0.5 (0.4–0.6)
Antipsychotics	219 (7.3)	195 (10.5)	24 (2.1)	<0.01	0.2 (0.1–0.3)	0.2 (0.1–0.3)
Other	1,595 (7.8)	780 (8.3)	815 (7.4)	<0.05	0.9 (0.8–1.0)	0.9 (0.8–1.0)

See table footnotes on next page.

Toxicology testing was less likely to be performed for decedents without known mental health conditions. Among those with toxicology results, decedents without known mental health conditions were less likely to test positive for any substance overall (aOR = 0.8, 95% CI = 0.7–0.8), including opioids (aOR = 0.90, 95% CI = 0.81–0.99), but were more likely to test positive for alcohol (aOR = 1.2, 95% CI = 1.1–1.3).

Information on circumstances surrounding suicide were available for all decedents with mental health conditions (n = 9,407) and approximately 85% of those without known mental health conditions (n = 9,357) in 27 states (Table 2). Persons without known mental health conditions were less likely to have any substance use disorders (aOR = 0.7, 95% CI = 0.7–0.8) than were persons with known mental health conditions. Whereas two thirds of decedents with known mental health conditions had a history of mental health or substance use treatment (67.2%), just over half (54.0%) were in treatment at the time of death.

Decedents without known mental health conditions had a significantly higher likelihood of any relationship problem/loss (45.1%) than did those with known mental health conditions (39.6%), specifically intimate partner problems (30.2% versus 24.1%), arguments/conflicts (17.5% versus 13.6%), and perpetrating interpersonal violence in the past month (3.0% versus 1.4%). Decedents without known mental health conditions were also more likely than were those with known mental health conditions to have experienced any life stressors (54.2% versus 49.7%) such as criminal legal problems (10.7% versus 6.2%) or eviction/loss of home (4.3% versus 3.4%) and were more likely to have had a recent or impending (within the preceding or upcoming 2 weeks, respectively) crisis (a current or acute event thought to contribute to the suicide) (32.9% versus 26.0%). All of these differences remained significant in the adjusted models. Physical health problems and job/financial problems were commonly contributing stressors among both persons without mental health conditions (23.2% and



**TABLE 1. (Continued) Selected demographic and descriptive characteristics of suicides among persons aged ≥10 years with and without known mental health conditions — National Violent Death Reporting System, 27 states,\* 2015**

Characteristic	Total (N = 20,446)	Known mental health condition† (n = 9,407)	No known mental health condition (n = 11,039)	P-value	OR§ (95% CI)	Adjusted OR¶ (95% CI)
<b>Toxicology results</b>						
Any toxicology testing	13,317 (65.1)	6,658 (70.8)	6,659 (60.3)	<0.01	0.6 (0.6–0.7)	0.7 (0.6–0.7)
Positive for ≥1 substance¶¶	9,913 (74.4)	5,192 (78.0)	4,721 (70.9)	<0.01	0.7 (0.6–0.7)	0.8 (0.7–0.8)
<b>Substance detected***</b>						
Alcohol						
Tested	10,950 (53.6)	5,409 (57.5)	5,541 (50.2)	<0.01	0.7 (0.7–0.8)	0.8 (0.7–0.8)
Positive	4,442 (40.6)	2,115 (39.1)	2,327 (42.0)	<0.01	1.1 (1.0–1.2)	1.2 (1.1–1.3)
Opioids						
Tested	8,554 (41.8)	4,258 (45.3)	4,296 (38.9)	<0.01	0.8 (0.7–0.8)	0.8 (0.8–0.9)
Positive	2,279 (26.6)	1,238 (29.1)	1,041 (24.2)	<0.01	0.8 (0.7–0.9)	0.9 (0.8–1.0)
Benzodiazepines						
Tested	8,124 (39.7)	4,226 (44.9)	3,898 (35.3)	<0.01	0.7 (0.6–0.7)	0.7 (0.7–0.8)
Positive	2,464 (30.3)	1,639 (38.8)	825 (21.2)	<0.01	0.4 (0.4–0.5)	0.5 (0.5–0.6)
Cocaine						
Tested	7,978 (39.0)	3,866 (41.1)	4,112 (37.2)	<0.01	0.9 (0.8–0.9)	0.9 (0.9–1.0)
Positive	499 (6.3)	216 (5.6)	283 (6.9)	<0.05	1.2 (1.0–1.5)	1.2 (1.0–1.5)
Amphetamines						
Tested	7,615 (37.2)	3,696 (39.3)	3,919 (35.5)	<0.01	0.9 (0.8–0.9)	0.9 (0.8–0.9)
Positive	736 (9.7)	376 (10.2)	360 (9.2)	NS	0.9 (0.8–1.0)	1.0 (0.8–1.1)
Marijuana						
Tested	6,569 (32.1)	3,127 (33.2)	3,442 (31.2)	<0.01	0.9 (0.9–1.0)	0.9 (0.9–1.0)
Positive	1,471 (22.4)	710 (22.7)	761 (22.1)	NS	1.0 (0.9–1.1)	0.9 (0.8–1.0)
Antidepressants						
Tested	5,425 (26.5)	3,103 (33.0)	2,322 (21.0)	<0.01	0.5 (0.5–0.6)	0.6 (0.6–0.7)
Positive	2,214 (40.8)	1,735 (55.9)	479 (20.6)	<0.01	0.2 (0.2–0.2)	0.2 (0.2–0.3)

**Abbreviations:** CI = confidence interval; NA = not adjusted; NS = not significant; OR = odds ratio.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

† Decedent had been identified as having a current diagnosis of mental health condition in coroner/medical examiner or law enforcement reports.

§ OR reflects the risk among those without known mental health condition relative to those with known mental health condition.

¶ Logistic regression was used to estimate adjusted OR with 95% CIs after controlling for age, sex, race, and ethnicity. Known mental health condition was used as the reference group.

\*\* Decedents were aged ≥10 years, as per standard in the suicide prevention literature.

†† Denominator is decedents aged ≥18 years with reported military service status.

§§ Denominator is decedents who died by poisoning, including overdose.

¶¶ Denominator is decedents with any toxicology testing.

\*\*\* Denominator for each positive group is the number tested for the substance in that group.

15.6%, respectively) and those with mental health conditions (21.4% and 16.8%, respectively). Similarly, among all persons with recent crises, intimate partner problems were the most common types and did not differ by group.

Decedents without known mental health conditions had significantly lower odds of recent release from any institution (aOR = 0.5, 95% CI = 0.4–0.5). Among those recently released, decedents without known mental health conditions were significantly more likely than decedents with mental health problems to have been released from a correctional facility (25.7% versus 8.7%), hospital (43.7% versus 33.0%), or other facility, such as an alcohol/substance use treatment facility (24.2% versus 11.6%). Among decedents with known mental health conditions who were recently released from an institution, 46.7% were released from psychiatric facilities.

Decedents without known mental health conditions were significantly less likely to have a history of suicidal ideation

(23.0%) or prior suicide attempts (10.3%) compared with those with known mental health conditions (40.8% and 29.4%, respectively). Suicide intent was disclosed by 22.4% and 24.5% of persons without and with known mental health conditions, respectively.

## Conclusions and Comments

During 1999–2016, suicide rates increased significantly in 44 states, and 25 states experienced increases >30%. Rates increased significantly among males in 34 states, and females in 43 states. Additional research into the specific causes of these trends is needed. Data from the 27 states participating in NVDRS provide important insight into circumstances surrounding suicide and can help states identify prevention priorities.

Suicidologists regularly state that suicide is not caused by a single factor (5); however, suicide prevention is often



TABLE 2. Circumstances preceding suicide among decedents aged ≥10 years with and without known mental health conditions — National Violent Death Reporting System, 27 states,\* 2015

Characteristic	Total	Known mental health condition <sup>†</sup> no. (%)	No known mental health condition no. (%)	P-value	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>¶</sup> (95% CI)
<b>Suicide with known circumstances</b>	18,764 (91.8)	9,407 (100)	9,357 (84.8)	<0.01	N/A	N/A
<b>Mental health</b>						
Any current diagnosed mental health condition**						
Depression/Dysthymia	7,076 (75.2)	7,076 (75.2)	N/A	N/A	N/A	N/A
Anxiety disorder	1,579 (16.8)	1,579 (16.8)	N/A	N/A	N/A	N/A
Bipolar disorder	1,431 (15.2)	1,431 (15.2)	N/A	N/A	N/A	N/A
Schizophrenia	509 (5.4)	509 (5.4)	N/A	N/A	N/A	N/A
PTSD	424 (4.5)	424 (4.5)	N/A	N/A	N/A	N/A
ADD/ADHD	226 (2.4)	226 (2.4)	N/A	N/A	N/A	N/A
Not specified	760 (8.1)	760 (8.1)	N/A	N/A	N/A	N/A
Current depressed	3,962 (42.1)	3,962 (42.1)	3,076 (32.9)	<0.01	0.7 (0.6–0.7)	0.7 (0.6–0.7)
<b>Substance problems</b>						
Any current substance problem	5,319 (28.3)	2,976 (31.6)	2,343 (25.0)	<0.01	0.7 (0.7–0.8)	0.7 (0.7–0.8)
Alcohol problem	3,268 (17.4)	1,862 (19.8)	1,406 (15.0)	<0.01	0.7 (0.7–0.8)	0.7 (0.7–0.8)
Other substance problem	3,084 (16.4)	1,768 (18.8)	1,316 (14.1)	<0.01	0.7 (0.7–0.8)	0.7 (0.7–0.8)
<b>Treatment</b>						
Current mental health/substance abuse treatment	5,141 (27.4)	5,077 (54.0)	64 (0.7)	<0.01	0.01 (0.01–0.01)	0.01 (0.01–0.01)
Ever treated for mental health/substance problem	6,717 (35.8)	6,323 (67.2)	394 (4.2)	<0.01	0.02 (0.02–0.02)	0.02 (0.02–0.03)
<b>Relationship problems/loss</b>						
Any relationship problem/loss	7,948 (42.4)	3,726 (39.6)	4,222 (45.1)	<0.01	1.3 (1.2–1.3)	1.3 (1.2–1.4)
Intimate partner problem	5,098 (27.2)	2,270 (24.1)	2,828 (30.2)	<0.01	1.4 (1.3–1.5)	1.4 (1.3–1.5)
Perpetrator of interpersonal violence in past month	414 (2.2)	131 (1.4)	283 (3.0)	<0.01	2.2 (1.8–2.7)	2.0 (1.6–2.4)
Victim of interpersonal violence in past month	84 (0.4)	53 (0.6)	31 (0.3)	<0.05	0.6 (0.4–0.9)	0.8 (0.5–1.2)
Family relationship problem	1,671 (8.9)	873 (9.3)	798 (8.5)	NS	0.9 (0.8–1.0)	1.0 (0.9–1.1)
Other relationship problem (nonintimate)	403 (2.1)	202 (2.1)	201 (2.1)	NS	1.0 (0.8–1.2)	1.1 (0.9–1.3)
Argument or conflict (not specified)	2,914 (15.5)	1,278 (13.6)	1,636 (17.5)	<0.01	1.3 (1.2–1.5)	1.4 (1.3–1.5)
Death of a loved one (any)	1,497 (8.0)	826 (8.8)	671 (7.2)	<0.01	0.8 (0.7–0.9)	0.9 (0.8–0.9)
Nonsuicide death	1,181 (6.3)	647 (6.9)	534 (5.7)	<0.01	0.8 (0.7–0.9)	0.9 (0.8–1.0)
Suicide of family or friend	379 (2.0)	217 (2.3)	162 (1.7)	<0.01	0.7 (0.6–0.9)	0.8 (0.7–1.0)
<b>Other life stressors</b>						
Any life stressor	9,743 (51.9)	4,675 (49.7)	5,068 (54.2)	<0.01	1.2 (1.1–1.3)	1.1 (1.1–1.2)
Recent criminal legal problem	1,588 (8.5)	586 (6.2)	1,002 (10.7)	<0.01	1.8 (1.6–2.0)	1.7 (1.5–1.9)
Other legal problem	748 (4.0)	378 (4.0)	370 (4.0)	NS	1.0 (0.8–1.1)	1.0 (0.9–1.2)
Physical health problem	4,179 (22.3)	2,012 (21.4)	2,167 (23.2)	<0.01	1.1 (1.0–1.2)	1.0 (1.0–1.1)
Job/Financial problem <sup>§§</sup>	2,941 (16.2)	1,530 (16.8)	1,411 (15.6)	<0.05	0.9 (0.8–1.0)	0.9 (0.8–1.0)
Eviction or loss of home	722 (3.8)	317 (3.4)	405 (4.3)	<0.01	1.3 (1.1–1.5)	1.4 (1.2–1.6)
School problem <sup>¶¶</sup>	162 (19.9)	70 (17.8)	92 (21.9)	NS	1.3 (0.9–1.8)	1.3 (0.9–1.9)
Recent release from an institution***	1,412 (7.6)	941 (10.2)	471 (5.1)	<0.01	0.5 (0.4–0.5)	0.5 (0.4–0.5)
Jail/Prison/Detention facility	203 (14.4)	82 (8.7)	121 (25.7)	<0.01	3.6 (2.7–4.9)	4.5 (3.2–6.4)
Hospital	517 (36.6)	311 (33.0)	206 (43.7)	<0.01	1.6 (1.3–2.0)	1.3 (1.0–1.7)
Psychiatric hospital/institution	469 (33.2)	439 (46.7)	30 (6.4)	<0.01	0.1 (0.1–0.1)	0.1 (0.1–0.1)
Other (includes alcohol/S <sub>A</sub> treatment facilities)	223 (15.8)	109 (11.6)	114 (24.2)	<0.01	2.4 (1.8–3.3)	2.5 (1.8–3.3)


See table footnotes on next page.

oriented toward mental health conditions alone with regard to downstream identification of suicidal persons, treatment of mental health conditions, and prevention of reattempts. This study found that approximately half of suicide decedents in NVDRS did not have a known mental health condition, indicating that additional focus on nonmental health factors further upstream could provide important information for a public health approach (10). Those without a known mental health condition suffered more from relationship problems and other life stressors such as criminal/legal matters, eviction/loss of home, and recent or impending crises.

Similarly, persons with mental health conditions also often experienced nonmental health factors such as relationship problems and other life stressors such as job/financial or physical health problems. These findings point to the need to both prevent the circumstances associated with the onset of mental health conditions in the first place and support persons with known mental health conditions to decrease their risk for poor outcomes (11). Two thirds of suicide decedents with mental health conditions had a history of treatment for mental health or substance use disorders, with approximately half in treatment when they died. This finding suggests the need for additional safety supports, including broader implementation



**TABLE 2. (Continued) Circumstances preceding suicide among decedents aged  $\geq 10$  years with and without known mental health conditions — National Violent Death Reporting System, 27 states,\* 2015**

Characteristic	Total	Known mental health condition <sup>†</sup> no. (%)	No known mental health condition no. (%)	P-value	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>¶</sup> (95% CI)
<b>Crisis within past or upcoming 2 weeks<sup>††</sup></b>	<b>5,525 (29.4)</b>	<b>2,444 (26.0)</b>	<b>3,081 (32.9)</b>	<b>&lt;0.01</b>	<b>1.4 (1.3–1.5)</b>	<b>1.4 (1.3–1.5)</b>
Intimate partner problem crisis	1,968 (35.6)	854 (34.9)	1,114 (36.2)	NS	1.1 (0.9–1.2)	1.1 (0.9–1.2)
Physical health problem crisis 	739 (13.4)	315 (12.9)	424 (13.8)	NS	1.1 (0.9–1.3)	1.0 (0.8–1.2)
Criminal legal problem crisis	621 (11.2)	203 (8.3)	418 (13.6)	<0.01	1.7 (1.5–2.1)	1.6 (1.3–1.9)
Family relationship problem crisis	430 (7.8)	212 (8.7)	218 (7.1)	<0.05	0.8 (0.7–1.0)	0.9 (0.7–1.1)
Job problem crisis	354 (6.4)	191 (7.8)	163 (5.3)	<0.01	0.7 (0.5–0.8)	0.7 (0.5–0.8)
<b>Suicide event/history</b>						
Left a note	6,468 (34.5)	3,182 (33.8)	3,286 (35.1)	NS	1.1 (1.0–1.1)	1.2 (1.1–1.2)
Disclosed suicide intent	4,405 (23.5)	2,306 (24.5)	2,099 (22.4)	<0.01	0.9 (0.8–1.0)	0.9 (0.8–0.9)
History of ideation	5,990 (31.9)	3,838 (40.8)	2,152 (23.0)	<0.01	0.4 (0.4–0.5)	0.4 (0.4–0.5)
History of attempts	3,732 (19.9)	2,770 (29.4)	962 (10.3)	<0.01	0.3 (0.3–0.3)	0.3 (0.3–0.3)

**Abbreviations:** ADD/ADHD = attention deficit disorder/attention deficit hyperactivity disorder; CI = confidence interval; N/A = not applicable; NS = not significant; OR = odds ratio; PTSD = posttraumatic stress disorder; SA = substance abuse.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

<sup>†</sup> Decedent had been identified as having a current diagnosis of mental health condition in coroner/medical examiner or law enforcement reports.

<sup>§</sup> OR reflects the risk among those without known mental health condition relative to those with known mental health condition.

<sup>¶</sup> Logistic regression was used to estimate adjusted OR with 95% CIs after controlling for age, sex, race, and ethnicity. Known mental health condition was the reference group.

\*\* Includes decedents with one or more diagnosed current mental health conditions, which are not mutually exclusive. Therefore, sums of percentages for the diagnosed conditions exceed 100%. Denominator includes the number of decedents with one or more current diagnosed mental health conditions.

<sup>††</sup> Not a diagnosis.

<sup>§§</sup> Denominator is decedents aged  $\geq 18$  years.

<sup>¶¶</sup> Denominator is decedents aged 10–18 years.

\*\*\* Denominator of institution subgroup is decedents with recent release from an institution. Recent release from an institution is defined as having occurred within the past month.

<sup>†††</sup> Denominator of crisis subgroup is decedents with any crisis within past or upcoming 2 weeks. Crises depicted here represent the most commonly occurring categories.

of affordable and effective treatment modalities, such as doctor-patient collaborative care models and proven cognitive-behavioral therapies. In addition, increased access to behavioral health providers in underserved areas is needed, as is expansion of health care systems that integrate physical and behavioral health, with a priority on suicide prevention and patient safety, especially through care transitions (12).

Comprehensive statewide suicide prevention activities are needed to address the full range of factors contributing to suicide. Prevention strategies include strengthening economic supports (e.g., housing stabilization policies, household financial support); teaching coping and problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in life; promoting social connectedness to increase a sense of belonging and access to informational, tangible, emotional, and social support; and identifying and better supporting persons at risk (e.g., military veterans, persons with physical/mental health conditions) (12). Other strategies include creating protective environments (e.g., reducing access to lethal means among persons at risk for suicide, creating organizational and workplace policies to promote help-seeking, easing transitions into and out of work for persons with mental health conditions and other life challenges), strengthening access and delivery of

care, supporting family and friends after a suicide, and assuring the media follow safe reporting recommendations (12). Some states, such as Colorado, are planning to implement such a comprehensive approach to suicide prevention (10).

The findings in this report are subject to at least three limitations. First, in the state-level analysis, rankings for four states (Maryland, Massachusetts, Rhode Island, and Utah) might have been affected by large proportions of injury deaths of undetermined intent (potentially biasing reported suicide rates downward) or decreased percentages of such deaths over time (potentially biasing estimated rate trends upward). Second, NVDRS is not yet nationally representative; the 27 states included represent 49.6% of the population (<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml>). Finally, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the extent of informant knowledge can affect data completeness and accuracy. Studies that include more in-depth interviews with next-of-kin often identify greater attributions to mental disorders (13); however, many methodological variations across studies exist (14). It is likely that some persons without known mental health conditions in the current study were experiencing mental health challenges that were unknown, and



## References

## Summary

## What is already known about this topic?

In 2016, nearly 45,000 persons died by suicide in the United States. Mental health conditions ~~can contribute to suicide~~.

## What is added by this report?

During 1999–2016, suicide rates increased in nearly every state, including >30% increases in 25 states. 2015 data from 27 states indicate 54% of suicide decedents were not known to have mental health conditions. Other contributors included relationship, substance use, health, and job or financial problems, among others.

## What are the implications for public health practice?

A comprehensive approach using proven prevention strategies, such as those in CDC's Technical Package for Suicide Prevention, can help reach the national goal of reducing the annual suicide rate 20% by 2025.

hence underreported by key informants. Nonetheless, the high prevalence of diverse contributing circumstances among those with and without known mental health conditions suggests the importance of addressing the broad range of factors that contribute to suicide.

Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are available. States and communities can use data from NVDRS and resources such as CDC's Preventing Suicide: a Technical Package of Policy, Programs, and Practices (12) to better understand suicide in their populations, prioritize evidence-based comprehensive suicide prevention, and save lives.

## Acknowledgments

Robert Anderson, Holly Hedegaard, Margaret Warner, Division of Vital Statistics, National Center for Health Statistics, CDC.

## Conflict of Interest

No conflicts of interest were reported.

<sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis, Research, and Practice Integration, National Center for Injury Prevention and Control, CDC.

Corresponding author: Deborah M. Stone, dstone3@cdc.gov, 770-488-3942.

1. CDC. Web-based Injury Statistics Query and Reporting System (WISQARS). Atlanta, GA: National Center for Injury Prevention and Control; 2018. <https://www.cdc.gov/injury/wisqars/index.html>
2. Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide trends among and within urbanization levels by sex, race/ethnicity, age group, and mechanism of death—United States, 2001–2015. *MMWR Surveill Summ* 2017;66(No. SS-18). <https://doi.org/10.15585/mmwr.ss6618a1>
3. Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999–2014. NCHS data brief no 241. Hyattsville, MD: US Department of Health and Human Services, CDC, National Center for Health Statistics; 2016. <https://www.cdc.gov/nchs/data/databriefs/db241.pdf>
4. Kochanek K, Murphy S, Xu J, Arias E. Mortality in the United States, 2016. NCHS data brief no 293. Hyattsville, MD: US Department of Health and Human Services, CDC, National Center for Health Statistics; 2017. <https://www.cdc.gov/nchs/data/databriefs/db293.pdf>
5. Office of the Surgeon General; National Action Alliance for Suicide Prevention. 2012 National strategy for suicide prevention: goals and objectives for action. Washington, DC: US Department of Health and Human Services, Office of the Surgeon General; 2012. <https://www.surgeongeneral.gov/library/reports/national-strategy-suicide-prevention/full-report.pdf>
6. Zalsman G, Hawton K, Wasserman D, et al. Suicide prevention strategies revisited: 10-year systematic review. *Lancet Psychiatry* 2016;3:646–59. [https://doi.org/10.1016/S2215-0366\(16\)30030-X](https://doi.org/10.1016/S2215-0366(16)30030-X)
7. Torguson K, O'Brien A. Leading suicide prevention efforts unite to address rising national suicide rate. Washington, DC: American Foundation for Suicide Prevention; 2017. <https://afsp.org/leading-suicide-prevention-efforts-unite-address-rising-national-suicide-rate/>
8. Crepeau-Hobson F. The psychological autopsy and determination of child suicides: a survey of medical examiners. *Arch Suicide Res* 2010;14:24–34. <https://doi.org/10.1080/13811110903479011>
9. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5). Washington, DC: American Psychiatric Association; 2013.
10. Caine ED, Reed J, Hindman J, Quinlan K. Comprehensive, integrated approaches to suicide prevention: practical guidance. *Inj Prev* 2017. Epub December 20, 2017. <https://doi.org/10.1136/injuryprev-2017-042366>
11. World Health Organization. Risks to mental health: an overview of vulnerabilities and risk factors. Geneva, Switzerland: World Health Organization; 2012.
12. Stone DM, Holland KM, Bartholow BN, Crosby AE, Davis SP, Wilkins N. Preventing suicide: a technical package of policy, programs, and practice. Atlanta, GA: US Department of Health and Human Services, CDC; 2017. <https://www.cdc.gov/violenceprevention/pdf/suicidetechnicalpackage.pdf>
13. Milner A, Svetlicic J, De Leo D. Suicide in the absence of mental disorder? A review of psychological autopsy studies across countries. *Int J Soc Psychiatry* 2013;59:545–54. <https://doi.org/10.1177/0020764012444259>
14. Pouliot L, De Leo D. Critical issues in psychological autopsy studies. *Suicide Life Threat Behav* 2006;36:491–510. <https://doi.org/10.1521/suli.2006.36.5.491>



## Vital Signs: Trends in State Suicide Rates — United States, 1999–2016 and Circumstances Contributing to Suicide — 27 States, 2015

Deborah M. Stone, ScD<sup>1</sup>; Thomas R. Simon PhD<sup>1</sup>; Katherine A. Fowler, PhD<sup>1</sup>; Scott R. Kegler, PhD<sup>2</sup>; Keming Yuan, MS<sup>1</sup>; Kristin M. Holland, PhD<sup>1</sup>; Asha Z. Ivey-Stephenson, PhD<sup>1</sup>; Alex E. Crosby, MD<sup>1</sup>

### Abstract

**Introduction:** Suicide rates in the United States have risen nearly 30% since 1999, and mental health conditions are just one factor contributing to suicide. Examining state-level trends in suicide and the multiple circumstances contributing to it can inform comprehensive state suicide prevention planning.

**Methods:** Trends in age-adjusted suicide rates among persons aged  $\geq 10$  years, by state and sex, across six consecutive 3-year periods (1999–2016), were assessed using data from the National Vital Statistics System for 50 states and the District of Columbia. Data from the National Violent Death Reporting System, covering 27 states in 2015, were used to examine contributing circumstances among decedents with and without known mental health conditions.

**Results:** During 1999–2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases  $>30\%$ . Rates increased significantly among males and females in 34 and 43 states, respectively. Fifty-four percent of decedents in 27 states in 2015 did not have a known mental health condition.

Among decedents with available information, several circumstances were significantly more likely among those without known mental health conditions than among those with mental health conditions, including relationship problems/loss (45.1% versus 39.6%), life stressors (54.2% versus 49.7%), and recent/impending crises (32.9% versus 26.0%), but these circumstances were common across groups.

**Conclusions:** Suicide rates increased significantly across most states during 1999–2016. Various circumstances contributed to suicides among persons with and without known mental health conditions.

**Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach to prevent suicide risk before it occurs, identify and support persons at risk, prevent reattempts, and help friends and family members in the aftermath of a suicide.

### INSIDE

7 QuickStats

Continuing Education examination available at  
[https://www.cdc.gov/mmwr/cme/conted\\_info.html#weekly](https://www.cdc.gov/mmwr/cme/conted_info.html#weekly).



U.S. Department of Health and Human Services  
Centers for Disease Control and Prevention



## Introduction

In 2016, nearly 45,000 suicides (15.6/100,000 population [age-adjusted]) occurred in the United States among persons aged  $\geq 10$  years (1). From 1999 to 2015, suicide rates increased among both sexes, all racial/ethnic groups, and all urbanization levels (2,3). Suicide rates have also increased among persons in all age groups  $< 75$  years, with the largest percent increase (45%; from 13.2 per 100,000 persons [1999] to 19.2 per 100,000 [2016]) and the greatest number of suicides (232,108 from 1999 to 2016) occurring among adults age 45–65 years (1,3). Suicide is the 10th leading cause of death and is one of just three leading causes that are increasing (1,4). In addition, rates of emergency department visits for nonfatal self-harm, a main risk factor for suicide, increased 42% from 2001 to 2016 (1). Together, suicides and self-harm injuries cost the nation approximately \$69 billion in direct medical and work loss costs (1).

The National Strategy for Suicide Prevention (NSSP) (5) calls for a public health approach to suicide prevention with efforts spanning multiple levels (individual, family/relationship, community, and societal). Such a comprehensive approach underscores that suicide is rarely caused by any single factor, but rather, is determined by multiple factors. Despite NSSP guidance, suicide prevention largely focuses on mental health conditions alone by identifying suicidal persons, providing treatment for mental health conditions, and preventing reattempts (6). In addition to mental health conditions and

prior suicide attempts, other contributing circumstances include social and economic problems, access to lethal means (e.g., substances, firearms) among persons at risk, and poor coping and problem-solving skills (5). Expanded awareness of these additional circumstances contributing to suicide risk and action to address them can help reach the national goal, established by the National Action Alliance of Suicide Prevention and the American Foundation for Suicide Prevention, of reducing the annual suicide rate 20% by 2025 (7). To assist states in achieving this goal, CDC analyzed state-specific trends in suicide rates and assessed the multiple contributing factors to suicide; this report presents options for multilevel comprehensive suicide prevention based on the best available evidence.

## Methods

Suicide rates were analyzed for persons aged  $\geq 10$  years because determining suicidal intent in younger children can be difficult (8). Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases, Tenth Revision*, underlying-cause-of-death codes X60–X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive 3-year aggregate periods spanning 1999–2016 (1999–2001; 2002–2004; 2005–2007;

The *MMWR* series of publications is published by the Center for Surveillance, Epidemiology, and Laboratory Services, Centers for Disease Control and Prevention (CDC), U.S. Department of Health and Human Services, Atlanta, GA 30329-4027.

**Suggested citation:** [Author names; first three, then et al., if more than six.] [Report title]. *MMWR Morb Mortal Wkly Rep* 2018;67:[inclusive page numbers].

### Centers for Disease Control and Prevention

Robert R. Redfield, MD, *Director*  
Anne Schuchat, MD, *Principal Deputy Director*  
Leslie Dauphin, PhD, *Acting Associate Director for Science*  
Joanne Cono, MD, ScM, *Director, Office of Science Quality*  
Chesley L. Richards, MD, MPH, *Deputy Director for Public Health Scientific Services*  
Michael F. Iademarco, MD, MPH, *Director, Center for Surveillance, Epidemiology, and Laboratory Services*

### MMWR Editorial and Production Staff (Weekly)

Charlotte K. Kent, PhD, MPH, *Acting Editor in Chief, Executive Editor*  
Jacqueline Gindler, MD, *Editor*  
Mary Dott, MD, MPH, *Online Editor*  
Teresa F. Rutledge, *Managing Editor*  
Douglas W. Weatherwax, *Lead Technical Writer-Editor*  
Glenn Damon, Soumya Dunworth, PhD, Teresa M. Hood, MS,  
*Technical Writer-Editors*

Martha F. Boyd, *Lead Visual Information Specialist*  
Maureen A. Leahy, Julia C. Martinroe,  
Stephen R. Spriggs, Tong Yang,  
*Visual Information Specialists*  
Quang M. Doan, MBA, Phyllis H. King,  
Terraye M. Starr, Moua Yang,  
*Information Technology Specialists*

### MMWR Editorial Board

Timothy F. Jones, MD, *Chairman*  
Matthew L. Boulton, MD, MPH  
Virginia A. Caine, MD  
Katherine Lyon Daniel, PhD  
Jonathan E. Fielding, MD, MPH, MBA  
David W. Fleming, MD

William E. Halperin, MD, DrPH, MPH  
King K. Holmes, MD, PhD  
Robin Ikeda, MD, MPH  
Rima F. Khabbaz, MD  
Phyllis Meadows, PhD, MSN, RN  
Jewel Mullen, MD, MPH, MPA

Jeff Niederdeppe, PhD  
Patricia Quinlisk, MD, MPH  
Patrick L. Remington, MD, MPH  
Carlos Roig, MS, MA  
William L. Roper, MD, MPH  
William Schaffner, MD



2008–2010; 2011–2013; and 2014–2016). Rate estimates were age-adjusted to the U.S. 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same 3-year data aggregates, employing weighted least-squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes.

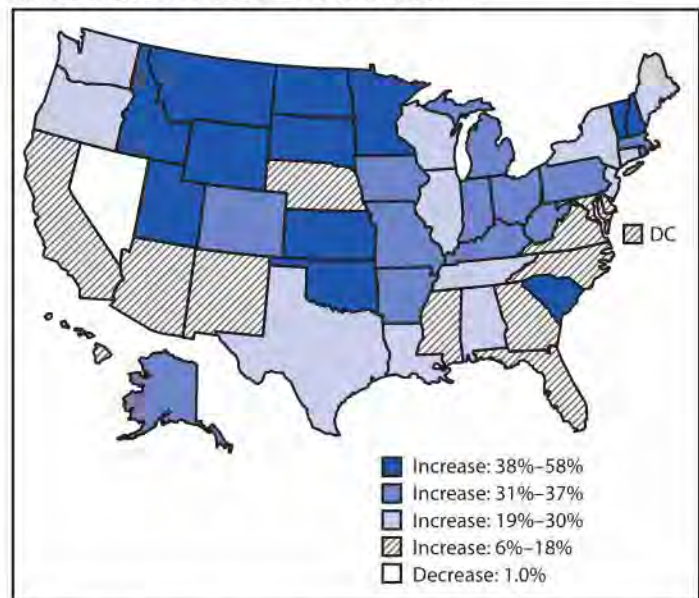
Characteristics of persons aged  $\geq 10$  years who died by suicide, with and without known mental health conditions, and the circumstances surrounding the suicides were compared in the 27 states\* with complete data participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines mental health conditions as disorders and syndromes listed in the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (9), with the exception of alcohol and other substance use disorders, which are captured separately in NVDRS. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. A range of circumstances (relationship problems, life stressors, and recent or impending crises) have been identified as potential risk factors for suicide. Circumstances captured by NVDRS are those identified by next of kin as having actively contributed to a person's suicide. Decedents could have experienced multiple circumstances. Decedents with and without known mental health conditions were compared using Chi-square tests. Logistic regression analyses estimated adjusted odds ratios (aORs) with 95% confidence intervals (CIs), controlling for age group, sex, and race/ethnicity.

## Results

The most recent overall suicide rates (representing 2014–2016) varied fourfold, from 6.9 (District of Columbia) to 29.2 (Montana) per 100,000 persons per year (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>). Across the study period, rates increased in all states except Nevada (where the rate was consistently high throughout the study period), with absolute increases ranging from 0.8 per 100,000 (Delaware) to 8.1 (Wyoming). Percentage increases in rates ranged from 5.9% (Delaware) to 57.6% (North Dakota), with increases  $>30\%$  observed in 25 states (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>) (Figure).

Modeled suicide rate trends indicated significant increases in 44 states, among males (34 states) and females (43 states), as well as for the United States overall (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>). Nationally, the

**FIGURE. Percent change in annual suicide rate,\* by state — United States, from 1999–2001 to 2014–2016**



\* Per 100,000 population, age-adjusted to the 2000 U.S. standard population.

model-estimated average annual percentage change for the overall suicide rate was an increase of 1.5%. By sex, estimated national rate trends further indicated significant average annual percentage change increases for males (1.1%) and females (2.6%) (Supplementary Table; <https://stacks.cdc.gov/view/cdc/53785>).

Suicide decedents without known mental health conditions (11,039) were compared with those with known mental health conditions (9,407) in 27 states. Whereas all decedents were predominately male (76.8%) (Table 1) and non-Hispanic white (83.6%), those without known mental health conditions, relative to those with mental health conditions, were more likely to be male (83.6% versus 68.8%; odds ratio [OR] = 2.3, 95% CI = 2.2–2.5) and belong to a racial/ethnic minority (OR range = 1.2–2.0). Suicide decedents without known mental health conditions also had significantly higher odds of perpetrating homicide followed by suicide (aOR = 2.9, 95% CI = 2.2–3.8). Among adult decedents aged  $\geq 18$  years, 20.1% of those without known mental health conditions and 15.3% of those with mental health conditions had ever served in the U.S. military or were serving at the time of death.

Whereas firearms were the most common method of suicide overall (48.5%) and among decedents with and without mental health conditions, decedents without known mental health conditions, relative to those with known mental health conditions, were more likely to die by firearm (55.3% versus 40.6%) and less likely to die by hanging/strangulation/suffocation (26.9% versus 31.3%) or poisoning (10.4% versus 19.8%). These differences remained significant in the adjusted models.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.



**TABLE 1. Selected demographic and descriptive characteristics of suicides among persons aged ≥10 years with and without known mental health conditions — National Violent Death Reporting System, 27 states,\* 2015**

Characteristic	Total (N = 20,446)	Known mental health condition <sup>†</sup> (n = 9,407)	No known mental health condition (n = 11,039)	P-value	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>¶</sup> (95% CI)
<b>Sex</b>						
Male	15,702 (76.8)	6,469 (68.8)	9,233 (83.6)	<0.01	2.3 (2.2–2.5)	NA
Female	4,744 (23.2)	2,938 (31.2)	1,806 (16.4)	<0.01	0.4 (0.4–0.5)	NA
<b>Age (yrs)**</b>						
10–24	2,804 (13.7)	1,211 (12.9)	1,593 (14.4)	<0.01	1.1 (1.1–1.2)	NA
25–44	6,456 (31.6)	3,036 (32.3)	3,420 (31.0)	<0.05	0.9 (0.9–1.0)	NA
45–64	7,718 (37.7)	3,820 (40.6)	3,898 (35.3)	<0.01	0.8 (0.8–0.8)	NA
≥65	3,468 (17.0)	1,340 (14.2)	2,128 (19.3)	<0.01	1.4 (1.3–1.5)	NA
<b>Race/Ethnicity</b>						
White, non-Hispanic	17,102 (83.6)	8,165 (86.8)	8,937 (81.0)	<0.01	0.6 (0.6–0.7)	NA
Black, non-Hispanic	1,228 (6.0)	411 (4.4)	817 (7.4)	<0.01	1.7 (1.5–2.0)	NA
American Indian/Alaska Native, non-Hispanic	378 (1.8)	112 (1.2)	266 (2.4)	<0.01	2.0 (1.6–2.6)	NA
Asian, non-Hispanic	576 (2.8)	235 (2.5)	341 (3.1)	<0.05	1.2 (1.1–1.5)	NA
Hispanic	1,096 (5.4)	463 (4.9)	633 (5.7)	<0.05	1.2 (1.0–1.3)	NA
Other	66 (0.3)	21 (0.2)	45 (0.4)	<0.05	1.8 (1.1–3.1)	NA
<b>Extended demographics</b>						
Ever served in military <sup>††</sup>	3,429 (17.8)	1,354 (15.3)	2,075 (20.1)	<0.01	1.4 (1.3–1.5)	1.1 (1.0–1.1)
Homeless	240 (1.2)	104 (1.1)	136 (1.3)		1.1 (0.9–1.5)	1.2 (0.9–1.5)
<b>Incident type</b>						
Single suicide	20,063 (98.2)	9,318 (99.1)	10,745 (97.4)	<0.01	0.3 (0.3–0.4)	0.4 (0.3–0.5)
Homicide followed by suicide	319 (1.6)	64 (0.7)	255 (2.3)	<0.01	3.5 (2.6–4.5)	2.9 (2.2–3.8)
Multiple suicides	64 (0.3)	25 (0.3)	39 (0.4)	NS	1.3 (0.8–2.2)	1.6 (0.9–2.6)
<b>Method</b>						
Firearm	9,909 (48.5)	3,821 (40.6)	6,088 (55.3)	<0.01	1.8 (1.7–1.9)	1.6 (1.5–1.7)
Hanging/Strangulation/Suffocation	5,907 (28.9)	2,940 (31.3)	2,967 (26.9)	<0.01	0.8 (0.8–0.9)	0.8 (0.7–0.8)
Poisoning	3,003 (14.7)	1,861 (19.8)	1,142 (10.4)	<0.01	0.5 (0.4–0.5)	0.6 (0.6–0.7)
<b>Substance class causing death<sup>§§</sup></b>						
Other (e.g., over-the-counter)	1,021 (34.0)	666 (35.8)	355 (31.1)	<0.01	0.8 (0.7–0.9)	0.9 (0.7–1.0)
Opioids	944 (31.4)	608 (32.7)	336 (29.4)	NS	0.9 (0.7–1.0)	0.9 (0.8–1.1)
Antidepressants	800 (26.6)	644 (34.6)	156 (13.7)	<0.01	0.3 (0.2–0.4)	0.3 (0.3–0.4)
Benzodiazepines	624 (20.8)	468 (25.1)	156 (13.7)	<0.01	0.5 (0.4–0.6)	0.5 (0.4–0.6)
Antipsychotics	219 (7.3)	195 (10.5)	24 (2.1)	<0.01	0.2 (0.1–0.3)	0.2 (0.1–0.3)
Other	1,595 (7.8)	780 (8.3)	815 (7.4)	<0.05	0.9 (0.8–1.0)	0.9 (0.8–1.0)

See table footnotes on next page.

Toxicology testing was less likely to be performed for decedents without known mental health conditions. Among those with toxicology results, decedents without known mental health conditions were less likely to test positive for any substance overall (aOR = 0.8, 95% CI = 0.7–0.8), including opioids (aOR = 0.90, 95% CI = 0.81–0.99), but were more likely to test positive for alcohol (aOR = 1.2, 95% CI = 1.1–1.3).

Information on circumstances surrounding suicide were available for all decedents with mental health conditions (n = 9,407) and approximately 85% of those without known mental health conditions (n = 9,357) in 27 states (Table 2). Persons without known mental health conditions were less likely to have any substance use disorders (aOR = 0.7, 95% CI = 0.7–0.8) than were persons with known mental health conditions. Whereas two thirds of decedents with known mental health conditions had a history of mental health or substance use treatment (67.2%), just over half (54.0%) were in treatment at the time of death.

Decedents without known mental health conditions had a significantly higher likelihood of any relationship problem/loss (45.1%) than did those with known mental health conditions (39.6%), specifically intimate partner problems (30.2% versus 24.1%), arguments/conflicts (17.5% versus 13.6%), and perpetrating interpersonal violence in the past month (3.0% versus 1.4%). Decedents without known mental health conditions were also more likely than were those with known mental health conditions to have experienced any life stressors (54.2% versus 49.7%) such as criminal legal problems (10.7% versus 6.2%) or eviction/loss of home (4.3% versus 3.4%) and were more likely to have had a recent or impending (within the preceding or upcoming 2 weeks, respectively) crisis (a current or acute event thought to contribute to the suicide) (32.9% versus 26.0%). All of these differences remained significant in the adjusted models. Physical health problems and job/financial problems were commonly contributing stressors among both persons without mental health conditions (23.2% and



**TABLE 1. (Continued) Selected demographic and descriptive characteristics of suicides among persons aged ≥10 years with and without known mental health conditions — National Violent Death Reporting System, 27 states,\* 2015**

Characteristic	Total (N = 20,446)	Known mental health condition† (n = 9,407)	No known mental health condition (n = 11,039)	P-value	OR§ (95% CI)	Adjusted OR¶ (95% CI)
<b>Toxicology results</b>						
Any toxicology testing	13,317 (65.1)	6,658 (70.8)	6,659 (60.3)	<0.01	0.6 (0.6–0.7)	0.7 (0.6–0.7)
Positive for ≥1 substance¶¶	9,913 (74.4)	5,192 (78.0)	4,721 (70.9)	<0.01	0.7 (0.6–0.7)	0.8 (0.7–0.8)
<b>Substance detected***</b>						
Alcohol						
Tested	10,950 (53.6)	5,409 (57.5)	5,541 (50.2)	<0.01	0.7 (0.7–0.8)	0.8 (0.7–0.8)
Positive	4,442 (40.6)	2,115 (39.1)	2,327 (42.0)	<0.01	1.1 (1.0–1.2)	1.2 (1.1–1.3)
Opioids						
Tested	8,554 (41.8)	4,258 (45.3)	4,296 (38.9)	<0.01	0.8 (0.7–0.8)	0.8 (0.8–0.9)
Positive	2,279 (26.6)	1,238 (29.1)	1,041 (24.2)	<0.01	0.8 (0.7–0.9)	0.9 (0.8–1.0)
Benzodiazepines						
Tested	8,124 (39.7)	4,226 (44.9)	3,898 (35.3)	<0.01	0.7 (0.6–0.7)	0.7 (0.7–0.8)
Positive	2,464 (30.3)	1,639 (38.8)	825 (21.2)	<0.01	0.4 (0.4–0.5)	0.5 (0.5–0.6)
Cocaine						
Tested	7,978 (39.0)	3,866 (41.1)	4,112 (37.2)	<0.01	0.9 (0.8–0.9)	0.9 (0.9–1.0)
Positive	499 (6.3)	216 (5.6)	283 (6.9)	<0.05	1.2 (1.0–1.5)	1.2 (1.0–1.5)
Amphetamines						
Tested	7,615 (37.2)	3,696 (39.3)	3,919 (35.5)	<0.01	0.9 (0.8–0.9)	0.9 (0.8–0.9)
Positive	736 (9.7)	376 (10.2)	360 (9.2)	NS	0.9 (0.8–1.0)	1.0 (0.8–1.1)
Marijuana						
Tested	6,569 (32.1)	3,127 (33.2)	3,442 (31.2)	<0.01	0.9 (0.9–1.0)	0.9 (0.9–1.0)
Positive	1,471 (22.4)	710 (22.7)	761 (22.1)	NS	1.0 (0.9–1.1)	0.9 (0.8–1.0)
Antidepressants						
Tested	5,425 (26.5)	3,103 (33.0)	2,322 (21.0)	<0.01	0.5 (0.5–0.6)	0.6 (0.6–0.7)
Positive	2,214 (40.8)	1,735 (55.9)	479 (20.6)	<0.01	0.2 (0.2–0.2)	0.2 (0.2–0.3)

**Abbreviations:** CI = confidence interval; NA = not adjusted; NS = not significant; OR = odds ratio.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

† Decedent had been identified as having a current diagnosis of mental health condition in coroner/medical examiner or law enforcement reports.

§ OR reflects the risk among those without known mental health condition relative to those with known mental health condition.

¶ Logistic regression was used to estimate adjusted OR with 95% CIs after controlling for age, sex, race, and ethnicity. Known mental health condition was used as the reference group.

\*\* Decedents were aged ≥10 years, as per standard in the suicide prevention literature.

†† Denominator is decedents aged ≥18 years with reported military service status.

§§ Denominator is decedents who died by poisoning, including overdose.

¶¶ Denominator is decedents with any toxicology testing.

\*\*\* Denominator for each positive group is the number tested for the substance in that group.

15.6%, respectively) and those with mental health conditions (21.4% and 16.8%, respectively). Similarly, among all persons with recent crises, intimate partner problems were the most common types and did not differ by group.

Decedents without known mental health conditions had significantly lower odds of recent release from any institution (aOR = 0.5, 95% CI = 0.4–0.5). Among those recently released, decedents without known mental health conditions were significantly more likely than decedents with mental health problems to have been released from a correctional facility (25.7% versus 8.7%), hospital (43.7% versus 33.0%), or other facility, such as an alcohol/substance use treatment facility (24.2% versus 11.6%). Among decedents with known mental health conditions who were recently released from an institution, 46.7% were released from psychiatric facilities.

Decedents without known mental health conditions were significantly less likely to have a history of suicidal ideation

(23.0%) or prior suicide attempts (10.3%) compared with those with known mental health conditions (40.8% and 29.4%, respectively). Suicide intent was disclosed by 22.4% and 24.5% of persons without and with known mental health conditions, respectively.

## Conclusions and Comments

During 1999–2016, suicide rates increased significantly in 44 states, and 25 states experienced increases >30%. Rates increased significantly among males in 34 states, and females in 43 states. Additional research into the specific causes of these trends is needed. Data from the 27 states participating in NVDRS provide important insight into circumstances surrounding suicide and can help states identify prevention priorities.

Suicidologists regularly state that suicide is not caused by a single factor (5); however, suicide prevention is often



**TABLE 2. Circumstances preceding suicide among decedents aged  $\geq 10$  years with and without known mental health conditions — National Violent Death Reporting System, 27 states,\* 2015**

Characteristic	Total	Known mental health condition <sup>†</sup> no. (%)	No known mental health condition no. (%)	P-value	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>¶</sup> (95% CI)
<b>Suicide with known circumstances</b>	<b>18,764 (91.8)</b>	<b>9,407 (100)</b>	<b>9,357 (84.8)</b>	<b>&lt;0.01</b>	<b>N/A</b>	<b>N/A</b>
<b>Mental health</b>						
Any current diagnosed mental health condition**						
Depression/Dysthymia	7,076 (75.2)	7,076 (75.2)	N/A	N/A	N/A	N/A
Anxiety disorder	1,579 (16.8)	1,579 (16.8)	N/A	N/A	N/A	N/A
Bipolar disorder	1,431 (15.2)	1,431 (15.2)	N/A	N/A	N/A	N/A
Schizophrenia	509 (5.4)	509 (5.4)	N/A	N/A	N/A	N/A
PTSD	424 (4.5)	424 (4.5)	N/A	N/A	N/A	N/A
ADD/ADHD	226 (2.4)	226 (2.4)	N/A	N/A	N/A	N/A
Not specified	760 (8.1)	760 (8.1)	N/A	N/A	N/A	N/A
Current depressed mood <sup>††</sup>	3,962 (42.1)	3,962 (42.1)	3,076 (32.9)	<0.01	0.7 (0.6–0.7)	0.7 (0.6–0.7)
<b>Substance problems</b>						
Any current substance problem	5,319 (28.3)	2,976 (31.6)	2,343 (25.0)	<0.01	0.7 (0.7–0.8)	0.7 (0.7–0.8)
Alcohol problem	3,268 (17.4)	1,862 (19.8)	1,406 (15.0)	<0.01	0.7 (0.7–0.8)	0.7 (0.7–0.8)
Other substance problem	3,084 (16.4)	1,768 (18.8)	1,316 (14.1)	<0.01	0.7 (0.7–0.8)	0.7 (0.7–0.8)
<b>Treatment</b>						
Current mental health/substance abuse treatment	5,141 (27.4)	5,077 (54.0)	64 (0.7)	<0.01	0.01 (0.01–0.01)	0.01 (0.01–0.01)
Ever treated for mental health/substance problem	6,717 (35.8)	6,323 (67.2)	394 (4.2)	<0.01	0.02 (0.02–0.02)	0.02 (0.02–0.03)
<b>Relationship problems/loss</b>						
Any relationship problem/loss	7,948 (42.4)	3,726 (39.6)	4,222 (45.1)	<0.01	1.3 (1.2–1.3)	1.3 (1.2–1.4)
Intimate partner problem	5,098 (27.2)	2,270 (24.1)	2,828 (30.2)	<0.01	1.4 (1.3–1.5)	1.4 (1.3–1.5)
Perpetrator of interpersonal violence in past month	414 (2.2)	131 (1.4)	283 (3.0)	<0.01	2.2 (1.8–2.7)	2.0 (1.6–2.4)
Victim of interpersonal violence in past month	84 (0.4)	53 (0.6)	31 (0.3)	<0.05	0.6 (0.4–0.9)	0.8 (0.5–1.2)
Family relationship problem	1,671 (8.9)	873 (9.3)	798 (8.5)	NS	0.9 (0.8–1.0)	1.0 (0.9–1.1)
Other relationship problem (nonintimate)	403 (2.1)	202 (2.1)	201 (2.1)	NS	1.0 (0.8–1.2)	1.1 (0.9–1.3)
Argument or conflict (not specified)	2,914 (15.5)	1,278 (13.6)	1,636 (17.5)	<0.01	1.3 (1.2–1.5)	1.4 (1.3–1.5)
Death of a loved one (any)	1,497 (8.0)	826 (8.8)	671 (7.2)	<0.01	0.8 (0.7–0.9)	0.9 (0.8–0.9)
Nonsuicide death	1,181 (6.3)	647 (6.9)	534 (5.7)	<0.01	0.8 (0.7–0.9)	0.9 (0.8–1.0)
Suicide of family or friend	379 (2.0)	217 (2.3)	162 (1.7)	<0.01	0.7 (0.6–0.9)	0.8 (0.7–1.0)
<b>Other life stressors</b>						
Any life stressor	9,743 (51.9)	4,675 (49.7)	5,068 (54.2)	<0.01	1.2 (1.1–1.3)	1.1 (1.1–1.2)
Recent criminal legal problem	1,588 (8.5)	586 (6.2)	1,002 (10.7)	<0.01	1.8 (1.6–2.0)	1.7 (1.5–1.9)
Other legal problem	748 (4.0)	378 (4.0)	370 (4.0)	NS	1.0 (0.8–1.1)	1.0 (0.9–1.2)
Physical health problem	4,179 (22.3)	2,012 (21.4)	2,167 (23.2)	<0.01	1.1 (1.0–1.2)	1.0 (1.0–1.1)
Job/Financial problem <sup>§§</sup>	2,941 (16.2)	1,530 (16.8)	1,411 (15.6)	<0.05	0.9 (0.8–1.0)	0.9 (0.8–1.0)
Eviction or loss of home	722 (3.8)	317 (3.4)	405 (4.3)	<0.01	1.3 (1.1–1.5)	1.4 (1.2–1.6)
School problem <sup>¶¶</sup>	162 (19.9)	70 (17.8)	92 (21.9)	NS	1.3 (0.9–1.8)	1.3 (0.9–1.9)
Recent release from an institution <sup>***</sup>	1,412 (7.6)	941 (10.2)	471 (5.1)	<0.01	0.5 (0.4–0.5)	0.5 (0.4–0.5)
Jail/Prison/Detention facility	203 (14.4)	82 (8.7)	121 (25.7)	<0.01	3.6 (2.7–4.9)	4.5 (3.2–6.4)
Hospital	517 (36.6)	311 (33.0)	206 (43.7)	<0.01	1.6 (1.3–2.0)	1.3 (1.0–1.7)
Psychiatric hospital/institution	469 (33.2)	439 (46.7)	30 (6.4)	<0.01	0.1 (0.1–0.1)	0.1 (0.1–0.1)
Other (includes alcohol/SA treatment facilities)	223 (15.8)	109 (11.6)	114 (24.2)	<0.01	2.4 (1.8–3.3)	2.5 (1.8–3.3)

See table footnotes on next page.

oriented toward mental health conditions alone with regard to downstream identification of suicidal persons, treatment of mental health conditions, and prevention of reattempts. This study found that approximately half of suicide decedents in NVDRS did not have a known mental health condition, indicating that additional focus on nonmental health factors further upstream could provide important information for a public health approach (10). Those without a known mental health condition suffered more from relationship problems and other life stressors such as criminal/legal matters, eviction/loss of home, and recent or impending crises.

Similarly, persons with mental health conditions also often experienced nonmental health factors such as relationship problems and other life stressors such as job/financial or physical health problems. These findings point to the need to both prevent the circumstances associated with the onset of mental health conditions in the first place and support persons with known mental health conditions to decrease their risk for poor outcomes (11). Two thirds of suicide decedents with mental health conditions had a history of treatment for mental health or substance use disorders, with approximately half in treatment when they died. This finding suggests the need for additional safety supports, including broader implementation



**TABLE 2. (Continued) Circumstances preceding suicide among decedents aged  $\geq 10$  years with and without known mental health conditions — National Violent Death Reporting System, 27 states,\* 2015**

Characteristic	Total	Known mental health condition <sup>†</sup> no. (%)	No known mental health condition no. (%)	P-value	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>¶</sup> (95% CI)
<b>Crisis within past or upcoming 2 weeks<sup>††</sup></b>	<b>5,525 (29.4)</b>	<b>2,444 (26.0)</b>	<b>3,081 (32.9)</b>	<b>&lt;0.01</b>	<b>1.4 (1.3–1.5)</b>	<b>1.4 (1.3–1.5)</b>
Intimate partner problem crisis	1,968 (35.6)	854 (34.9)	1,114 (36.2)	NS	1.1 (0.9–1.2)	1.1 (0.9–1.2)
Physical health problem crisis	739 (13.4)	315 (12.9)	424 (13.8)	NS	1.1 (0.9–1.3)	1.0 (0.8–1.2)
Criminal legal problem crisis	621 (11.2)	203 (8.3)	418 (13.6)	<0.01	1.7 (1.5–2.1)	1.6 (1.3–1.9)
Family relationship problem crisis	430 (7.8)	212 (8.7)	218 (7.1)	<0.05	0.8 (0.7–1.0)	0.9 (0.7–1.1)
Job problem crisis	354 (6.4)	191 (7.8)	163 (5.3)	<0.01	0.7 (0.5–0.8)	0.7 (0.5–0.8)
<b>Suicide event/history</b>						
Left a note	6,468 (34.5)	3,182 (33.8)	3,286 (35.1)	NS	1.1 (1.0–1.1)	1.2 (1.1–1.2)
Disclosed suicide intent	4,405 (23.5)	2,306 (24.5)	2,099 (22.4)	<0.01	0.9 (0.8–1.0)	0.9 (0.8–0.9)
History of ideation	5,990 (31.9)	3,838 (40.8)	2,152 (23.0)	<0.01	0.4 (0.4–0.5)	0.4 (0.4–0.5)
History of attempts	3,732 (19.9)	2,770 (29.4)	962 (10.3)	<0.01	0.3 (0.3–0.3)	0.3 (0.3–0.3)

**Abbreviations:** ADD/ADHD = attention deficit disorder/attention deficit hyperactivity disorder; CI = confidence interval; N/A = not applicable; NS = not significant; OR = odds ratio; PTSD = posttraumatic stress disorder; SA = substance abuse.

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

<sup>†</sup> Decedent had been identified as having a current diagnosis of mental health condition in coroner/medical examiner or law enforcement reports.

<sup>§</sup> OR reflects the risk among those without known mental health condition relative to those with known mental health condition.

<sup>¶</sup> Logistic regression was used to estimate adjusted OR with 95% CIs after controlling for age, sex, race, and ethnicity. Known mental health condition was the reference group.

\*\* Includes decedents with one or more diagnosed current mental health conditions, which are not mutually exclusive. Therefore, sums of percentages for the diagnosed conditions exceed 100%. Denominator includes the number of decedents with one or more current diagnosed mental health conditions.

<sup>††</sup> Not a diagnosis.

<sup>§§</sup> Denominator is decedents aged  $\geq 18$  years.

<sup>¶¶</sup> Denominator is decedents aged 10–18 years.

\*\*\* Denominator of institution subgroup is decedents with recent release from an institution. Recent release from an institution is defined as having occurred within the past month.

<sup>†††</sup> Denominator of crisis subgroup is decedents with any crisis within past or upcoming 2 weeks. Crises depicted here represent the most commonly occurring categories.

of affordable and effective treatment modalities, such as doctor-patient collaborative care models and proven cognitive-behavioral therapies. In addition, increased access to behavioral health providers in underserved areas is needed, as is expansion of health care systems that integrate physical and behavioral health, with a priority on suicide prevention and patient safety, especially through care transitions (12).

Comprehensive statewide suicide prevention activities are needed to address the full range of factors contributing to suicide. Prevention strategies include strengthening economic supports (e.g., housing stabilization policies, household financial support); teaching coping and problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in life; promoting social connectedness to increase a sense of belonging and access to informational, tangible, emotional, and social support; and identifying and better supporting persons at risk (e.g., military veterans, persons with physical/mental health conditions) (12). Other strategies include creating protective environments (e.g., reducing access to lethal means among persons at risk for suicide, creating organizational and workplace policies to promote help-seeking, easing transitions into and out of work for persons with mental health conditions and other life challenges), strengthening access and delivery of

care, supporting family and friends after a suicide, and assuring the media follow safe reporting recommendations (12). Some states, such as Colorado, are planning to implement such a comprehensive approach to suicide prevention (10).

The findings in this report are subject to at least three limitations. First, in the state-level analysis, rankings for four states (Maryland, Massachusetts, Rhode Island, and Utah) might have been affected by large proportions of injury deaths of undetermined intent (potentially biasing reported suicide rates downward) or decreased percentages of such deaths over time (potentially biasing estimated rate trends upward). Second, NVDRS is not yet nationally representative; the 27 states included represent 49.6% of the population (<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml>). Finally, abstractors of NVDRS data are limited to information contained in investigative reports. Therefore, the extent of informant knowledge can affect data completeness and accuracy. Studies that include more in-depth interviews with next-of-kin often identify greater attributions to mental disorders (13); however, many methodological variations across studies exist (14). It is likely that some persons without known mental health conditions in the current study were experiencing mental health challenges that were unknown, and



## References

## Summary

## What is already known about this topic?

In 2016, nearly 45,000 persons died by suicide in the United States. Mental health conditions can contribute to suicide.

## What is added by this report?

During 1999–2016, suicide rates increased in nearly every state, including >30% increases in 25 states. 2015 data from 27 states indicate 54% of suicide decedents were not known to have mental health conditions. Other contributors included relationship, substance use, health, and job or financial problems, among others.

## What are the implications for public health practice?

A comprehensive approach using proven prevention strategies, such as those in CDC's Technical Package for Suicide Prevention, can help reach the national goal of reducing the annual suicide rate 20% by 2025.

hence underreported by key informants. Nonetheless, the high prevalence of diverse contributing circumstances among those with and without known mental health conditions suggests the importance of addressing the broad range of factors that contribute to suicide.

Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are available. States and communities can use data from NVDRS and resources such as CDC's Preventing Suicide: a Technical Package of Policy, Programs, and Practices (12) to better understand suicide in their populations, prioritize evidence-based comprehensive suicide prevention, and save lives.

## Acknowledgments

Robert Anderson, Holly Hedegaard, Margaret Warner, Division of Vital Statistics, National Center for Health Statistics, CDC.

## Conflict of Interest

No conflicts of interest were reported.

<sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC; <sup>2</sup>Division of Analysis, Research, and Practice Integration, National Center for Injury Prevention and Control, CDC.

Corresponding author: Deborah M. Stone, dstone3@cdc.gov, 770-488-3942.

1. CDC. Web-based Injury Statistics Query and Reporting System (WISQARS). Atlanta, GA: National Center for Injury Prevention and Control; 2018. <https://www.cdc.gov/injury/wisqars/index.html>
2. Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide trends among and within urbanization levels by sex, race/ethnicity, age group, and mechanism of death—United States, 2001–2015. *MMWR Surveill Summ* 2017;66(No. SS-18). <https://doi.org/10.15585/mmwr.ss6618a1>
3. Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999–2014. NCHS data brief no 241. Hyattsville, MD: US Department of Health and Human Services, CDC, National Center for Health Statistics; 2016. <https://www.cdc.gov/nchs/data/databriefs/db241.pdf>
4. Kochanek K, Murphy S, Xu J, Arias E. Mortality in the United States, 2016. NCHS data brief no 293. Hyattsville, MD: US Department of Health and Human Services, CDC, National Center for Health Statistics; 2017. <https://www.cdc.gov/nchs/data/databriefs/db293.pdf>
5. Office of the Surgeon General; National Action Alliance for Suicide Prevention. 2012 National strategy for suicide prevention: goals and objectives for action. Washington, DC: US Department of Health and Human Services, Office of the Surgeon General; 2012. <https://www.surgeongeneral.gov/library/reports/national-strategy-suicide-prevention/full-report.pdf>
6. Zalsman G, Hawton K, Wasserman D, et al. Suicide prevention strategies revisited: 10-year systematic review. *Lancet Psychiatry* 2016;3:646–59. [https://doi.org/10.1016/S2215-0366\(16\)30030-X](https://doi.org/10.1016/S2215-0366(16)30030-X)
7. Torguson K, O'Brien A. Leading suicide prevention efforts unite to address rising national suicide rate. Washington, DC: American Foundation for Suicide Prevention; 2017. <https://afsp.org/leading-suicide-prevention-efforts-unite-address-rising-national-suicide-rate/>
8. Crepeau-Hobson F. The psychological autopsy and determination of child suicides: a survey of medical examiners. *Arch Suicide Res* 2010;14:24–34. <https://doi.org/10.1080/13811110903479011>
9. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5). Washington, DC: American Psychiatric Association; 2013.
10. Caine ED, Reed J, Hindman J, Quinlan K. Comprehensive, integrated approaches to suicide prevention: practical guidance. *Inj Prev* 2017. Epub December 20, 2017. <https://doi.org/10.1136/injuryprev-2017-042366>
11. World Health Organization. Risks to mental health: an overview of vulnerabilities and risk factors. Geneva, Switzerland: World Health Organization; 2012.
12. Stone DM, Holland KM, Bartholow BN, Crosby AE, Davis SP, Wilkins N. Preventing suicide: a technical package of policy, programs, and practice. Atlanta, GA: US Department of Health and Human Services, CDC; 2017. <https://www.cdc.gov/violenceprevention/pdf/suicidetechnicalpackage.pdf>
13. Milner A, Svetlicic J, De Leo D. Suicide in the absence of mental disorder? A review of psychological autopsy studies across countries. *Int J Soc Psychiatry* 2013;59:545–54. <https://doi.org/10.1177/0020764012444259>
14. Pouliot L, De Leo D. Critical issues in psychological autopsy studies. *Suicide Life Threat Behav* 2006;36:491–510. <https://doi.org/10.1521/suli.2006.36.5.491>



## **Vital Signs: Trends in State Suicide Rates — United States, 1999–2016 and Circumstances Contributing to Suicide — 27 States, 2015**

Deborah M. Stone, ScD<sup>1</sup>; Thomas R. Simon PhD<sup>1</sup>; Katherine A. Fowler, PhD<sup>1</sup>; Scott R. Kegler, PhD<sup>2</sup>; Keming Yuan, MS<sup>1</sup>; Kristin M. Holland, PhD<sup>1</sup>; Asha Z. Ivey-Stephenson, PhD<sup>1</sup>; Alex E. Crosby, MD<sup>1</sup>

**Background:** Suicide rates in the United States have risen nearly 30% since 1999, and mental health problems are just one factor contributing to suicide. Examining state-level trends in, and the multiple circumstances contributing to, suicide can inform comprehensive state suicide prevention planning.

**Methods:** Trends in age-adjusted suicide rates among persons aged  $\geq 10$  years, by state and sex, across six consecutive three-year periods (1999–2016), were assessed using data from the National Vital Statistics System for 50 states and the District of Columbia (DC). Data from the National Violent Death Reporting System, covering 27 states in 2015, were used to examine contributing circumstances among decedents with and without known mental health problems.

**Results:** During 1999–2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases of more than 30%. Rates increased significantly among males and females in 34 and 43 states, respectively. In 2015, more than half (54%) of decedents in 27 states did not have a known mental health problem. Among persons with circumstance information, several circumstances were significantly more likely among those without a known mental health problems than among decedents with mental health problems, including relationship problems/loss (45.1% vs 39.6%), life stressors (54.2% vs 49.7%), and recent/impending crises (32.9% vs 26.0%), but these circumstances were common across groups.

**Conclusions:** Suicide rates increased significantly across most states during 1999–2016. Various circumstances contributed to suicides among persons with and without known mental health problems.

**Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach to prevent suicide risk before it occurs, identify and support persons at risk, prevent reattempts, and help friends/family after a suicide occurs.

## INTRODUCTION

### BACKGROUND AND PURPOSE

In 2016, nearly 45,000 suicides (15.6/100,000 population [age-adjusted]) occurred in the United States, among persons aged  $\geq 10$  years (1). Between 1999 and 2015, suicide rates increased among both sexes, all racial/ethnic groups, and all urbanization levels (2,3). Suicide is the 10<sup>th</sup> leading cause of death and is one of just three leading causes that are increasing (1,4).

Additionally, rates of emergency department visits for nonfatal self-harm, a key risk factor for suicide, increased 42% between 2001 and 2015 (1). Together, suicides and self-harm injuries cost the nation more than \$69 billion in direct medical and work loss costs (1).

The *National Strategy for Suicide Prevention (NSSP)* (5) calls for a public health approach to suicide prevention with efforts spanning multiple levels (i.e., individual, family/relationship, community, and societal). Such a comprehensive approach underscores that suicide is rarely caused by any single factor, but rather, is determined by multiple factors. Despite the NSSP guidance, suicide prevention largely focuses on identifying suicidal persons, providing treatment for mental health problems and preventing reattempts (6). In addition to mental health problems and prior attempts, other circumstances contributing to suicide include social and economic



problems, access to lethal means (e.g., substances, firearms) among persons at risk, and poor coping and problem-solving skills (5). Expanded awareness of these additional circumstances contributing to suicide risk and action to address them can help reach the nation's goal of reducing suicide rates 20% by 2025 (7). To assist states in achieving this goal, CDC analyzed state-specific trends in suicide rates, assessed the multiple contributing factors to suicide, and presents options for multi-level comprehensive suicide prevention based on the best available evidence.

## **METHODS**

Suicide rates were analyzed for persons aged  $\geq 10$  years only, as determining suicidal intent in younger children can be difficult (8). Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases 10<sup>th</sup> Revision*, underlying-cause-of death codes X60–X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods spanning 1999–2016 (1999–2001, 2002–2004; 2005–2007; 2008–2010; 2011–2013; and 2014–2016). Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Characteristics and circumstances of persons aged  $\geq 10$  years who died by suicide, with and without known mental health problems, were compared in the 27 states with complete data

participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines mental health problems as disorders and syndromes listed in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (9), with the exception of alcohol and other substance use disorders, which are captured separately in NVDRS. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known mental health problems were compared using Chi-square tests. Logistic regression analyses estimated adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and race/ethnicity.

## **RESULTS**

The most recent overall suicide rates (representing 2014–2016) varied four-fold, from 6.9 (DC) to 29.2 (Montana) per 100,000 persons per year (available online). Across the study period, rates increased in all states except Nevada (which had a consistently high rate throughout), with absolute increases ranging from +0.8 per 100,000 (Delaware) to +8.1 (Wyoming). Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with increases of more than 30% observed in 25 states (available online; Figure 1).

Modeled suicide rate trends indicated significant increases in 44 states, among males (34 states) and females (43 states), as well as for the United States overall (available online). Nationally, the model-estimated AAPC for the overall suicide rate was +1.5%. By sex, estimated national rate trends further indicated significant increases for males (AAPC +1.1%) and females (AAPC +2.6%) (available online).

Suicide decedents without known mental health problems (N = 11,039) were compared with those with known mental health problems (N = 9,407) in 27 states. Whereas all decedents were predominately male (76.8%) (Table 1) and non-Hispanic white (83.6%), those without known



mental health problems, relative to those with mental health problems, were more likely male (83.6% versus 68.8%; odds ratio (OR) = 2.3, 95% CI = 2.2–2.5) and racial/ethnic minorities (OR range: 1.2–2.0). Suicide decedents without known mental health problems also had significantly higher odds of perpetrating homicide-suicide (adjusted odds ratio (aOR) = 2.9, 95% CI = 2.2–3.8). Among adult decedents  $\geq 18$  years, 20.1% of those without known mental health problems and 15.3% of those with mental health problems had ever served, or were currently serving, in the U.S. military.

Whereas firearms were the most common method of suicide overall (48.5%) and for decedents with and without mental health problems, decedents without known mental health problems were more likely to die by firearm (55.3% versus 40.6%) and less likely to die by hanging/strangulation/suffocation (26.9% versus 31.3%) or poisoning (10.4% versus 19.8%) than were those with known mental health problems. These differences remained significant in the adjusted models.

Decedents without known mental health problems were less likely to receive toxicology testing. Among those with toxicology results, decedents without known mental health problems were less likely to test positive for any substance overall (aOR = 0.8, 95% CI = 0.7–0.8), including opioids (aOR = 0.90 95% CI = 0.81–0.99), but were more likely to test positive for alcohol (aOR = 1.2, 95% CI = 1.1–1.3).

Information on circumstances surrounding suicide were available for all decedents with mental health problems (N = 9,407) and approximately 85% of those without known mental health problems (N = 9,357) (Table 2). Persons without known mental health problems were less likely to have any substance use disorders (aOR = 0.7, 95% CI = 0.7–0.8). Whereas two thirds of

decedents with known mental health problems had a history of mental health or substance use treatment (67.2%), just over half (54.0%) were in current treatment.

Decedents without known mental health problems had a significantly higher likelihood of any relationship problem/loss (45.1%) than did those with known mental health problems (39.6%), specifically intimate partner problems (30.2% versus 24.1%), arguments/conflicts (17.5% versus 13.6%), and recently perpetrating interpersonal violence (3.0% versus 1.4%). Decedents without known mental health problems were also more likely than those with known mental health problems to have experienced any life stressors (54.2% versus 49.7%) such as criminal-legal problems (10.7% versus 6.2%) or eviction/loss of home (4.3% versus 3.4%) and were more likely to have had a crisis a current or acute event thought to contribute to the suicide, within the preceding or impending, two weeks (32.9% versus 26.0%). All of these differences remained significant in the adjusted models. Among all persons with recent crises, intimate partner problems were the most common types and did not differ by group. Similarly, physical health problems and job/financial problems were commonly experienced among both persons without mental health problems (23.2% and 15.6%, respectively) and those with mental health problems (21.4% and 16.8%, respectively).

Decedents without known mental health problems had significantly lower odds of recent release from any institution (aOR = 0.5, 95% CI = 0.4–0.5), but those who were recently released (5.1%), were significantly more likely to have been released from a correctional facility (25.7% versus 8.7%), hospital (43.7% versus 33.0%), or other facility (e.g., alcohol/substance treatment) (aOR = 2.5 95% CI = 1.8–3.3), than those with a known mental health problems. Among decedents with known mental health problems who were recently released from an institution (10.2%), 46.7% of were released from psychiatric facilities.



Decedents without known mental health problems were significantly less likely to have a history of suicidal ideation (23.0%) or prior suicide attempts (10.3%) compared with those with known mental health problems (40.8% and 29.4%, respectively). Suicide intent was disclosed by 22.4% and 24.5% of persons without and with known mental health problems, respectively.

### **Conclusions and Comments**

During 1999–2016, suicide rates increased significantly in 44 states, and 25 states experienced increases of more than 30%. Rates increased significantly among males in 34 states, and females, in 43 states. This finding is consistent with prior research showing a decreasing gender gap in male-female suicide rates during 1999–2014 (3). Additional research into the specific causes of these trends is necessary. Fortunately, data from the 27 states participating in NVDRS provides important insight into circumstances surrounding suicide and can help states identify prevention priorities.

Suicidologists regularly state that suicide is not caused by a single factor (5); however, suicide prevention is often oriented toward downstream identification of suicidal persons, treatment of mental health problems and prevention of reattempts. This study found that more than half of suicide decedents in NVDRS did not have a known mental health problems, indicating that additional focus on non-mental health factors, further upstream, is essential to a public health approach (10). This group suffered more from relationship problems and other life stressors such as criminal-legal matters, eviction/loss of home, and recent or impending crises.

Similarly, persons with mental health problems often experienced relationship problems and other life stressors such as job/financial and/or physical health problems. These findings point to the need to both help persons manage the conditions associated with mental health problems in the first place, and to support persons with known mental health problems to decrease their risk

of poor outcomes (11). Two thirds of this group had a history of any mental health and/or substance use treatment, with over half in treatment when they died. This suggests the need for additional safety supports, including broader implementation of affordable and effective treatment modalities such as doctor-patient collaborative care models and proven cognitive-behavioral therapies. Additionally, increased access to behavioral health providers in underserved areas is needed, as is expansion of health care systems that integrate physical and behavioral health, with a priority on suicide prevention and patient safety, especially through care transitions (12).

Comprehensive statewide suicide prevention activities are needed to address the full range of factors contributing to suicide. Prevention strategies include strengthening economic supports (e.g., housing stabilization policies, household financial support); teaching coping and problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in life; promoting social connectedness to increase a sense of belonging and access to informational, tangible, emotional, and social support; and identifying and better supporting persons at risk (e.g., military veterans, persons with physical/mental health problems) (12). Other strategies include creating protective environments (e.g., reducing access to lethal means among persons at risk, creating organizational and workplace policies to promote help-seeking, easing transitions into and out of work for persons with mental health problems and other life challenges), supporting family and friends after a suicide, and assuring safe reporting by the media in order to prevent suicide contagion (12). Some states, such as Colorado, are planning to implement such a comprehensive approach to suicide prevention (10).

The findings in this report are subject to at least three limitations. In the state-level analysis, rankings for four states (Maryland, Massachusetts, Rhode Island, and Utah) might have been



affected by large proportions of injury deaths of undetermined intent (potentially biasing reported suicide rates downward), or decreased percentages of such deaths over time (potentially biasing estimated rate trends upward). Second, NVDRS is not yet nationally representative; the 27 states included represent 49.6% of the population

(<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml>). Finally, abstractors of NVDRS data are limited to information contained in investigative reports.

Therefore, the extent of informant knowledge can affect data completeness and accuracy. Studies including more in-depth interviews with next-of-kin often identify greater attributions to mental disorders (13); however, many methodological variations across studies exist (14). It is likely that some persons without known mental health problems in the current study were experiencing mental health challenges that were unknown, and hence underreported by key informants.

Nonetheless, the high prevalence of diverse contributing circumstances among those with and without known mental health problems suggests the importance of addressing the broad range of factors that contribute to suicide.

Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are available. States and communities can use data from NVDRS and resources such as CDC's *Preventing Suicide: a Technical Package of Policies, Programs, and Practices* (12) to better understand their suicide problem, prioritize evidence-based comprehensive suicide prevention, and save lives.

### **Acknowledgments**

Robert Anderson, Holly Hedegaard, and Margaret Warner, Division of Vital Statistics, National Center for Health Statistics, CDC.

**Conflict of Interest** No conflicts of interest were reported.

<sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC;

<sup>2</sup>Division of Analysis, Research, and Practice Integration, National Center for Injury Prevention and Control, CDC. Corresponding author: Deborah M. Stone, dstone3@cdc.gov , 770-488-3942

## References:

1. Centers for Disease Control and Prevention. Web-based Injury Statistics Query and Reporting System (WISQARS). Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018. In.
2. Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide Trends Among and Within Urbanization Levels by Sex, Race/Ethnicity, Age Group, and Mechanism of Death—United States, 2001–2015. *MMWR Surveill Summ* 2017;66:1–16.
3. Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999–2014. In: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics Hyattsville, MD; 2016.
4. Kochanek K, Murphy S, Xu J, Arias E. Mortality in the United States, 2016. *NCHS Data Brief*, no 293. National Center for Health Statistics 2017.
5. Office of the Surgeon General, National Action Alliance for Suicide Prevention. 2012 National strategy for suicide prevention: Goals and objectives for action: a report of the US Surgeon General and of the National Action Alliance for Suicide Prevention. 2012.
6. Zalsman G, Hawton K, Wasserman D, et al. Suicide prevention strategies revisited: 10-year systematic review. *Lancet Psychiatry* 2016;3:646–59.
7. Torguson K, O'Brien A. Leading Suicide Prevention Efforts Unite to Address Rising National Suicide Rate. In. Washington, D.C.; 2017.



8. Crepeau-Hobson F. The psychological autopsy and determination of child suicides: a survey of medical examiners. *Arch Suicide Res* 2010;14:24–34.
9. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5®): American Psychiatric Pub; 2013.
10. Caine ED, Reed J, Hindman J, Quinlan K. Comprehensive, integrated approaches to suicide prevention: practical guidance. *Inj Prev* 2017;injuryprev-2017-042366.
11. World Health Organization. Risks to mental health: An overview of vulnerabilities and risk factors. Geneva: WHO 2012.
12. Stone DM, Holland KM, Bartholow BN, Crosby AE, Davis SP, Wilkins N. Preventing suicide: A technical package of policies, programs, and practice. 2017.
13. Milner A, Svetlicic J, De Leo D. Suicide in the absence of mental disorder? A review of psychological autopsy studies across countries. *Int J Soc Psychiatry* 2013;59:545–54.
14. Pouliot L, De Leo D. Critical issues in psychological autopsy studies. *Suicide Life Threat Behav* 2006;36:491–510.

### **Summary Box (word count 100/100)**

#### **What is already known on the topic?**

In 2016, nearly 45,000 lives were lost to suicide in the U.S.

#### **What is added by this report?**

Between 1999-2016, suicide rates increased in nearly every state. Twenty-five states saw rate increases >30%. Mental health problems often contribute to suicide, however, 2015 data from the National Violent Death Reporting System (27 states) indicate that 54% of suicide decedents

were not known to have such problems. Other contributors included relationship, substance use, health, and job/financial problems.

**What are the implications for public health practice?**

A comprehensive approach using proven prevention strategies, such as those in CDC's Technical Package for Suicide Prevention, can help reach the national goal of reducing suicide rates 20% by 2025.



## **Vital Signs: Trends in State Suicide Rates — United States, 1999–2016 and Circumstances Contributing to Suicide — 27 States, 2015**

Deborah M. Stone, ScD<sup>1</sup>; Thomas R. Simon PhD<sup>1</sup>; Katherine A. Fowler, PhD<sup>1</sup>; Scott R. Kegler, PhD<sup>2</sup>; Keming Yuan, MS<sup>1</sup>; Kristin M. Holland, PhD<sup>1</sup>; Asha Z. Ivey-Stephenson, PhD<sup>1</sup>; Alex E. Crosby, MD<sup>1</sup>

**Background:** Suicide rates in the United States have risen nearly 30% since 1999, and mental health problems are just one factor contributing to suicide. Examining state-level trends in, and the multiple circumstances contributing to, suicide can inform comprehensive state suicide prevention planning.

**Methods:** Trends in age-adjusted suicide rates among persons aged  $\geq 10$  years, by state and sex, across six consecutive three-year periods (1999–2016), were assessed using data from the National Vital Statistics System for 50 states and the District of Columbia (DC). Data from the National Violent Death Reporting System, covering 27 states in 2015, were used to examine contributing circumstances among decedents with and without known mental health problems.

**Results:** During 1999–2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases of more than 30%. Rates increased significantly among males and females in 34 and 43 states, respectively. In 2015, more than half (54%) of decedents in 27 states did not have a known mental health problem. Among decedents with circumstance information available, several circumstances were significantly more likely among those without a known mental health problems than among those with mental health problems, including relationship problems/loss (45.1% versus 39.6%), life stressors (54.2% versus 49.7%), and recent/impending crises (32.9% versus 26.0%), but these circumstances were common across groups.

**Conclusions:** Suicide rates increased significantly across most states during 1999–2016. Various circumstances contributed to suicides among persons with and without known mental health problems.

**Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach to prevent suicide risk before it occurs, identify and support persons at risk, prevent reattempts, and help friends and family in the aftermath of a suicide.

## INTRODUCTION

### BACKGROUND AND PURPOSE

In 2016, nearly 45,000 suicides (15.6/100,000 population [age-adjusted]) occurred in the United States among persons aged  $\geq 10$  years (1). Between 1999 and 2015, suicide rates increased among both sexes, all racial/ethnic groups, and all urbanization levels (2,3). Suicide is the 10<sup>th</sup> leading cause of death and is one of just three leading causes that are increasing (1,4).

Additionally, rates of emergency department visits for nonfatal self-harm, a key risk factor for suicide, increased 42% between 2001 and 2015 (1). Together, suicides and self-harm injuries cost the nation more than \$69 billion in direct medical and work loss costs (1).

The *National Strategy for Suicide Prevention (NSSP)* (5) calls for a public health approach to suicide prevention with efforts spanning multiple levels (i.e., individual, family/relationship, community, and societal). Such a comprehensive approach underscores that suicide is rarely caused by any single factor, but rather, is determined by multiple factors. Despite the NSSP guidance, suicide prevention largely focuses on identifying suicidal persons, providing treatment for mental health problems, and preventing reattempts (6). In addition to mental health problems and prior attempts, other circumstances contributing to suicide include social and economic



problems, access to lethal means (e.g., substances, firearms) among persons at risk, and poor coping and problem-solving skills (5). Expanded awareness of these additional circumstances contributing to suicide risk and action to address them can help reach the nation's goal of reducing suicide rates by 20% by 2025 (7). To assist states in achieving this goal, CDC analyzed state-specific trends in suicide rates and assessed the multiple contributing factors to suicide; this report presents options for multi-level comprehensive suicide prevention based on the best available evidence.

## **METHODS**

Suicide rates were analyzed for persons aged  $\geq 10$  years only, as determining suicidal intent in younger children can be difficult (8). Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases 10<sup>th</sup> Revision*, underlying-cause-of death codes X60–X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods spanning 1999–2016 (1999–2001, 2002–2004; 2005–2007; 2008–2010; 2011–2013; and 2014–2016). Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Characteristics of persons aged  $\geq 10$  years who died by suicide, with and without known mental health problems, and the circumstances surrounding the suicides were compared in the 27 states

with complete data participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines mental health problems as disorders and syndromes listed in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (9), with the exception of alcohol and other substance use disorders, which are captured separately in NVDRS. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known mental health problems were compared using Chi-square tests. Logistic regression analyses estimated adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and race/ethnicity.

## **RESULTS**

The most recent overall suicide rates (representing 2014–2016) varied four-fold, from 6.9 (DC) to 29.2 (Montana) per 100,000 persons per year (Supplementary Table). Across the study period, rates increased in all states except Nevada (where the rate was consistently high throughout the study period), with absolute increases ranging from +0.8 per 100,000 (Delaware) to +8.1 (Wyoming). Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with increases of more than 30% observed in 25 states (Supplementary Table) (Figure 1).

Modeled suicide rate trends indicated significant increases in 44 states, among males (34 states) and females (43 states), as well as for the United States overall (Supplementary Table).

Nationally, the model-estimated AAPC for the overall suicide rate was +1.5%. By sex, estimated national rate trends further indicated significant increases for males (AAPC +1.1%) and females (AAPC +2.6%) (Supplementary Table).



Suicide decedents without known mental health problems (N = 11,039) were compared with those with known mental health problems (N = 9,407) in 27 states. Whereas all decedents were predominately male (76.8%) (Table 1) and non-Hispanic white (83.6%), those without known mental health problems, relative to those with mental health problems, were more likely male (83.6% versus 68.8%; odds ratio (OR) = 2.3, 95% CI = 2.2–2.5) and racial/ethnic minorities (OR range: 1.2–2.0). Suicide decedents without known mental health problems also had significantly higher odds of perpetrating homicide-suicide (adjusted odds ratio (aOR) = 2.9, 95% CI = 2.2–3.8). Among adult decedents aged  $\geq 18$  years, 20.1% of those without known mental health problems and 15.3% of those with mental health problems had ever served, or were currently serving, in the U.S. military.

Whereas firearms were the most common method of suicide overall (48.5%) and among decedents with and without mental health problems, decedents without known mental health problems, relative to those with known mental health problems, were more likely to die by firearm (55.3% versus 40.6%) and less likely to die by hanging/strangulation/suffocation (26.9% versus 31.3%) or poisoning (10.4% versus 19.8%). These differences remained significant in the adjusted models.

Decedents without known mental health problems were less likely to receive toxicology testing. Among those with toxicology results, decedents without known mental health problems were less likely to test positive for any substance overall (aOR = 0.8, 95% CI = 0.7–0.8), including opioids (aOR = 0.90 95% CI = 0.81–0.99), but were more likely to test positive for alcohol (aOR = 1.2, 95% CI = 1.1–1.3).

Information on circumstances surrounding suicide were available for all decedents with mental health problems (N = 9,407) and approximately 85% of those without known mental health

problems (N = 9,357) in 27 states (Table 2). Persons without known mental health problems were less likely to have any substance use disorders (aOR = 0.7, 95% CI = 0.7–0.8) than were persons with known mental health problems. Whereas two thirds of decedents with known mental health problems had a history of mental health or substance use treatment (67.2%), just over half (54.0%) were in current treatment.

Decedents without known mental health problems had a significantly higher likelihood of any relationship problem/loss (45.1%) than did those with known mental health problems (39.6%), specifically intimate partner problems (30.2% versus 24.1%), arguments/conflicts (17.5% versus 13.6%), and recently perpetrating interpersonal violence (3.0% versus 1.4%). Decedents without known mental health problems were also more likely than were those with known mental health problems to have experienced any life stressors (54.2% versus 49.7%) such as criminal-legal problems (10.7% versus 6.2%) or eviction/loss of home (4.3% versus 3.4%) and were more likely to have had a recent or impending (within the preceding or upcoming 2 weeks, respectively) crisis (a current or acute event thought to contribute to the suicide) (32.9% versus 26.0%). All of these differences remained significant in the adjusted models. Among all persons with recent crises, intimate partner problems were the most common types and did not differ by group. Similarly, physical health problems and job/financial problems were commonly experienced among both persons without mental health problems (23.2% and 15.6%, respectively) and those with mental health problems (21.4% and 16.8%, respectively).

Decedents without known mental health problems had significantly lower odds of recent release from any institution (aOR = 0.5, 95% CI = 0.4–0.5), but those who were recently released (5.1%), were significantly more likely to have been released from a correctional facility (25.7% versus 8.7%), hospital (43.7% versus 33.0%), or other facility (e.g., alcohol/substance treatment)



(aOR = 2.5 95% CI = 1.8–3.3), than were those with a known mental health problem. Among decedents with known mental health problems who were recently released from an institution (10.2%), 46.7% of were released from psychiatric facilities.

Decedents without known mental health problems were significantly less likely to have a history of suicidal ideation (23.0%) or prior suicide attempts (10.3%) compared with those with known mental health problems (40.8% and 29.4%, respectively). Suicide intent was disclosed by 22.4% and 24.5% of persons without and with known mental health problems, respectively.

### **Conclusions and Comments**

During 1999–2016, suicide rates increased significantly in 44 states, and 25 states experienced increases of more than 30%. Rates increased significantly among males in 34 states, and females, in 43 states. This finding is consistent with prior research showing a decreasing gender gap in male-female suicide rates during 1999–2014 (3). Additional research into the specific causes of these trends is necessary. Data from the 27 states participating in NVDRS provides important insight into circumstances surrounding suicide and can help states identify prevention priorities.

Suicidologists regularly state that suicide is not caused by a single factor (5); however, suicide prevention is often oriented toward downstream identification of suicidal persons, treatment of mental health problems and prevention of reattempts. This study found that more than half of suicide decedents in NVDRS did not have a known mental health problems, indicating that additional focus on non-mental health factors, further upstream, is essential to a public health approach (10). This group suffered more from relationship problems and other life stressors such as criminal-legal matters, eviction/loss of home, and recent or impending crises.

Similarly, persons with mental health problems often experienced relationship problems and other life stressors such as job/financial and/or physical health problems. These findings point to the need to both help persons manage the conditions associated with mental health problems in the first place, and to support persons with known mental health problems to decrease their risk of poor outcomes (11). Two thirds of this group had a history of any mental health and/or substance use treatment, with over half in treatment when they died. This suggests the need for additional safety supports, including broader implementation of affordable and effective treatment modalities such as doctor-patient collaborative care models and proven cognitive-behavioral therapies. Additionally, increased access to behavioral health providers in underserved areas is needed, as is expansion of health care systems that integrate physical and behavioral health, with a priority on suicide prevention and patient safety, especially through care transitions (12).

Comprehensive statewide suicide prevention activities are needed to address the full range of factors contributing to suicide. Prevention strategies include strengthening economic supports (e.g., housing stabilization policies, household financial support); teaching coping and problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in life; promoting social connectedness to increase a sense of belonging and access to informational, tangible, emotional, and social support; and identifying and better supporting persons at risk (e.g., military veterans, persons with physical/mental health problems) (12). Other strategies include creating protective environments (e.g., reducing access to lethal means among persons at risk, creating organizational and workplace policies to promote help-seeking, easing transitions into and out of work for persons with mental health problems and other life challenges), supporting family and friends after a suicide, and assuring safe reporting by the



media in order to prevent suicide contagion (12). Some states, such as Colorado, are planning to implement such a comprehensive approach to suicide prevention (10).

The findings in this report are subject to at least three limitations. In the state-level analysis, rankings for four states (Maryland, Massachusetts, Rhode Island, and Utah) might have been affected by large proportions of injury deaths of undetermined intent (potentially biasing reported suicide rates downward), or decreased percentages of such deaths over time (potentially biasing estimated rate trends upward). Second, NVDRS is not yet nationally representative; the 27 states included represent 49.6% of the population

(<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml>). Finally, abstractors of NVDRS data are limited to information contained in investigative reports.

Therefore, the extent of informant knowledge can affect data completeness and accuracy. Studies including more in-depth interviews with next-of-kin often identify greater attributions to mental disorders (13); however, many methodological variations across studies exist (14). It is likely that some persons without known mental health problems in the current study were experiencing mental health challenges that were unknown, and hence underreported by key informants.

Nonetheless, the high prevalence of diverse contributing circumstances among those with and without known mental health problems suggests the importance of addressing the broad range of factors that contribute to suicide.

Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are available. States and communities can use data from NVDRS and resources such as CDC's *Preventing Suicide: a Technical Package of Policies, Programs, and Practices* (12) to better understand their suicide problem, prioritize evidence-based comprehensive suicide prevention, and save lives.

## **Acknowledgments**

Robert Anderson, Holly Hedegaard, and Margaret Warner, Division of Vital Statistics, National Center for Health Statistics, CDC.

**Conflict of Interest** No conflicts of interest were reported.

<sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC;

<sup>2</sup>Division of Analysis, Research, and Practice Integration, National Center for Injury Prevention and Control, CDC. Corresponding author: Deborah M. Stone, dstone3@cdc.gov , 770-488-3942

## **References**

1. Centers for Disease Control and Prevention. Web-based Injury Statistics Query and Reporting System (WISQARS). Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018. In.
2. Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide Trends Among and Within Urbanization Levels by Sex, Race/Ethnicity, Age Group, and Mechanism of Death—United States, 2001–2015. *MMWR Surveill Summ* 2017;66:1–16.
3. Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999–2014. In: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics Hyattsville, MD; 2016.
4. Kochanek K, Murphy S, Xu J, Arias E. Mortality in the United States, 2016. *NCHS Data Brief*, no 293. National Center for Health Statistics 2017.
5. Office of the Surgeon General, National Action Alliance for Suicide Prevention. 2012 National strategy for suicide prevention: Goals and objectives for action: a report of the US Surgeon General and of the National Action Alliance for Suicide Prevention. 2012.



6. Zalsman G, Hawton K, Wasserman D, et al. Suicide prevention strategies revisited: 10-year systematic review. *Lancet Psychiatry* 2016;3:646–59.
7. Torguson K, O'Brien A. Leading Suicide Prevention Efforts Unite to Address Rising National Suicide Rate. In. Washington, D.C.; 2017.
8. Crepeau-Hobson F. The psychological autopsy and determination of child suicides: a survey of medical examiners. *Arch Suicide Res* 2010;14:24–34.
9. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5®): American Psychiatric Pub; 2013.
10. Caine ED, Reed J, Hindman J, Quinlan K. Comprehensive, integrated approaches to suicide prevention: practical guidance. *Inj Prev* 2017:injuryprev-2017-042366.
11. World Health Organization. Risks to mental health: An overview of vulnerabilities and risk factors. Geneva: WHO 2012.
12. Stone DM, Holland KM, Bartholow BN, Crosby AE, Davis SP, Wilkins N. Preventing suicide: A technical package of policies, programs, and practice. 2017.
13. Milner A, Sveticic J, De Leo D. Suicide in the absence of mental disorder? A review of psychological autopsy studies across countries. *Int J Soc Psychiatry* 2013;59:545–54.
14. Pouliot L, De Leo D. Critical issues in psychological autopsy studies. *Suicide Life Threat Behav* 2006;36:491–510.

## **Summary**

### **What is already known about this topic?**

In 2016, nearly 45,000 lives were lost to suicide in the United States.

**What is added by this report?**

During 1999–2016, suicide rates increased in nearly every state, including >30% increases in 25 states. Mental health problems often contribute to suicide; however, 2015 data from the National Violent Death Reporting System (27 states) indicate that 54% of suicide decedents were not known to have such problems. Other contributors included relationship, substance use, health, and job/financial problems.

**What are the implications for public health practice?**

A comprehensive approach using proven prevention strategies, such as those in CDC's Technical Package for Suicide Prevention, can help reach the national goal of reducing suicide rates 20% by 2025.



### **Vital Signs: Trends in State Suicide Rates — United States, 1999–2016 and Circumstances Contributing to Suicide — 27 States, 2015**

Deborah M. Stone, ScD<sup>1</sup>; Thomas R. Simon PhD<sup>1</sup>; Katherine A. Fowler, PhD<sup>1</sup>; Scott R. Kegler, PhD<sup>2</sup>; Keming Yuan, MS<sup>1</sup>; Kristin M. Holland, PhD<sup>1</sup>; Asha Z. Ivey-Stephenson, PhD<sup>1</sup>; Alex E. Crosby, MD<sup>1</sup>

**Background:** Suicide rates in the United States have risen nearly 30% since 1999, and mental health problems are just one factor contributing to suicide. Examining state-level trends in, and the multiple circumstances contributing to, suicide can inform comprehensive state suicide prevention planning.

**Methods:** Trends in age-adjusted suicide rates among persons aged  $\geq 10$  years, by state and sex, across six consecutive three-year periods (1999–2016), were assessed using data from the National Vital Statistics System for 50 states and the District of Columbia (DC). Data from the National Violent Death Reporting System, covering 27 states in 2015, were used to examine contributing circumstances among decedents with and without known mental health problems.

**Results:** During 1999–2016, suicide rates increased significantly in 44 states, with 25 states experiencing increases of more than 30%. Rates increased significantly among males and females in 34 and 43 states, respectively. In 2015, more than half (54%) of decedents in 27 states did not have a known mental health problem. Among persons with circumstance information, several circumstances were significantly more likely among those without a known mental health problems than among decedents with mental health problems, including relationship problems/loss (45.1% vs 39.6%), life stressors (54.2% vs 49.7%), and recent/impending crises (32.9% vs 26.0%), but these circumstances were common across groups.

**Conclusions:** Suicide rates increased significantly across most states during 1999–2016. Various circumstances contributed to suicides among persons with and without known mental health problems.

**Implications for Public Health Practice:** States can use a comprehensive evidence-based public health approach to prevent suicide risk before it occurs, identify and support persons at risk, prevent reattempts, and help friends/family after a suicide occurs.

## INTRODUCTION

### BACKGROUND AND PURPOSE

In 2016, nearly 45,000 suicides (15.6/100,000 population [age-adjusted]) occurred in the United States, among persons aged  $\geq 10$  years (1). Between 1999 and 2015, suicide rates increased among both sexes, all racial/ethnic groups, and all urbanization levels (2,3). Suicide is the 10<sup>th</sup> leading cause of death and is one of just three leading causes that are increasing (1,4).

Additionally, rates of emergency department visits for nonfatal self-harm, a key risk factor for suicide, increased nearly 45% between 2001 and 2015 (1). Together, suicides and self-harm injuries cost the nation more than \$69 billion in direct medical and work loss costs (1).

The *National Strategy for Suicide Prevention (NSSP)* (5) calls for a public health approach to suicide prevention with efforts spanning multiple levels (i.e., individual, family/relationship, community, and societal). Such a comprehensive approach underscores that suicide is rarely caused by any single factor, but rather, is determined by multiple factors. Despite the NSSP guidance, suicide prevention largely focuses on identifying suicidal persons, providing treatment for mental health problems and preventing reattempts (6). In addition to mental health problems and prior attempts, other circumstances contributing to suicide include social and economic



problems, access to lethal means (e.g., substances, firearms) among persons at risk, and poor coping and problem-solving skills (5). Expanded awareness of these additional circumstances contributing to suicide risk and action to address them can help reach the nation's goal of reducing suicide rates 20% by 2025 (7). To assist states in achieving this goal, CDC analyzed state-specific trends in suicide rates, assessed the multiple contributing factors to suicide, and presents options for multi-level comprehensive suicide prevention based on the best available evidence.

## **METHODS**

Suicide rates were analyzed for persons aged  $\geq 10$  years only, as determining suicidal intent in younger children can be difficult (8). Age-specific suicide counts were tabulated based on National Vital Statistics System coded death certificate records (*International Classification of Diseases 10<sup>th</sup> Revision*, underlying-cause-of death codes X60–X84, Y87.0, U03). Age-specific population estimates were obtained from U.S. Census Bureau/National Center for Health Statistics bridged-race population data releases.

National and state-level suicide rate estimates were calculated for six consecutive three-year aggregate periods spanning 1999–2016 (1999–2001, 2002–2004; 2005–2007; 2008–2010; 2011–2013; and 2014–2016). Rate estimates were age-adjusted to the U.S. year 2000 standard population and expressed per 100,000 persons per year. Age-adjusted suicide rate trends were modeled using the same three-year data aggregates, employing weighted least squares regression with inverse-variance weighting. Modeled rate trends are reported in terms of average annual percentage changes (AAPCs).

Characteristics and circumstances of persons aged  $\geq 10$  years who died by suicide, with and without known mental health problems, were compared in the 27 states with complete data

participating in CDC's National Violent Death Reporting System (NVDRS) in 2015. NVDRS defines mental health problems as disorders and syndromes listed in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (9), with the exception of alcohol and other substance use disorders, which are captured separately in NVDRS. NVDRS aggregates data from three primary data sources: death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. Decedents with and without known mental health problems were compared using Chi-square tests. Logistic regression analyses estimated adjusted odds ratios with 95% confidence intervals (CI), controlling for age group, sex, and race/ethnicity.

## **RESULTS**

The most recent overall suicide rates (representing 2014–2016) varied four-fold, from 6.9 (DC) to 29.2 (Montana) per 100,000 persons per year (Table 1). Across the study period, rates increased in all states except Nevada (which had a consistently high rate throughout), with absolute increases ranging from +0.8 per 100,000 (Delaware) to +8.1 (Wyoming). Percentage increases in rates ranged from +5.9% (Delaware) to +57.6% (North Dakota), with increases of more than 30% observed in 25 states (Table 1) (Figure).

Modeled suicide rate trends indicated significant increases in 44 states (Table 1), among males (34 states) and females (43 states; Supplemental Table 1), as well as for the United States overall (Table 1). Nationally, the model-estimated AAPC for the overall suicide rate was +1.5%. By sex, estimated national rate trends further indicated significant increases for males (AAPC +1.1%) and females (AAPC +2.6%) (Supplemental Table 1).

Suicide decedents without known mental health problems (N = 11,039) were compared with those with known mental health problems (N = 9,407) in 27 states. Whereas all decedents were predominately male (76.8%) (Table 2) and non-Hispanic white (83.6%), those without known



mental health problems, relative to those with mental health problems, were more likely male (83.6% versus 68.8%; odds ratio (OR) = 2.3, 95% CI = 2.2–2.5) and racial/ethnic minorities (OR range: 1.2–2.0). Suicide decedents without known mental health problems also had significantly higher odds of perpetrating homicide-suicide (adjusted odds ratio (aOR) = 2.9, 95% CI = 2.2–3.8). Among adult decedents  $\geq 18$  years, 20.1% of those without known mental health problems and 15.3% of those with mental health problems had ever served, or were currently serving, in the U.S. military.

Whereas firearms were the most common method of suicide overall (48.5%) and for decedents with and without mental health problems, decedents without known mental health problems were more likely to die by firearm (55.3% versus 40.6%) and less likely to die by hanging/strangulation/suffocation (26.9% versus 31.3%) or poisoning (10.4% versus 19.8%) than were those with known mental health problems. These differences remained significant in the adjusted models.

Decedents without known mental health problems were less likely to receive toxicology testing. Among those with toxicology results, decedents without known mental health problems were less likely to test positive for any substance overall (aOR = 0.8, 95% CI = 0.7–0.8), including opioids (aOR = 0.90 95% CI = 0.81–0.99), but were more likely to test positive for alcohol (aOR = 1.2, 95% CI = 1.1–1.3).

Information on circumstances surrounding suicide were available for all decedents with mental health problems (N = 9,407) and approximately 85% of those without known mental health problems (N = 9,357) (Table 3). Persons without known mental health problems were less likely to have any substance use disorders (aOR = 0.7, 95% CI = 0.7–0.8). Whereas two thirds of

decedents with known mental health problems had a history of mental health or substance use treatment (67.2%), just over half (54.0%) were in current treatment.

Decedents without known mental health problems had a significantly higher likelihood of any relationship problem/loss (45.1%) than did those with known mental health problems (39.6%), specifically intimate partner problems (30.2% versus 24.1%), arguments/conflicts (17.5% versus 13.6%), and recently perpetrating interpersonal violence (3.0% versus 1.4%). Decedents without known mental health problems were also more likely than those with known mental health problems to have experienced any life stressors (54.2% versus 49.7%) such as criminal-legal problems (10.7% versus 6.2%) or eviction/loss of home (4.3% versus 3.4%) and were more likely to have had a crisis a current or acute event thought to contribute to the suicide, within the preceding or impending, two weeks (32.9% versus 26.0%). All of these differences remained significant in the adjusted models. Among all persons with recent crises, intimate partner problems were the most common types and did not differ by group. Similarly, physical health problems and job/financial problems were commonly experienced among both persons without mental health problems (23.2% and 15.6%, respectively) and those with mental health problems (21.4% and 16.8%, respectively).

Decedents without known mental health problems had significantly lower odds of recent release from any institution (aOR = 0.5, 95% CI = 0.4–0.5), but those who were recently released (5.1%), were significantly more likely to have been released from a correctional facility (25.7% versus 8.7%), hospital (43.7% versus 33.0%), or other facility (e.g., alcohol/substance treatment) (aOR = 2.5 95% CI = 1.8–3.3), than those with a known mental health problems. Among decedents with known mental health problems who were recently released from an institution (10.2%), 46.7% of were released from psychiatric facilities.



Decedents without known mental health problems were significantly less likely to have a history of suicidal ideation (23.0%) or prior suicide attempts (10.3%) compared with those with known mental health problems (40.8% and 29.4%, respectively). Suicide intent was disclosed by 22.4% and 24.5% of persons without and with known mental health problems, respectively.

### **Conclusions and Comments**

During 1999–2016, suicide rates increased significantly in 44 states, and 25 states experienced increases of more than 30%. Rates increased significantly among males in 34 states, and females, in 43 states. This finding is consistent with prior research showing a decreasing gender gap in male-female suicide rates during 1999–2014 (3). Additional research into the specific causes of these trends is necessary. Fortunately, data from the 27 states participating in NVDRS provides important insight into circumstances surrounding suicide and can help states identify prevention priorities.

Suicidologists regularly state that suicide is not caused by a single factor (5); however, suicide prevention is often oriented toward downstream identification of suicidal persons, treatment of mental health problems and prevention of reattempts. This study found that more than half of suicide decedents in NVDRS did not have a known mental health problems, indicating that additional focus on non-mental health factors, further upstream, is essential to a public health approach (10). This group suffered more from relationship problems and other life stressors such as criminal-legal matters, eviction/loss of home, and recent or impending crises.

Similarly, persons with mental health problems often experienced relationship problems and other life stressors such as job/financial and/or physical health problems. These findings point to the need to both help persons manage the conditions associated with mental health problems in the first place, and to support persons with known mental health problems to decrease their risk

of poor outcomes (11). Two thirds of this group had a history of any mental health and/or substance use treatment, with over half in treatment when they died. This suggests the need for additional safety supports, including broader implementation of affordable and effective treatment modalities such as doctor-patient collaborative care models and proven cognitive-behavioral therapies. Additionally, increased access to behavioral health providers in underserved areas is needed, as is expansion of health care systems that integrate physical and behavioral health, with a priority on suicide prevention and patient safety, especially through care transitions (12).

Comprehensive statewide suicide prevention activities are needed to address the full range of factors contributing to suicide. Prevention strategies include strengthening economic supports (e.g., housing stabilization policies, household financial support); teaching coping and problem-solving skills to manage everyday stressors and prevent future relationship problems, especially early in life; promoting social connectedness to increase a sense of belonging and access to informational, tangible, emotional, and social support; and identifying and better supporting persons at risk (e.g., military veterans, persons with physical/mental health problems) (12). Other strategies include creating protective environments (e.g., reducing access to lethal means among persons at risk, creating organizational and workplace policies to promote help-seeking, easing transitions into and out of work for persons with mental health problems and other life challenges), supporting family and friends after a suicide, and assuring safe reporting by the media in order to prevent suicide contagion (12). Some states, such as Colorado, are planning to implement such a comprehensive approach to suicide prevention (10).

The findings in this report are subject to at least three limitations. In the state-level analysis, rankings for four states (Maryland, Massachusetts, Rhode Island, and Utah) might have been



affected by large proportions of injury deaths of undetermined intent (potentially biasing reported suicide rates downward), or decreased percentages of such deaths over time (potentially biasing estimated rate trends upward). Second, NVDRS is not yet nationally representative; the 27 states included represent 49.6% of the population

(<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml>). Finally, abstractors of NVDRS data are limited to information contained in investigative reports.

Therefore, the extent of informant knowledge can affect data completeness and accuracy. Studies including more in-depth interviews with next-of-kin often identify greater attributions to mental disorders (13); however, many methodological variations across studies exist (14). It is likely that some persons without known mental health problems in the current study were experiencing mental health challenges that were unknown, and hence underreported by key informants.

Nonetheless, the high prevalence of diverse contributing circumstances among those with and without known mental health problems suggests the importance of addressing the broad range of factors that contribute to suicide.

Suicide is a growing public health problem. Effective approaches to prevent the many suicide risk factors are available. States and communities can use data from NVDRS and resources such as CDC's *Preventing Suicide: a Technical Package of Policies, Programs, and Practices* (12) to better understand their suicide problem, prioritize evidence-based comprehensive suicide prevention, and save lives.

### **Acknowledgments**

Robert Anderson, Holly Hedegaard, and Margaret Warner, Division of Vital Statistics, National Center for Health Statistics, CDC.

**Conflict of Interest** No conflicts of interest were reported.

<sup>1</sup>Division of Violence Prevention, National Center for Injury Prevention and Control, CDC;

<sup>2</sup>Division of Analysis, Research, and Practice Integration, National Center for Injury Prevention and Control, CDC. Corresponding author: Deborah M. Stone, dstone3@cdc.gov , 770-488-3942

## References:

1. Centers for Disease Control and Prevention. Web-based Injury Statistics Query and Reporting System (WISQARS). Atlanta, GA: National Center for Injury Prevention and Control. Retrieved March 15, 2018. In.
2. Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide Trends Among and Within Urbanization Levels by Sex, Race/Ethnicity, Age Group, and Mechanism of Death—United States, 2001–2015. *MMWR Surveill Summ* 2017;66:1–16.
3. Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999–2014. In: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics Hyattsville, MD; 2016.
4. Kochanek K, Murphy S, Xu J, Arias E. Mortality in the United States, 2016. *NCHS Data Brief*, no 293. National Center for Health Statistics 2017.
5. Office of the Surgeon General, National Action Alliance for Suicide Prevention. 2012 National strategy for suicide prevention: Goals and objectives for action: a report of the US Surgeon General and of the National Action Alliance for Suicide Prevention. 2012.
6. Zalsman G, Hawton K, Wasserman D, et al. Suicide prevention strategies revisited: 10-year systematic review. *Lancet Psychiatry* 2016;3:646–59.
7. Torguson K, O'Brien A. Leading Suicide Prevention Efforts Unite to Address Rising National Suicide Rate. In. Washington, D.C.; 2017.



8. Crepeau-Hobson F. The psychological autopsy and determination of child suicides: a survey of medical examiners. *Arch Suicide Res* 2010;14:24–34.
9. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (DSM-5®): American Psychiatric Pub; 2013.
10. Caine ED, Reed J, Hindman J, Quinlan K. Comprehensive, integrated approaches to suicide prevention: practical guidance. *Inj Prev* 2017;injuryprev-2017-042366.
11. World Health Organization. Risks to mental health: An overview of vulnerabilities and risk factors. Geneva: WHO 2012.
12. Stone DM, Holland KM, Bartholow BN, Crosby AE, Davis SP, Wilkins N. Preventing suicide: A technical package of policies, programs, and practice. 2017.
13. Milner A, Svetcic J, De Leo D. Suicide in the absence of mental disorder? A review of psychological autopsy studies across countries. *Int J Soc Psychiatry* 2013;59:545–54.
14. Pouliot L, De Leo D. Critical issues in psychological autopsy studies. *Suicide Life Threat Behav* 2006;36:491–510.

### **Summary Box (word count 100/100)**

#### **What is already known on the topic?**

In 2016, nearly 45,000 lives were lost to suicide in the U.S.

#### **What is added by this report?**

Between 1999-2016, suicide rates increased in nearly every state. Twenty-five states saw rate increases >30%. Mental health problems often contribute to suicide, however, 2015 data from the National Violent Death Reporting System (27 states) indicate that 54% of suicide decedents

were not known to have such problems. Other contributors included relationship, substance use, health, and job/financial problems.

**What are the implications for public health practice?**

A comprehensive approach using proven prevention strategies, such as those in CDC's Technical Package for Suicide Prevention, can help reach the national goal of reducing suicide rates 20% by 2025.



## Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, 1999 – 2016

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
U.S.	Both	12.3 (n/a)	12.7 (+ 0.4)	12.9 (+ 0.2)	13.8 (+ 0.9)	14.5 (+ 0.8)	15.4 (+ 0.9)	+ 1.5 % (p<.01)	n/a	+ 3.1 (n/a)	+ 25.4 % (n/a)
	Male	20.9 (n/a)	21.2 (+ 0.4)	21.3 (+ 0.0)	22.5 (+1.3)	23.5 (+ 1.0)	24.5 (+ 1.0)	+ 1.1 % (p<.01)			
	Female	4.7 (n/a)	5.0 (+ 0.3)	5.3 (+ 0.2)	5.7 (+ 0.4)	6.2 (+ 0.5)	6.9 (+ 0.7)	+ 2.6 % (p<.01)			
AL	Both	14.3 (n/a)	13.4 (- 0.9)	14.1 (+ 0.6)	15.6 (+ 1.6)	16.4 (+ 0.7)	17.5 (+ 1.1)	+ 1.6 % (p<.05)	25	+ 3.1 (31)	+ 21.9 % (33)
	Male	25.1 (n/a)	23.4 (- 1.7)	24.4 (+ 1.0)	26.4 (+ 2.0)	27.6 (+ 1.1)	29.1 (+ 1.5)	+ 1.3 % (p<.05)			
	Female	5.1 (n/a)	4.8 (- 0.3)	5.0 (+ 0.2)	6.1 (+ 1.1)	6.4 (+ 0.3)	7.0 (+ 0.7)	+ 2.6 % (p<.01)			
AK	Both	21.0 (n/a)	24.8 (+ 3.8)	24.2 (- 0.6)	26.0 (+ 1.7)	25.4 (- 0.5)	28.8 (+ 3.4)	+ 1.7 % (p<.05)	2	+ 7.8 ( 4)	+ 37.4 % (13)
	Male	33.2 (n/a)	38.1 (+ 4.9)	38.9 (+ 0.8)	40.1 (+ 1.2)	40.1 (- 0.1)	42.9 (+ 2.8)	+ 1.4 % (p<.01)			
	Female	8.6 (n/a)	11.4 (+ 2.9)	9.8 (- 1.6)	11.1 (+ 1.2)	9.9 (- 1.2)	13.2 (+ 3.4)	+ 1.7 % n/s			
AZ	Both	17.8 (n/a)	18.5 (+ 0.7)	19.1 (+ 0.5)	19.1 (- 0.0)	20.4 (+ 1.3)	20.9 (+ 0.5)	+ 1.0 % (p<.01)	15	+ 3.1 (32)	+ 17.3 % (42)
	Male	29.3 (n/a)	30.2 (+ 1.0)	30.6 (+ 0.4)	30.2 (- 0.5)	32.0 (+ 1.9)	32.4 (+ 0.4)	+ 0.6 % (p<.05)			
	Female	7.1 (n/a)	7.5 (+ 0.4)	8.2 (+ 0.7)	8.6 (+ 0.5)	9.2 (+ 0.6)	9.9 (+ 0.6)	+ 2.2 % (p<.01)			
AR	Both	15.5 (n/a)	15.8 (+ 0.3)	16.2 (+ 0.5)	17.6 (+ 1.4)	19.2 (+ 1.6)	21.2 (+ 2.0)	+ 2.2 % (p<.01)	12	+ 5.7 (14)	+ 36.8 % (15)
	Male	26.7 (n/a)	26.7 (+ 0.0)	27.2 (+ 0.5)	28.2 (+ 1.0)	31.7 (+ 3.5)	33.5 (+ 1.9)	+ 1.6 % (p<.05)			
	Female	5.6 (n/a)	5.9 (+ 0.3)	6.2 (+ 0.4)	7.9 (+ 1.7)	7.5 (- 0.4)	9.6 (+ 2.1)	+ 3.6 % (p<.01)			
CA	Both	10.6 (n/a)	11.3 (+ 0.7)	11.0 (- 0.3)	12.0 (+ 1.0)	11.8 (- 0.1)	12.1 (+ 0.3)	+ 0.9 % (p<.05)	45	+ 1.6 (46)	+ 14.8 % (46)
	Male	17.9 (n/a)	18.4 (+ 0.5)	17.7 (- 0.7)	19.1 (+ 1.4)	18.9 (- 0.2)	19.2 (+ 0.3)	+ 0.5 % n/s			
	Female	4.1 (n/a)	5.0 (+ 0.9)	4.9 (- 0.1)	5.4 (+ 0.5)	5.3 (- 0.1)	5.6 (+ 0.3)	+ 1.7 % (p<.05)			
CO	Both	17.3 (n/a)	19.2 (+ 1.9)	19.0 (- 0.2)	20.0 (+ 1.0)	21.6 (+ 1.5)	23.2 (+ 1.6)	+ 1.8 % (p<.01)	8	+ 5.9 (12)	+ 34.1 % (22)
	Male	28.6 (n/a)	30.9 (+ 2.3)	30.5 (- 0.4)	31.5 (+ 1.0)	33.4 (+ 1.9)	36.3 (+ 2.9)	+ 1.4 % (p<.01)			
	Female	7.0 (n/a)	8.2 (+ 1.3)	8.2 (+ 0.0)	9.1 (+ 0.9)	10.1 (+ 1.0)	10.4 (+ 0.3)	+ 2.6 % (p<.01)			
CT	Both	9.6 (n/a)	8.9 (- 0.7)	9.1 (+ 0.2)	10.2 (+ 1.1)	11.0 (+ 0.8)	11.5 (+ 0.5)	+ 1.6 % (p<.05)	46	+ 1.9 (43)	+ 19.2 % (34)
	Male	16.4 (n/a)	14.6 (- 1.8)	15.0 (+ 0.4)	16.6 (+ 1.6)	17.6 (+ 1.0)	17.3 (- 0.3)	+ 0.9 % n/s			
	Female	3.6 (n/a)	3.8 (+ 0.2)	3.7 (- 0.2)	4.4 (+ 0.7)	4.9 (+ 0.5)	6.2 (+ 1.3)	+ 3.5 % (p<.05)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.

### Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, 1999 – 2016

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
DE	Both	13.6 (n/a)	12.2 (- 1.4)	11.9 (- 0.3)	13.6 (+ 1.7)	14.2 (+ 0.6)	14.4 (+ 0.2)	+ 0.9 % n/s	42	+ 0.8 (50)	+ 5.9 % (50)
	Male	23.0 (n/a)	20.3 (- 2.7)	19.9 (- 0.4)	23.1 (+ 3.2)	22.7 (- 0.4)	23.5 (+ 0.8)	+ 0.6 % n/s			
	Female	5.3 (n/a)	5.0 (- 0.2)	4.6 (- 0.4)	4.9 (+ 0.3)	6.4 (+ 1.5)	6.2 (- 0.2)	+ 1.6 % n/s			
DC	Both	5.9 (n/a)	6.4 (+ 0.5)	6.4 (- 0.0)	7.3 (+ 0.8)	6.6 (- 0.7)	6.9 (+ 0.3)	+ 0.9 % n/s	51	+ 1.0 (48)	+ 16.1 % (45)
	Male	10.7 (n/a)	11.1 (+ 0.4)	10.3 (- 0.8)	12.7 (+ 2.4)	10.0 (- 2.6)	11.7 (+ 1.7)	+ 0.3 % n/s			
	Female	1.7 (n/a) ††	2.3 (+ 0.6) ††	3.3 (+ 1.0)	2.6 (- 0.7)	3.6 (+ 1.0)	2.8 (- 0.8)	+ 3.5 % n/s			
FL	Both	14.8 (n/a)	15.2 (+ 0.4)	14.9 (- 0.3)	16.3 (+ 1.4)	16.3 (- 0.0)	16.4 (+ 0.1)	+ 0.8 % (p<.05)	29	+ 1.6 (45)	+ 10.6 % (48)
	Male	24.3 (n/a)	24.4 (+ 0.1)	23.6 (- 0.8)	26.2 (+ 2.6)	25.6 (- 0.6)	25.6 (- 0.1)	+ 0.5 % n/s			
	Female	6.3 (n/a)	6.8 (+ 0.5)	6.8 (+ 0.0)	7.1 (+ 0.3)	7.6 (+ 0.5)	7.8 (+ 0.3)	+ 1.4 % (p<.01)			
GA	Both	12.9 (n/a)	13.2 (+ 0.3)	12.3 (- 0.9)	13.2 (+ 0.9)	13.7 (+ 0.5)	15.0 (+ 1.3)	+ 0.9 % n/s	39	+ 2.1 (40)	+ 16.2 % (44)
	Male	22.1 (n/a)	23.1 (+ 1.0)	21.3 (- 1.8)	21.9 (+ 0.6)	22.6 (+ 0.7)	24.4 (+ 1.7)	+ 0.5 % n/s			
	Female	5.0 (n/a)	4.8 (- 0.2)	4.6 (- 0.2)	5.5 (+ 0.9)	5.8 (+ 0.3)	6.6 (+ 0.8)	+ 2.1 % (p<.05)			
HI	Both	12.9 (n/a)	11.1 (- 1.8)	10.3 (- 0.7)	14.5 (+ 4.1)	14.4 (- 0.1)	15.2 (+ 0.8)	+ 2.0 % n/s	35	+ 2.4 (35)	+ 18.3 % (38)
	Male	20.4 (n/a)	17.2 (- 3.1)	15.3 (- 1.9)	21.9 (+ 6.7)	22.5 (+ 0.5)	24.3 (+ 1.8)	+ 2.1 % n/s			
	Female	5.4 (n/a)	5.0 (- 0.4)	5.5 (+ 0.5)	7.1 (+ 1.5)	6.2 (- 0.9)	5.9 (- 0.3)	+ 1.2 % n/s			
ID	Both	17.3 (n/a)	19.2 (+ 2.0)	18.3 (- 0.9)	21.6 (+ 3.3)	21.9 (+ 0.3)	24.7 (+ 2.8)	+ 2.3 % (p<.01)	6	+ 7.5 ( 6)	+ 43.2 % ( 7)
	Male	28.4 (n/a)	33.1 (+ 4.7)	31.1 (- 2.0)	34.9 (+ 3.8)	34.7 (- 0.2)	38.0 (+ 3.3)	+ 1.6 % (p<.05)			
	Female	7.2 (n/a)	6.1 (- 1.1)	6.1 (+ 0.0)	9.0 (+ 2.9)	9.5 (+ 0.5)	11.8 (+ 2.3)	+ 4.4 % (p<.05)			
IL	Both	9.9 (n/a)	9.8 (- 0.1)	9.7 (- 0.1)	10.6 (+ 0.8)	11.2 (+ 0.6)	12.2 (+ 1.0)	+ 1.5 % (p<.05)	44	+ 2.3 (38)	+ 22.8 % (32)
	Male	17.1 (n/a)	16.7 (- 0.4)	16.2 (- 0.4)	17.6 (+ 1.4)	18.5 (+ 0.9)	19.8 (+ 1.3)	+ 1.1 % (p<.05)			
	Female	3.7 (n/a)	3.6 (- 0.0)	3.8 (+ 0.2)	4.2 (+ 0.4)	4.5 (+ 0.4)	5.2 (+ 0.6)	+ 2.4 % (p<.01)			
IN	Both	13.0 (n/a)	13.7 (+ 0.7)	14.4 (+ 0.7)	14.9 (+ 0.5)	16.4 (+ 1.4)	17.1 (+ 0.7)	+ 1.9 % (p<.01)	26	+ 4.1 (23)	+ 31.9 % (25)
	Male	22.4 (n/a)	23.2 (+ 0.8)	24.4 (+ 1.2)	24.7 (+ 0.4)	26.7 (+ 2.0)	28.3 (+ 1.6)	+ 1.5 % (p<.01)			
	Female	4.6 (n/a)	5.0 (+ 0.4)	5.3 (+ 0.2)	5.9 (+ 0.6)	6.8 (+ 0.9)	6.6 (- 0.2)	+ 2.7 % (p<.01)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.



### Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, 1999 – 2016

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
IA	Both	11.8 (n/a)	13.2 (+ 1.4)	12.8 (- 0.4)	14.2 (+ 1.4)	15.9 (+ 1.7)	16.0 (+ 0.1)	+ 2.1 % (p<.01)	31	+ 4.3 (20)	+ 36.2 % (18)
	Male	20.6 (n/a)	22.1 (+ 1.5)	20.8 (- 1.4)	23.3 (+ 2.5)	26.0 (+ 2.7)	25.7 (- 0.3)	+ 1.6 % (p<.05)			
	Female	3.7 (n/a)	4.7 (+ 1.0)	5.3 (+ 0.6)	5.5 (+ 0.2)	6.1 (+ 0.6)	6.7 (+ 0.6)	+ 3.8 % (p<.01)			
KS	Both	13.3 (n/a)	15.1 (+ 1.8)	15.8 (+ 0.7)	15.3 (- 0.5)	17.7 (+ 2.4)	19.4 (+ 1.6)	+ 2.2 % (p<.01)	19	+ 6.0 (11)	+ 45.0 % ( 5)
	Male	22.7 (n/a)	25.0 (+ 2.3)	26.5 (+ 1.5)	25.6 (- 0.9)	29.1 (+ 3.5)	30.7 (+ 1.6)	+ 1.9 % (p<.01)			
	Female	4.6 (n/a)	6.0 (+ 1.4)	5.7 (- 0.3)	5.4 (- 0.3)	6.8 (+ 1.4)	8.4 (+ 1.6)	+ 3.2 % (p<.05)			
KY	Both	14.1 (n/a)	15.4 (+ 1.3)	16.7 (+ 1.3)	16.2 (- 0.5)	18.2 (+ 2.0)	19.3 (+ 1.1)	+ 1.9 % (p<.01)	20	+ 5.2 (16)	+ 36.6 % (16)
	Male	25.0 (n/a)	26.8 (+ 1.9)	28.3 (+ 1.4)	27.2 (- 1.0)	30.1 (+ 2.9)	31.7 (+ 1.6)	+ 1.4 % (p<.01)			
	Female	4.8 (n/a)	5.2 (+ 0.4)	6.1 (+ 0.8)	6.1 (+ 0.1)	7.1 (+ 0.9)	7.7 (+ 0.6)	+ 3.2 % (p<.01)			
LA	Both	13.1 (n/a)	12.9 (- 0.2)	13.4 (+ 0.4)	13.6 (+ 0.3)	14.4 (+ 0.8)	17.0 (+ 2.5)	+ 1.6 % (p<.05)	27	+ 3.8 (27)	+ 29.3 % (26)
	Male	22.9 (n/a)	22.3 (- 0.6)	22.4 (+ 0.1)	23.3 (+ 0.8)	23.7 (+ 0.5)	27.3 (+ 3.6)	+ 1.1 % n/s			
	Female	4.8 (n/a)	4.7 (- 0.1)	5.2 (+ 0.5)	4.9 (- 0.2)	6.1 (+ 1.2)	7.5 (+ 1.4)	+ 2.8 % (p<.05)			
ME	Both	14.5 (n/a)	13.6 (- 0.9)	14.4 (+ 0.8)	15.4 (+ 1.0)	18.9 (+ 3.5)	18.5 (- 0.4)	+ 2.2 % (p<.05)	21	+ 4.0 (25)	+ 27.4 % (29)
	Male	25.0 (n/a)	22.9 (- 2.1)	24.6 (+ 1.7)	25.7 (+ 1.1)	31.1 (+ 5.4)	29.8 (- 1.3)	+ 1.8 % (p<.05)			
	Female	5.3 (n/a)	5.3 (- 0.0)	5.2 (- 0.1)	6.0 (+ 0.7)	7.6 (+ 1.6)	7.9 (+ 0.3)	+ 3.1 % (p<.05)			
MD	Both	10.0 (n/a)	10.3 (+ 0.3)	10.1 (- 0.2)	10.2 (+ 0.1)	10.7 (+ 0.5)	10.8 (+ 0.1)	+ 0.5 % (p<.05)	47 §§	+ 0.8 (49 §§)	+ 8.5 % (49 §§)
	Male	17.6 (n/a)	17.8 (+ 0.1)	17.3 (- 0.5)	17.7 (+ 0.4)	18.2 (+ 0.5)	18.0 (- 0.2)	+ 0.2 % n/s			
	Female	3.5 (n/a)	3.8 (+ 0.4)	3.9 (+ 0.0)	3.7 (- 0.2)	4.1 (+ 0.4)	4.5 (+ 0.4)	+ 1.3 % (p<.05)			
MA	Both	7.4 (n/a)	7.6 (+ 0.2)	8.4 (+ 0.8)	9.3 (+ 1.0)	9.8 (+ 0.4)	10.0 (+ 0.3)	+ 2.3 % (p<.01)	48	+ 2.6 (34 ¶¶)	+ 35.3 % (20 ¶¶)
	Male	12.1 (n/a)	12.8 (+ 0.7)	13.3 (+ 0.5)	15.4 (+ 2.1)	15.2 (- 0.2)	16.0 (+ 0.8)	+ 2.0 % (p<.01)			
	Female	3.3 (n/a)	2.9 (- 0.4)	4.0 (+ 1.0)	3.8 (- 0.1)	4.8 (+ 1.0)	4.6 (- 0.2)	+ 3.0 % (p<.05)			
MI	Both	11.8 (n/a)	12.5 (+ 0.7)	12.9 (+ 0.4)	13.9 (+ 1.0)	14.5 (+ 0.7)	15.6 (+ 1.1)	+ 1.9 % (p<.01)	33	+ 3.9 (26)	+ 32.9 % (24)
	Male	20.0 (n/a)	20.9 (+ 0.9)	21.6 (+ 0.7)	22.8 (+ 1.3)	23.9 (+ 1.0)	25.0 (+ 1.2)	+ 1.5 % (p<.01)			
	Female	4.4 (n/a)	4.8 (+ 0.4)	5.0 (+ 0.2)	5.6 (+ 0.6)	5.9 (+ 0.3)	6.7 (+ 0.9)	+ 2.8 % (p<.01)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.

### Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, 1999 – 2016

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
MN	Both	10.7 (n/a)	11.5 (+ 0.9)	12.4 (+ 0.8)	12.9 (+ 0.5)	14.2 (+ 1.3)	15.0 (+ 0.9)	+ 2.3 % (p<.01)	38	+ 4.3 (19)	+ 40.6 % ( 8)
	Male	18.3 (n/a)	19.3 (+ 1.1)	20.4 (+ 1.0)	20.9 (+ 0.6)	22.9 (+ 1.9)	23.3 (+ 0.4)	+ 1.7 % (p<.01)			
	Female	3.6 (n/a)	4.2 (+ 0.6)	4.8 (+ 0.6)	5.1 (+ 0.4)	5.8 (+ 0.6)	6.9 (+ 1.2)	+ 4.2 % (p<.01)			
MS	Both	12.9 (n/a)	14.1 (+ 1.2)	14.7 (+ 0.6)	15.5 (+ 0.8)	15.6 (+ 0.1)	15.2 (- 0.3)	+ 1.1 % (p<.05)	36	+ 2.3 (36)	+ 17.8 % (40)
	Male	22.9 (n/a)	24.6 (+ 1.7)	25.1 (+ 0.6)	26.8 (+ 1.7)	25.9 (- 0.9)	25.3 (- 0.6)	+ 0.7 % n/s			
	Female	4.3 (n/a)	5.0 (+ 0.7)	5.5 (+ 0.5)	5.5 (- 0.0)	6.4 (+ 0.9)	6.2 (- 0.2)	+ 2.4 % (p<.01)			
MO	Both	14.7 (n/a)	14.1 (- 0.6)	15.4 (+ 1.3)	16.0 (+ 0.7)	17.8 (+ 1.7)	20.0 (+ 2.3)	+ 2.2 % (p<.01)	16	+ 5.3 (15)	+ 36.4 % (17)
	Male	25.3 (n/a)	23.7 (- 1.6)	25.6 (+ 1.9)	26.6 (+ 1.0)	28.9 (+ 2.3)	32.2 (+ 3.3)	+ 1.8 % (p<.05)			
	Female	5.4 (n/a)	5.4 (+ 0.1)	6.1 (+ 0.7)	6.3 (+ 0.2)	7.4 (+ 1.1)	8.6 (+ 1.2)	+ 3.2 % (p<.01)			
MT	Both	21.1 (n/a)	22.6 (+ 1.4)	23.6 (+ 1.0)	24.7 (+ 1.1)	26.7 (+ 2.0)	29.2 (+ 2.5)	+ 2.1 % (p<.01)	1	+ 8.0 ( 2)	+ 38.0 % (11)
	Male	36.9 (n/a)	37.3 (+ 0.4)	39.8 (+ 2.5)	39.7 (- 0.1)	41.0 (+ 1.4)	45.5 (+ 4.4)	+ 1.3 % (p<.01)			
	Female	6.7 (n/a)	8.4 (+ 1.8)	8.4 (- 0.1)	10.0 (+ 1.6)	12.6 (+ 2.6)	13.1 (+ 0.5)	+ 4.6 % (p<.01)			
NE	Both	12.7 (n/a)	12.2 (- 0.5)	12.6 (+ 0.4)	11.7 (- 0.8)	13.5 (+ 1.8)	14.8 (+ 1.3)	+ 1.0 % n/s	40	+ 2.1 (42)	+ 16.2 % (43)
	Male	22.2 (n/a)	20.7 (- 1.5)	20.3 (- 0.4)	19.8 (- 0.5)	22.0 (+ 2.2)	23.9 (+ 1.9)	+ 0.6 % n/s			
	Female	3.8 (n/a)	4.2 (+ 0.4)	5.1 (+ 0.9)	4.0 (- 1.1)	5.5 (+ 1.4)	5.8 (+ 0.3)	+ 2.6 % n/s			
NV	Both	23.3 (n/a)	22.6 (- 0.6)	22.1 (- 0.5)	22.6 (+ 0.5)	21.4 (- 1.2)	23.1 (+ 1.6)	- 0.2 % n/s	9	- 0.2 (51)	- 1.0 % (51)
	Male	38.3 (n/a)	36.7 (- 1.7)	35.1 (- 1.6)	35.6 (+ 0.5)	32.5 (- 3.0)	35.4 (+ 2.8)	- 0.7 % n/s			
	Female	8.9 (n/a)	9.5 (+ 0.5)	9.6 (+ 0.1)	10.0 (+ 0.4)	10.6 (+ 0.6)	11.2 (+ 0.6)	+ 1.5 % (p<.01)			
NH	Both	13.5 (n/a)	12.5 (- 1.0)	13.3 (+ 0.8)	15.2 (+ 1.9)	15.8 (+ 0.6)	20.0 (+ 4.2)	+ 2.7 % (p<.05)	17	+ 6.5 ( 8)	+ 48.3 % ( 3)
	Male	22.5 (n/a)	21.1 (- 1.4)	21.7 (+ 0.6)	24.8 (+ 3.1)	25.4 (+ 0.6)	30.6 (+ 5.2)	+ 2.2 % (p<.05)			
	Female	5.3 (n/a)	4.8 (- 0.5)	5.9 (+ 1.0)	6.2 (+ 0.4)	6.6 (+ 0.4)	9.8 (+ 3.2)	+ 3.9 % (p<.05)			
NJ	Both	7.8 (n/a)	7.7 (- 0.1)	7.5 (- 0.2)	8.0 (+ 0.5)	8.9 (+ 0.9)	9.2 (+ 0.4)	+ 1.3 % (p<.05)	50	+ 1.5 (47)	+ 19.2 % (35)
	Male	13.0 (n/a)	13.1 (+ 0.0)	12.6 (- 0.5)	13.7 (+ 1.1)	14.5 (+ 0.8)	14.6 (+ 0.1)	+ 0.9 % (p<.05)			
	Female	3.2 (n/a)	2.9 (- 0.3)	3.0 (+ 0.0)	2.9 (- 0.1)	3.8 (+ 0.9)	4.4 (+ 0.6)	+ 2.3 % n/s			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.



### Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, 1999 – 2016

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
NM	Both	22.0 (n/a)	22.0 (- 0.1)	21.8 (- 0.2)	23.0 (+ 1.2)	24.1 (+ 1.1)	26.0 (+ 1.9)	+ 1.1 % (p<.05)	4	+ 4.0 (24)	+ 18.3 % (39)
	Male	36.8 (n/a)	37.7 (+ 0.9)	36.4 (- 1.2)	35.8 (- 0.6)	37.1 (+ 1.3)	40.7 (+ 3.6)	+ 0.4 % n/s			
	Female	8.5 (n/a)	7.4 (- 1.1)	8.2 (+ 0.7)	10.7 (+ 2.6)	11.7 (+ 0.9)	12.0 (+ 0.3)	+ 3.3 % (p<.05)			
NY	Both	7.2 (n/a)	7.1 (- 0.1)	7.7 (+ 0.6)	8.4 (+ 0.8)	9.5 (+ 1.1)	9.3 (- 0.1)	+ 2.1 % (p<.01)	49	+ 2.1 (41)	+ 28.8 % (27)
	Male	12.5 (n/a)	12.2 (- 0.3)	12.9 (+ 0.7)	13.9 (+ 1.0)	15.4 (+ 1.4)	14.5 (- 0.9)	+ 1.4 % (p<.05)			
	Female	2.7 (n/a)	2.6 (- 0.1)	3.0 (+ 0.3)	3.5 (+ 0.5)	4.2 (+ 0.7)	4.6 (+ 0.5)	+ 4.2 % (p<.01)			
NC	Both	13.6 (n/a)	13.5 (- 0.1)	13.7 (+ 0.1)	14.2 (+ 0.5)	14.5 (+ 0.4)	15.3 (+ 0.8)	+ 0.8 % (p<.01)	34	+ 1.7 (44)	+ 12.7 % (47)
	Male	22.7 (n/a)	22.7 (+ 0.0)	22.2 (- 0.6)	23.3 (+ 1.1)	23.3 (+ 0.0)	23.9 (+ 0.6)	+ 0.4 % n/s			
	Female	5.6 (n/a)	5.5 (- 0.2)	6.2 (+ 0.8)	6.0 (- 0.2)	6.7 (+ 0.7)	7.6 (+ 0.9)	+ 2.0 % (p<.05)			
ND	Both	13.3 (n/a)	14.6 (+ 1.3)	16.0 (+ 1.4)	16.6 (+ 0.6)	18.4 (+ 1.9)	20.9 (+ 2.5)	+ 2.9 % (p<.01)	14	+ 7.6 ( 5)	+ 57.6 % ( 1)
	Male	21.4 (n/a)	24.6 (+ 3.2)	28.0 (+ 3.4)	27.1 (- 0.9)	29.6 (+ 2.5)	32.7 (+ 3.0)	+ 2.5 % (p<.01)			
	Female	5.6 (n/a)	4.5 (- 1.0)	3.7 (- 0.8)	5.7 (+ 2.0)	6.7 (+ 1.0)	8.5 (+ 1.8)	+ 3.9 % n/s			
OH	Both	11.6 (n/a)	12.3 (+ 0.8)	13.1 (+ 0.8)	13.4 (+ 0.2)	14.8 (+ 1.4)	15.8 (+ 1.0)	+ 2.0 % (p<.01)	32	+ 4.2 (21)	+ 36.0 % (19)
	Male	20.4 (n/a)	20.9 (+ 0.5)	22.2 (+ 1.3)	22.1 (- 0.1)	24.2 (+ 2.1)	25.5 (+ 1.3)	+ 1.5 % (p<.01)			
	Female	4.0 (n/a)	4.7 (+ 0.7)	4.9 (+ 0.1)	5.3 (+ 0.5)	6.2 (+ 0.9)	6.7 (+ 0.6)	+ 3.4 % (p<.01)			
OK	Both	17.0 (n/a)	16.5 (- 0.6)	17.2 (+ 0.8)	18.4 (+ 1.1)	20.7 (+ 2.3)	23.5 (+ 2.8)	+ 2.3 % (p<.05)	7	+ 6.4 (10)	+ 37.6 % (12)
	Male	28.5 (n/a)	27.3 (- 1.2)	27.8 (+ 0.5)	30.3 (+ 2.5)	33.4 (+ 3.1)	37.3 (+ 3.8)	+ 2.0 % (p<.05)			
	Female	6.6 (n/a)	6.4 (- 0.2)	7.5 (+ 1.1)	7.0 (- 0.5)	8.5 (+ 1.6)	10.3 (+ 1.8)	+ 2.9 % (p<.05)			
OR	Both	16.4 (n/a)	17.7 (+ 1.3)	17.7 (- 0.0)	18.6 (+ 0.9)	19.8 (+ 1.2)	21.1 (+ 1.3)	+ 1.6 % (p<.01)	13	+ 4.6 (18)	+ 28.2 % (28)
	Male	27.4 (n/a)	29.5 (+ 2.1)	28.5 (- 0.9)	29.5 (+ 1.0)	31.4 (+ 1.8)	33.0 (+ 1.6)	+ 1.1 % (p<.01)			
	Female	6.5 (n/a)	7.1 (+ 0.6)	7.7 (+ 0.6)	8.4 (+ 0.7)	8.8 (+ 0.4)	9.8 (+ 0.9)	+ 2.7 % (p<.01)			
PA	Both	12.1 (n/a)	12.5 (+ 0.4)	12.8 (+ 0.3)	13.9 (+ 1.1)	15.0 (+ 1.1)	16.3 (+ 1.2)	+ 2.0 % (p<.01)	30	+ 4.1 (22)	+ 34.3 % (21)
	Male	21.0 (n/a)	21.3 (+ 0.3)	21.9 (+ 0.6)	23.1 (+ 1.2)	24.7 (+ 1.7)	26.1 (+ 1.3)	+ 1.5 % (p<.01)			
	Female	4.2 (n/a)	4.6 (+ 0.3)	4.6 (+ 0.0)	5.4 (+ 0.9)	6.0 (+ 0.6)	7.1 (+ 1.1)	+ 3.5 % (p<.01)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.

# Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, 1999 – 2016

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
RI	Both	9.4 (n/a)	9.0 (- 0.3)	9.0 (- 0.0)	12.8 (+ 3.8)	11.9 (- 0.9)	12.6 (+ 0.7)	+ 2.6 % (p<.05)	43	+ 3.2 (30 ¶¶)	+ 34.1 % (23 ¶¶)
	Male	15.4 (n/a)	15.2 (- 0.2)	14.8 (- 0.3)	21.2 (+ 6.4)	19.2 (- 2.0)	19.6 (+ 0.4)	+ 2.2 % n/s			
	Female	4.0 (n/a)	3.3 (- 0.7)	3.8 (+ 0.4)	5.1 (+ 1.3)	5.1 (+ 0.0)	6.1 (+ 1.0)	+ 3.7 % (p<.05)			
SC	Both	12.8 (n/a)	13.0 (+ 0.2)	13.7 (+ 0.7)	14.9 (+ 1.2)	16.0 (+ 1.1)	17.7 (+ 1.7)	+ 2.3 % (p<.01)	23	+ 4.9 (17)	+ 38.3 % (10)
	Male	21.3 (n/a)	22.5 (+ 1.2)	22.3 (- 0.1)	24.6 (+ 2.2)	26.1 (+ 1.5)	28.0 (+ 1.9)	+ 1.8 % (p<.01)			
	Female	5.4 (n/a)	4.7 (- 0.7)	6.0 (+ 1.3)	6.2 (+ 0.2)	7.0 (+ 0.8)	8.4 (+ 1.4)	+ 3.4 % (p<.05)			
SD	Both	15.7 (n/a)	15.8 (+ 0.1)	17.1 (+ 1.3)	19.3 (+ 2.2)	19.7 (+ 0.4)	22.6 (+ 2.9)	+ 2.5 % (p<.01)	10	+ 7.0 ( 7)	+ 44.5 % ( 6)
	Male	27.6 (n/a)	26.3 (- 1.3)	27.9 (+ 1.6)	30.1 (+ 2.2)	32.0 (+ 1.9)	33.6 (+ 1.6)	+ 1.6 % (p<.01)			
	Female	4.2 (n/a)	5.8 (+ 1.6)	6.4 (+ 0.6)	8.3 (+ 2.0)	7.3 (- 1.0)	11.3 (+ 4.0)	+ 5.8 % (p<.01)			
TN	Both	14.6 (n/a)	15.2 (+ 0.6)	16.1 (+ 0.8)	17.2 (+ 1.1)	17.2 (+ 0.0)	18.2 (+ 1.0)	+ 1.4 % (p<.01)	22	+ 3.5 (28)	+ 24.2 % (31)
	Male	25.1 (n/a)	25.4 (+ 0.3)	26.8 (+ 1.3)	28.0 (+ 1.2)	28.6 (+ 0.6)	29.8 (+ 1.2)	+ 1.2 % (p<.01)			
	Female	5.4 (n/a)	6.3 (+ 0.9)	6.7 (+ 0.4)	7.5 (+ 0.8)	6.9 (- 0.6)	7.6 (+ 0.7)	+ 1.9 % (p<.05)			
TX	Both	12.2 (n/a)	12.7 (+ 0.6)	12.3 (- 0.4)	13.2 (+ 0.9)	13.6 (+ 0.3)	14.5 (+ 0.9)	+ 1.1 % (p<.01)	41	+ 2.3 (37)	+ 18.9 % (36)
	Male	20.4 (n/a)	20.9 (+ 0.5)	20.4 (- 0.6)	22.0 (+ 1.6)	22.2 (+ 0.3)	23.1 (+ 0.9)	+ 0.9 % (p<.05)			
	Female	4.8 (n/a)	5.4 (+ 0.6)	5.0 (- 0.4)	5.2 (+ 0.2)	5.6 (+ 0.4)	6.4 (+ 0.8)	+ 1.6 % (p<.05)			
UT	Both	17.2 (n/a)	19.0 (+ 1.8)	18.2 (- 0.7)	20.2 (+ 2.0)	24.0 (+ 3.8)	25.2 (+ 1.2)	+ 2.7 % (p<.01)	5	+ 8.0 ( 3 ¶¶)	+ 46.5 % ( 4 ¶¶)
	Male	28.2 (n/a)	31.1 (+ 2.9)	29.4 (- 1.7)	32.1 (+ 2.7)	37.8 (+ 5.7)	38.0 (+ 0.2)	+ 2.1 % (p<.05)			
	Female	6.8 (n/a)	7.4 (+ 0.6)	7.5 (+ 0.1)	8.5 (+ 1.0)	10.6 (+ 2.1)	12.6 (+ 2.0)	+ 4.4 % (p<.01)			
VT	Both	13.2 (n/a)	16.2 (+ 3.0)	14.9 (- 1.3)	16.6 (+ 1.7)	18.7 (+ 2.1)	19.7 (+ 1.0)	+ 2.4 % (p<.01)	18	+ 6.4 ( 9)	+ 48.6 % ( 2)
	Male	23.6 (n/a)	28.3 (+ 4.6)	24.3 (- 4.0)	27.3 (+ 3.0)	31.0 (+ 3.7)	32.5 (+ 1.5)	+ 1.9 % (p<.05)			
	Female	4.3 (n/a)	5.2 (+ 0.9)	6.4 (+ 1.3)	6.6 (+ 0.2)	7.3 (+ 0.7)	7.6 (+ 0.3)	+ 3.8 % (p<.01)			
VA	Both	12.8 (n/a)	12.7 (- 0.1)	12.9 (+ 0.3)	13.6 (+ 0.7)	14.6 (+ 0.9)	15.0 (+ 0.5)	+ 1.2 % (p<.01)	37	+ 2.2 (39)	+ 17.4 % (41)
	Male	21.6 (n/a)	21.3 (- 0.2)	21.0 (- 0.4)	22.5 (+ 1.5)	23.6 (+ 1.2)	23.9 (+ 0.2)	+ 0.9 % (p<.05)			
	Female	5.3 (n/a)	5.2 (- 0.1)	5.9 (+ 0.7)	5.6 (- 0.3)	6.4 (+ 0.8)	6.9 (+ 0.5)	+ 1.8 % (p<.05)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.



### Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, 1999 – 2016

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
WA	Both	14.8 (n/a)	15.4 (+ 0.5)	14.8 (- 0.6)	15.7 (+ 0.9)	16.6 (+ 0.9)	17.6 (+ 1.0)	+ 1.1 % (p<.05)	24	+ 2.8 (33)	+ 18.8 % (37)
	Male	24.7 (n/a)	25.2 (+ 0.5)	24.1 (- 1.1)	25.1 (+ 1.0)	26.0 (+ 0.9)	27.1 (+ 1.1)	+ 0.6 % n/s			
	Female	5.9 (n/a)	6.4 (+ 0.6)	6.2 (- 0.2)	6.9 (+ 0.7)	7.7 (+ 0.8)	8.5 (+ 0.8)	+ 2.5 % (p<.01)			
WV	Both	15.6 (n/a)	17.2 (+ 1.6)	16.7 (- 0.5)	16.0 (- 0.7)	19.2 (+ 3.2)	21.4 (+ 2.2)	+ 1.8 % n/s	11	+ 5.8 (13)	+ 37.1 % (14)
	Male	27.2 (n/a)	30.1 (+ 2.9)	28.6 (- 1.5)	27.6 (- 1.0)	31.5 (+ 3.9)	33.5 (+ 2.0)	+ 1.1 % n/s			
	Female	5.3 (n/a)	5.5 (+ 0.1)	5.8 (+ 0.3)	5.3 (- 0.5)	7.6 (+ 2.3)	9.8 (+ 2.2)	+ 3.7 % n/s			
WI	Both	13.1 (n/a)	13.5 (+ 0.4)	14.0 (+ 0.5)	15.0 (+ 1.0)	15.3 (+ 0.3)	16.5 (+ 1.2)	+ 1.5 % (p<.01)	28	+ 3.4 (29)	+ 25.8 % (30)
	Male	21.7 (n/a)	22.2 (+ 0.5)	22.7 (+ 0.5)	24.0 (+ 1.2)	24.4 (+ 0.4)	25.7 (+ 1.3)	+ 1.1 % (p<.01)			
	Female	5.1 (n/a)	5.3 (+ 0.2)	5.6 (+ 0.4)	6.4 (+ 0.7)	6.5 (+ 0.1)	7.5 (+ 1.0)	+ 2.5 % (p<.01)			
WY	Both	20.7 (n/a)	23.4 (+ 2.7)	22.5 (- 0.9)	25.4 (+ 2.8)	28.9 (+ 3.5)	28.8 (- 0.1)	+ 2.3 % (p<.01)	3	+ 8.1 ( 1)	+ 39.0 % ( 9)
	Male	34.8 (n/a)	39.3 (+ 4.5)	36.3 (- 3.0)	41.5 (+ 5.2)	47.1 (+ 5.6)	44.6 (- 2.4)	+ 1.8 % (p<.05)			
	Female	7.7 (n/a)	8.2 (+ 0.6)	9.2 (+ 0.9)	9.4 (+ 0.2)	10.7 (+ 1.4)	12.6 (+ 1.9)	+ 3.2 % (p<.01)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.

**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
U.S.	Both	12.3 (n/a)	12.7 (+ 0.4)	12.9 (+ 0.2)	13.8 (+ 0.9)	14.5 (+ 0.8)	15.4 (+ 0.9)	+ 1.5 % (p<.01)	n/a	+ 3.1 (n/a)	+ 25.4 % (n/a)
	Male	20.9 (n/a)	21.2 (+ 0.4)	21.3 (+ 0.0)	22.5 (+1.3)	23.5 (+ 1.0)	24.5 (+ 1.0)	+ 1.1 % (p<.01)			
	Female	4.7 (n/a)	5.0 (+ 0.3)	5.3 (+ 0.2)	5.7 (+ 0.4)	6.2 (+ 0.5)	6.9 (+ 0.7)	+ 2.6 % (p<.01)			
AL	Both	14.3 (n/a)	13.4 (- 0.9)	14.1 (+ 0.6)	15.6 (+ 1.6)	16.4 (+ 0.7)	17.5 (+ 1.1)	+ 1.6 % (p<.05)	25	+ 3.1 (31)	+ 21.9 % (33)
	Male	25.1 (n/a)	23.4 (- 1.7)	24.4 (+ 1.0)	26.4 (+ 2.0)	27.6 (+ 1.1)	29.1 (+ 1.5)	+ 1.3 % (p<.05)			
	Female	5.1 (n/a)	4.8 (- 0.3)	5.0 (+ 0.2)	6.1 (+ 1.1)	6.4 (+ 0.3)	7.0 (+ 0.7)	+ 2.6 % (p<.01)			
AK	Both	21.0 (n/a)	24.8 (+ 3.8)	24.2 (- 0.6)	26.0 (+ 1.7)	25.4 (- 0.5)	28.8 (+ 3.4)	+ 1.7 % (p<.05)	2	+ 7.8 ( 4)	+ 37.4 % (13)
	Male	33.2 (n/a)	38.1 (+ 4.9)	38.9 (+ 0.8)	40.1 (+ 1.2)	40.1 (- 0.1)	42.9 (+ 2.8)	+ 1.4 % (p<.01)			
	Female	8.6 (n/a)	11.4 (+ 2.9)	9.8 (- 1.6)	11.1 (+ 1.2)	9.9 (- 1.2)	13.2 (+ 3.4)	+ 1.7 % n/s			
AZ	Both	17.8 (n/a)	18.5 (+ 0.7)	19.1 (+ 0.5)	19.1 (- 0.0)	20.4 (+ 1.3)	20.9 (+ 0.5)	+ 1.0 % (p<.01)	15	+ 3.1 (32)	+ 17.3 % (42)
	Male	29.3 (n/a)	30.2 (+ 1.0)	30.6 (+ 0.4)	30.2 (- 0.5)	32.0 (+ 1.9)	32.4 (+ 0.4)	+ 0.6 % (p<.05)			
	Female	7.1 (n/a)	7.5 (+ 0.4)	8.2 (+ 0.7)	8.6 (+ 0.5)	9.2 (+ 0.6)	9.9 (+ 0.6)	+ 2.2 % (p<.01)			
AR	Both	15.5 (n/a)	15.8 (+ 0.3)	16.2 (+ 0.5)	17.6 (+ 1.4)	19.2 (+ 1.6)	21.2 (+ 2.0)	+ 2.2 % (p<.01)	12	+ 5.7 (14)	+ 36.8 % (15)
	Male	26.7 (n/a)	26.7 (+ 0.0)	27.2 (+ 0.5)	28.2 (+ 1.0)	31.7 (+ 3.5)	33.5 (+ 1.9)	+ 1.6 % (p<.05)			
	Female	5.6 (n/a)	5.9 (+ 0.3)	6.2 (+ 0.4)	7.9 (+ 1.7)	7.5 (- 0.4)	9.6 (+ 2.1)	+ 3.6 % (p<.01)			
CA	Both	10.6 (n/a)	11.3 (+ 0.7)	11.0 (- 0.3)	12.0 (+ 1.0)	11.8 (- 0.1)	12.1 (+ 0.3)	+ 0.9 % (p<.05)	45	+ 1.6 (46)	+ 14.8 % (46)
	Male	17.9 (n/a)	18.4 (+ 0.5)	17.7 (- 0.7)	19.1 (+ 1.4)	18.9 (- 0.2)	19.2 (+ 0.3)	+ 0.5 % n/s			
	Female	4.1 (n/a)	5.0 (+ 0.9)	4.9 (- 0.1)	5.4 (+ 0.5)	5.3 (- 0.1)	5.6 (+ 0.3)	+ 1.7 % (p<.05)			
CO	Both	17.3 (n/a)	19.2 (+ 1.9)	19.0 (- 0.2)	20.0 (+ 1.0)	21.6 (+ 1.5)	23.2 (+ 1.6)	+ 1.8 % (p<.01)	8	+ 5.9 (12)	+ 34.1 % (22)
	Male	28.6 (n/a)	30.9 (+ 2.3)	30.5 (- 0.4)	31.5 (+ 1.0)	33.4 (+ 1.9)	36.3 (+ 2.9)	+ 1.4 % (p<.01)			
	Female	7.0 (n/a)	8.2 (+ 1.3)	8.2 (+ 0.0)	9.1 (+ 0.9)	10.1 (+ 1.0)	10.4 (+ 0.3)	+ 2.6 % (p<.01)			
CT	Both	9.6 (n/a)	8.9 (- 0.7)	9.1 (+ 0.2)	10.2 (+ 1.1)	11.0 (+ 0.8)	11.5 (+ 0.5)	+ 1.6 % (p<.05)	46	+ 1.9 (43)	+ 19.2 % (34)
	Male	16.4 (n/a)	14.6 (- 1.8)	15.0 (+ 0.4)	16.6 (+ 1.6)	17.6 (+ 1.0)	17.3 (- 0.3)	+ 0.9 % n/s			
	Female	3.6 (n/a)	3.8 (+ 0.2)	3.7 (- 0.2)	4.4 (+ 0.7)	4.9 (+ 0.5)	6.2 (+ 1.3)	+ 3.5 % (p<.05)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first and last periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.



### Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, 1999 – 2016

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
DE	Both	13.6 (n/a)	12.2 (- 1.4)	11.9 (- 0.3)	13.6 (+ 1.7)	14.2 (+ 0.6)	14.4 (+ 0.2)	+ 0.9 % n/s	42	+ 0.8 (50)	+ 5.9 % (50)
	Male	23.0 (n/a)	20.3 (- 2.7)	19.9 (- 0.4)	23.1 (+ 3.2)	22.7 (- 0.4)	23.5 (+ 0.8)	+ 0.6 % n/s			
	Female	5.3 (n/a)	5.0 (- 0.2)	4.6 (- 0.4)	4.9 (+ 0.3)	6.4 (+ 1.5)	6.2 (- 0.2)	+ 1.6 % n/s			
DC	Both	5.9 (n/a)	6.4 (+ 0.5)	6.4 (- 0.0)	7.3 (+ 0.8)	6.6 (- 0.7)	6.9 (+ 0.3)	+ 0.9 % n/s	51	+ 1.0 (48)	+ 16.1 % (45)
	Male	10.7 (n/a)	11.1 (+ 0.4)	10.3 (- 0.8)	12.7 (+ 2.4)	10.0 (- 2.6)	11.7 (+ 1.7)	+ 0.3 % n/s			
	Female	1.7 (n/a) ††	2.3 (+ 0.6) ††	3.3 (+ 1.0)	2.6 (- 0.7)	3.6 (+ 1.0)	2.8 (- 0.8)	+ 3.5 % n/s			
FL	Both	14.8 (n/a)	15.2 (+ 0.4)	14.9 (- 0.3)	16.3 (+ 1.4)	16.3 (- 0.0)	16.4 (+ 0.1)	+ 0.8 % (p<.05)	29	+ 1.6 (45)	+ 10.6 % (48)
	Male	24.3 (n/a)	24.4 (+ 0.1)	23.6 (- 0.8)	26.2 (+ 2.6)	25.6 (- 0.6)	25.6 (- 0.1)	+ 0.5 % n/s			
	Female	6.3 (n/a)	6.8 (+ 0.5)	6.8 (+ 0.0)	7.1 (+ 0.3)	7.6 (+ 0.5)	7.8 (+ 0.3)	+ 1.4 % (p<.01)			
GA	Both	12.9 (n/a)	13.2 (+ 0.3)	12.3 (- 0.9)	13.2 (+ 0.9)	13.7 (+ 0.5)	15.0 (+ 1.3)	+ 0.9 % n/s	39	+ 2.1 (40)	+ 16.2 % (44)
	Male	22.1 (n/a)	23.1 (+ 1.0)	21.3 (- 1.8)	21.9 (+ 0.6)	22.6 (+ 0.7)	24.4 (+ 1.7)	+ 0.5 % n/s			
	Female	5.0 (n/a)	4.8 (- 0.2)	4.6 (- 0.2)	5.5 (+ 0.9)	5.8 (+ 0.3)	6.6 (+ 0.8)	+ 2.1 % (p<.05)			
HI	Both	12.9 (n/a)	11.1 (- 1.8)	10.3 (- 0.7)	14.5 (+ 4.1)	14.4 (- 0.1)	15.2 (+ 0.8)	+ 2.0 % n/s	35	+ 2.4 (35)	+ 18.3 % (38)
	Male	20.4 (n/a)	17.2 (- 3.1)	15.3 (- 1.9)	21.9 (+ 6.7)	22.5 (+ 0.5)	24.3 (+ 1.8)	+ 2.1 % n/s			
	Female	5.4 (n/a)	5.0 (- 0.4)	5.5 (+ 0.5)	7.1 (+ 1.5)	6.2 (- 0.9)	5.9 (- 0.3)	+ 1.2 % n/s			
ID	Both	17.3 (n/a)	19.2 (+ 2.0)	18.3 (- 0.9)	21.6 (+ 3.3)	21.9 (+ 0.3)	24.7 (+ 2.8)	+ 2.3 % (p<.01)	6	+ 7.5 ( 6)	+ 43.2 % ( 7)
	Male	28.4 (n/a)	33.1 (+ 4.7)	31.1 (- 2.0)	34.9 (+ 3.8)	34.7 (- 0.2)	38.0 (+ 3.3)	+ 1.6 % (p<.05)			
	Female	7.2 (n/a)	6.1 (- 1.1)	6.1 (+ 0.0)	9.0 (+ 2.9)	9.5 (+ 0.5)	11.8 (+ 2.3)	+ 4.4 % (p<.05)			
IL	Both	9.9 (n/a)	9.8 (- 0.1)	9.7 (- 0.1)	10.6 (+ 0.8)	11.2 (+ 0.6)	12.2 (+ 1.0)	+ 1.5 % (p<.05)	44	+ 2.3 (38)	+ 22.8 % (32)
	Male	17.1 (n/a)	16.7 (- 0.4)	16.2 (- 0.4)	17.6 (+ 1.4)	18.5 (+ 0.9)	19.8 (+ 1.3)	+ 1.1 % (p<.05)			
	Female	3.7 (n/a)	3.6 (- 0.0)	3.8 (+ 0.2)	4.2 (+ 0.4)	4.5 (+ 0.4)	5.2 (+ 0.6)	+ 2.4 % (p<.01)			
IN	Both	13.0 (n/a)	13.7 (+ 0.7)	14.4 (+ 0.7)	14.9 (+ 0.5)	16.4 (+ 1.4)	17.1 (+ 0.7)	+ 1.9 % (p<.01)	26	+ 4.1 (23)	+ 31.9 % (25)
	Male	22.4 (n/a)	23.2 (+ 0.8)	24.4 (+ 1.2)	24.7 (+ 0.4)	26.7 (+ 2.0)	28.3 (+ 1.6)	+ 1.5 % (p<.01)			
	Female	4.6 (n/a)	5.0 (+ 0.4)	5.3 (+ 0.2)	5.9 (+ 0.6)	6.8 (+ 0.9)	6.6 (- 0.2)	+ 2.7 % (p<.01)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first and last periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.

### Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, 1999 – 2016

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
IA	Both	11.8 (n/a)	13.2 (+ 1.4)	12.8 (- 0.4)	14.2 (+ 1.4)	15.9 (+ 1.7)	16.0 (+ 0.1)	+ 2.1 % (p<.01)	31	+ 4.3 (20)	+ 36.2 % (18)
	Male	20.6 (n/a)	22.1 (+ 1.5)	20.8 (- 1.4)	23.3 (+ 2.5)	26.0 (+ 2.7)	25.7 (- 0.3)	+ 1.6 % (p<.05)			
	Female	3.7 (n/a)	4.7 (+ 1.0)	5.3 (+ 0.6)	5.5 (+ 0.2)	6.1 (+ 0.6)	6.7 (+ 0.6)	+ 3.8 % (p<.01)			
KS	Both	13.3 (n/a)	15.1 (+ 1.8)	15.8 (+ 0.7)	15.3 (- 0.5)	17.7 (+ 2.4)	19.4 (+ 1.6)	+ 2.2 % (p<.01)	19	+ 6.0 (11)	+ 45.0 % ( 5)
	Male	22.7 (n/a)	25.0 (+ 2.3)	26.5 (+ 1.5)	25.6 (- 0.9)	29.1 (+ 3.5)	30.7 (+ 1.6)	+ 1.9 % (p<.01)			
	Female	4.6 (n/a)	6.0 (+ 1.4)	5.7 (- 0.3)	5.4 (- 0.3)	6.8 (+ 1.4)	8.4 (+ 1.6)	+ 3.2 % (p<.05)			
KY	Both	14.1 (n/a)	15.4 (+ 1.3)	16.7 (+ 1.3)	16.2 (- 0.5)	18.2 (+ 2.0)	19.3 (+ 1.1)	+ 1.9 % (p<.01)	20	+ 5.2 (16)	+ 36.6 % (16)
	Male	25.0 (n/a)	26.8 (+ 1.9)	28.3 (+ 1.4)	27.2 (- 1.0)	30.1 (+ 2.9)	31.7 (+ 1.6)	+ 1.4 % (p<.01)			
	Female	4.8 (n/a)	5.2 (+ 0.4)	6.1 (+ 0.8)	6.1 (+ 0.1)	7.1 (+ 0.9)	7.7 (+ 0.6)	+ 3.2 % (p<.01)			
LA	Both	13.1 (n/a)	12.9 (- 0.2)	13.4 (+ 0.4)	13.6 (+ 0.3)	14.4 (+ 0.8)	17.0 (+ 2.5)	+ 1.6 % (p<.05)	27	+ 3.8 (27)	+ 29.3 % (26)
	Male	22.9 (n/a)	22.3 (- 0.6)	22.4 (+ 0.1)	23.3 (+ 0.8)	23.7 (+ 0.5)	27.3 (+ 3.6)	+ 1.1 % n/s			
	Female	4.8 (n/a)	4.7 (- 0.1)	5.2 (+ 0.5)	4.9 (- 0.2)	6.1 (+ 1.2)	7.5 (+ 1.4)	+ 2.8 % (p<.05)			
ME	Both	14.5 (n/a)	13.6 (- 0.9)	14.4 (+ 0.8)	15.4 (+ 1.0)	18.9 (+ 3.5)	18.5 (- 0.4)	+ 2.2 % (p<.05)	21	+ 4.0 (25)	+ 27.4 % (29)
	Male	25.0 (n/a)	22.9 (- 2.1)	24.6 (+ 1.7)	25.7 (+ 1.1)	31.1 (+ 5.4)	29.8 (- 1.3)	+ 1.8 % (p<.05)			
	Female	5.3 (n/a)	5.3 (- 0.0)	5.2 (- 0.1)	6.0 (+ 0.7)	7.6 (+ 1.6)	7.9 (+ 0.3)	+ 3.1 % (p<.05)			
MD	Both	10.0 (n/a)	10.3 (+ 0.3)	10.1 (- 0.2)	10.2 (+ 0.1)	10.7 (+ 0.5)	10.8 (+ 0.1)	+ 0.5 % (p<.05)	47 §§	+ 0.8 (49 §§)	+ 8.5 % (49 §§)
	Male	17.6 (n/a)	17.8 (+ 0.1)	17.3 (- 0.5)	17.7 (+ 0.4)	18.2 (+ 0.5)	18.0 (- 0.2)	+ 0.2 % n/s			
	Female	3.5 (n/a)	3.8 (+ 0.4)	3.9 (+ 0.0)	3.7 (- 0.2)	4.1 (+ 0.4)	4.5 (+ 0.4)	+ 1.3 % (p<.05)			
MA	Both	7.4 (n/a)	7.6 (+ 0.2)	8.4 (+ 0.8)	9.3 (+ 1.0)	9.8 (+ 0.4)	10.0 (+ 0.3)	+ 2.3 % (p<.01)	48	+ 2.6 (34 ¶¶)	+ 35.3 % (20 ¶¶)
	Male	12.1 (n/a)	12.8 (+ 0.7)	13.3 (+ 0.5)	15.4 (+ 2.1)	15.2 (- 0.2)	16.0 (+ 0.8)	+ 2.0 % (p<.01)			
	Female	3.3 (n/a)	2.9 (- 0.4)	4.0 (+ 1.0)	3.8 (- 0.1)	4.8 (+ 1.0)	4.6 (- 0.2)	+ 3.0 % (p<.05)			
MI	Both	11.8 (n/a)	12.5 (+ 0.7)	12.9 (+ 0.4)	13.9 (+ 1.0)	14.5 (+ 0.7)	15.6 (+ 1.1)	+ 1.9 % (p<.01)	33	+ 3.9 (26)	+ 32.9 % (24)
	Male	20.0 (n/a)	20.9 (+ 0.9)	21.6 (+ 0.7)	22.8 (+ 1.3)	23.9 (+ 1.0)	25.0 (+ 1.2)	+ 1.5 % (p<.01)			
	Female	4.4 (n/a)	4.8 (+ 0.4)	5.0 (+ 0.2)	5.6 (+ 0.6)	5.9 (+ 0.3)	6.7 (+ 0.9)	+ 2.8 % (p<.01)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first and last periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.



### Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, 1999 – 2016

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
MN	Both	10.7 (n/a)	11.5 (+ 0.9)	12.4 (+ 0.8)	12.9 (+ 0.5)	14.2 (+ 1.3)	15.0 (+ 0.9)	+ 2.3 % (p<.01)	38	+ 4.3 (19)	+ 40.6 % ( 8)
	Male	18.3 (n/a)	19.3 (+ 1.1)	20.4 (+ 1.0)	20.9 (+ 0.6)	22.9 (+ 1.9)	23.3 (+ 0.4)	+ 1.7 % (p<.01)			
	Female	3.6 (n/a)	4.2 (+ 0.6)	4.8 (+ 0.6)	5.1 (+ 0.4)	5.8 (+ 0.6)	6.9 (+ 1.2)	+ 4.2 % (p<.01)			
MS	Both	12.9 (n/a)	14.1 (+ 1.2)	14.7 (+ 0.6)	15.5 (+ 0.8)	15.6 (+ 0.1)	15.2 (- 0.3)	+ 1.1 % (p<.05)	36	+ 2.3 (36)	+ 17.8 % (40)
	Male	22.9 (n/a)	24.6 (+ 1.7)	25.1 (+ 0.6)	26.8 (+ 1.7)	25.9 (- 0.9)	25.3 (- 0.6)	+ 0.7 % n/s			
	Female	4.3 (n/a)	5.0 (+ 0.7)	5.5 (+ 0.5)	5.5 (- 0.0)	6.4 (+ 0.9)	6.2 (- 0.2)	+ 2.4 % (p<.01)			
MO	Both	14.7 (n/a)	14.1 (- 0.6)	15.4 (+ 1.3)	16.0 (+ 0.7)	17.8 (+ 1.7)	20.0 (+ 2.3)	+ 2.2 % (p<.01)	16	+ 5.3 (15)	+ 36.4 % (17)
	Male	25.3 (n/a)	23.7 (- 1.6)	25.6 (+ 1.9)	26.6 (+ 1.0)	28.9 (+ 2.3)	32.2 (+ 3.3)	+ 1.8 % (p<.05)			
	Female	5.4 (n/a)	5.4 (+ 0.1)	6.1 (+ 0.7)	6.3 (+ 0.2)	7.4 (+ 1.1)	8.6 (+ 1.2)	+ 3.2 % (p<.01)			
MT	Both	21.1 (n/a)	22.6 (+ 1.4)	23.6 (+ 1.0)	24.7 (+ 1.1)	26.7 (+ 2.0)	29.2 (+ 2.5)	+ 2.1 % (p<.01)	1	+ 8.0 ( 2)	+ 38.0 % (11)
	Male	36.9 (n/a)	37.3 (+ 0.4)	39.8 (+ 2.5)	39.7 (- 0.1)	41.0 (+ 1.4)	45.5 (+ 4.4)	+ 1.3 % (p<.01)			
	Female	6.7 (n/a)	8.4 (+ 1.8)	8.4 (- 0.1)	10.0 (+ 1.6)	12.6 (+ 2.6)	13.1 (+ 0.5)	+ 4.6 % (p<.01)			
NE	Both	12.7 (n/a)	12.2 (- 0.5)	12.6 (+ 0.4)	11.7 (- 0.8)	13.5 (+ 1.8)	14.8 (+ 1.3)	+ 1.0 % n/s	40	+ 2.1 (42)	+ 16.2 % (43)
	Male	22.2 (n/a)	20.7 (- 1.5)	20.3 (- 0.4)	19.8 (- 0.5)	22.0 (+ 2.2)	23.9 (+ 1.9)	+ 0.6 % n/s			
	Female	3.8 (n/a)	4.2 (+ 0.4)	5.1 (+ 0.9)	4.0 (- 1.1)	5.5 (+ 1.4)	5.8 (+ 0.3)	+ 2.6 % n/s			
NV	Both	23.3 (n/a)	22.6 (- 0.6)	22.1 (- 0.5)	22.6 (+ 0.5)	21.4 (- 1.2)	23.1 (+ 1.6)	- 0.2 % n/s	9	- 0.2 (51)	- 1.0 % (51)
	Male	38.3 (n/a)	36.7 (- 1.7)	35.1 (- 1.6)	35.6 (+ 0.5)	32.5 (- 3.0)	35.4 (+ 2.8)	- 0.7 % n/s			
	Female	8.9 (n/a)	9.5 (+ 0.5)	9.6 (+ 0.1)	10.0 (+ 0.4)	10.6 (+ 0.6)	11.2 (+ 0.6)	+ 1.5 % (p<.01)			
NH	Both	13.5 (n/a)	12.5 (- 1.0)	13.3 (+ 0.8)	15.2 (+ 1.9)	15.8 (+ 0.6)	20.0 (+ 4.2)	+ 2.7 % (p<.05)	17	+ 6.5 ( 8)	+ 48.3 % ( 3)
	Male	22.5 (n/a)	21.1 (- 1.4)	21.7 (+ 0.6)	24.8 (+ 3.1)	25.4 (+ 0.6)	30.6 (+ 5.2)	+ 2.2 % (p<.05)			
	Female	5.3 (n/a)	4.8 (- 0.5)	5.9 (+ 1.0)	6.2 (+ 0.4)	6.6 (+ 0.4)	9.8 (+ 3.2)	+ 3.9 % (p<.05)			
NJ	Both	7.8 (n/a)	7.7 (- 0.1)	7.5 (- 0.2)	8.0 (+ 0.5)	8.9 (+ 0.9)	9.2 (+ 0.4)	+ 1.3 % (p<.05)	50	+ 1.5 (47)	+ 19.2 % (35)
	Male	13.0 (n/a)	13.1 (+ 0.0)	12.6 (- 0.5)	13.7 (+ 1.1)	14.5 (+ 0.8)	14.6 (+ 0.1)	+ 0.9 % (p<.05)			
	Female	3.2 (n/a)	2.9 (- 0.3)	3.0 (+ 0.0)	2.9 (- 0.1)	3.8 (+ 0.9)	4.4 (+ 0.6)	+ 2.3 % n/s			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first and last periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.

### Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, 1999 – 2016

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
NM	Both	22.0 (n/a)	22.0 (- 0.1)	21.8 (- 0.2)	23.0 (+ 1.2)	24.1 (+ 1.1)	26.0 (+ 1.9)	+ 1.1 % (p<.05)	4	+ 4.0 (24)	+ 18.3 % (39)
	Male	36.8 (n/a)	37.7 (+ 0.9)	36.4 (- 1.2)	35.8 (- 0.6)	37.1 (+ 1.3)	40.7 (+ 3.6)	+ 0.4 % n/s			
	Female	8.5 (n/a)	7.4 (- 1.1)	8.2 (+ 0.7)	10.7 (+ 2.6)	11.7 (+ 0.9)	12.0 (+ 0.3)	+ 3.3 % (p<.05)			
NY	Both	7.2 (n/a)	7.1 (- 0.1)	7.7 (+ 0.6)	8.4 (+ 0.8)	9.5 (+ 1.1)	9.3 (- 0.1)	+ 2.1 % (p<.01)	49	+ 2.1 (41)	+ 28.8 % (27)
	Male	12.5 (n/a)	12.2 (- 0.3)	12.9 (+ 0.7)	13.9 (+ 1.0)	15.4 (+ 1.4)	14.5 (- 0.9)	+ 1.4 % (p<.05)			
	Female	2.7 (n/a)	2.6 (- 0.1)	3.0 (+ 0.3)	3.5 (+ 0.5)	4.2 (+ 0.7)	4.6 (+ 0.5)	+ 4.2 % (p<.01)			
NC	Both	13.6 (n/a)	13.5 (- 0.1)	13.7 (+ 0.1)	14.2 (+ 0.5)	14.5 (+ 0.4)	15.3 (+ 0.8)	+ 0.8 % (p<.01)	34	+ 1.7 (44)	+ 12.7 % (47)
	Male	22.7 (n/a)	22.7 (+ 0.0)	22.2 (- 0.6)	23.3 (+ 1.1)	23.3 (+ 0.0)	23.9 (+ 0.6)	+ 0.4 % n/s			
	Female	5.6 (n/a)	5.5 (- 0.2)	6.2 (+ 0.8)	6.0 (- 0.2)	6.7 (+ 0.7)	7.6 (+ 0.9)	+ 2.0 % (p<.05)			
ND	Both	13.3 (n/a)	14.6 (+ 1.3)	16.0 (+ 1.4)	16.6 (+ 0.6)	18.4 (+ 1.9)	20.9 (+ 2.5)	+ 2.9 % (p<.01)	14	+ 7.6 ( 5)	+ 57.6 % ( 1)
	Male	21.4 (n/a)	24.6 (+ 3.2)	28.0 (+ 3.4)	27.1 (- 0.9)	29.6 (+ 2.5)	32.7 (+ 3.0)	+ 2.5 % (p<.01)			
	Female	5.6 (n/a)	4.5 (- 1.0)	3.7 (- 0.8)	5.7 (+ 2.0)	6.7 (+ 1.0)	8.5 (+ 1.8)	+ 3.9 % n/s			
OH	Both	11.6 (n/a)	12.3 (+ 0.8)	13.1 (+ 0.8)	13.4 (+ 0.2)	14.8 (+ 1.4)	15.8 (+ 1.0)	+ 2.0 % (p<.01)	32	+ 4.2 (21)	+ 36.0 % (19)
	Male	20.4 (n/a)	20.9 (+ 0.5)	22.2 (+ 1.3)	22.1 (- 0.1)	24.2 (+ 2.1)	25.5 (+ 1.3)	+ 1.5 % (p<.01)			
	Female	4.0 (n/a)	4.7 (+ 0.7)	4.9 (+ 0.1)	5.3 (+ 0.5)	6.2 (+ 0.9)	6.7 (+ 0.6)	+ 3.4 % (p<.01)			
OK	Both	17.0 (n/a)	16.5 (- 0.6)	17.2 (+ 0.8)	18.4 (+ 1.1)	20.7 (+ 2.3)	23.5 (+ 2.8)	+ 2.3 % (p<.05)	7	+ 6.4 (10)	+ 37.6 % (12)
	Male	28.5 (n/a)	27.3 (- 1.2)	27.8 (+ 0.5)	30.3 (+ 2.5)	33.4 (+ 3.1)	37.3 (+ 3.8)	+ 2.0 % (p<.05)			
	Female	6.6 (n/a)	6.4 (- 0.2)	7.5 (+ 1.1)	7.0 (- 0.5)	8.5 (+ 1.6)	10.3 (+ 1.8)	+ 2.9 % (p<.05)			
OR	Both	16.4 (n/a)	17.7 (+ 1.3)	17.7 (- 0.0)	18.6 (+ 0.9)	19.8 (+ 1.2)	21.1 (+ 1.3)	+ 1.6 % (p<.01)	13	+ 4.6 (18)	+ 28.2 % (28)
	Male	27.4 (n/a)	29.5 (+ 2.1)	28.5 (- 0.9)	29.5 (+ 1.0)	31.4 (+ 1.8)	33.0 (+ 1.6)	+ 1.1 % (p<.01)			
	Female	6.5 (n/a)	7.1 (+ 0.6)	7.7 (+ 0.6)	8.4 (+ 0.7)	8.8 (+ 0.4)	9.8 (+ 0.9)	+ 2.7 % (p<.01)			
PA	Both	12.1 (n/a)	12.5 (+ 0.4)	12.8 (+ 0.3)	13.9 (+ 1.1)	15.0 (+ 1.1)	16.3 (+ 1.2)	+ 2.0 % (p<.01)	30	+ 4.1 (22)	+ 34.3 % (21)
	Male	21.0 (n/a)	21.3 (+ 0.3)	21.9 (+ 0.6)	23.1 (+ 1.2)	24.7 (+ 1.7)	26.1 (+ 1.3)	+ 1.5 % (p<.01)			
	Female	4.2 (n/a)	4.6 (+ 0.3)	4.6 (+ 0.0)	5.4 (+ 0.9)	6.0 (+ 0.6)	7.1 (+ 1.1)	+ 3.5 % (p<.01)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first and last periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.



### Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, 1999 – 2016

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
RI	Both	9.4 (n/a)	9.0 (- 0.3)	9.0 (- 0.0)	12.8 (+ 3.8)	11.9 (- 0.9)	12.6 (+ 0.7)	+ 2.6 % (p<.05)	43	+ 3.2 (30)	+ 34.1 % (23)
	Male	15.4 (n/a)	15.2 (- 0.2)	14.8 (- 0.3)	21.2 (+ 6.4)	19.2 (- 2.0)	19.6 (+ 0.4)	+ 2.2 % n/s			
	Female	4.0 (n/a)	3.3 (- 0.7)	3.8 (+ 0.4)	5.1 (+ 1.3)	5.1 (+ 0.0)	6.1 (+ 1.0)	+ 3.7 % (p<.05)			
SC	Both	12.8 (n/a)	13.0 (+ 0.2)	13.7 (+ 0.7)	14.9 (+ 1.2)	16.0 (+ 1.1)	17.7 (+ 1.7)	+ 2.3 % (p<.01)	23	+ 4.9 (17)	+ 38.3 % (10)
	Male	21.3 (n/a)	22.5 (+ 1.2)	22.3 (- 0.1)	24.6 (+ 2.2)	26.1 (+ 1.5)	28.0 (+ 1.9)	+ 1.8 % (p<.01)			
	Female	5.4 (n/a)	4.7 (- 0.7)	6.0 (+ 1.3)	6.2 (+ 0.2)	7.0 (+ 0.8)	8.4 (+ 1.4)	+ 3.4 % (p<.05)			
SD	Both	15.7 (n/a)	15.8 (+ 0.1)	17.1 (+ 1.3)	19.3 (+ 2.2)	19.7 (+ 0.4)	22.6 (+ 2.9)	+ 2.5 % (p<.01)	10	+ 7.0 ( 7)	+ 44.5 % ( 6)
	Male	27.6 (n/a)	26.3 (- 1.3)	27.9 (+ 1.6)	30.1 (+ 2.2)	32.0 (+ 1.9)	33.6 (+ 1.6)	+ 1.6 % (p<.01)			
	Female	4.2 (n/a)	5.8 (+ 1.6)	6.4 (+ 0.6)	8.3 (+ 2.0)	7.3 (- 1.0)	11.3 (+ 4.0)	+ 5.8 % (p<.01)			
TN	Both	14.6 (n/a)	15.2 (+ 0.6)	16.1 (+ 0.8)	17.2 (+ 1.1)	17.2 (+ 0.0)	18.2 (+ 1.0)	+ 1.4 % (p<.01)	22	+ 3.5 (28)	+ 24.2 % (31)
	Male	25.1 (n/a)	25.4 (+ 0.3)	26.8 (+ 1.3)	28.0 (+ 1.2)	28.6 (+ 0.6)	29.8 (+ 1.2)	+ 1.2 % (p<.01)			
	Female	5.4 (n/a)	6.3 (+ 0.9)	6.7 (+ 0.4)	7.5 (+ 0.8)	6.9 (- 0.6)	7.6 (+ 0.7)	+ 1.9 % (p<.05)			
TX	Both	12.2 (n/a)	12.7 (+ 0.6)	12.3 (- 0.4)	13.2 (+ 0.9)	13.6 (+ 0.3)	14.5 (+ 0.9)	+ 1.1 % (p<.01)	41	+ 2.3 (37)	+ 18.9 % (36)
	Male	20.4 (n/a)	20.9 (+ 0.5)	20.4 (- 0.6)	22.0 (+ 1.6)	22.2 (+ 0.3)	23.1 (+ 0.9)	+ 0.9 % (p<.05)			
	Female	4.8 (n/a)	5.4 (+ 0.6)	5.0 (- 0.4)	5.2 (+ 0.2)	5.6 (+ 0.4)	6.4 (+ 0.8)	+ 1.6 % (p<.05)			
UT	Both	17.2 (n/a)	19.0 (+ 1.8)	18.2 (- 0.7)	20.2 (+ 2.0)	24.0 (+ 3.8)	25.2 (+ 1.2)	+ 2.7 % (p<.01)	5	+ 8.0 ( 3)	+ 46.5 % ( 4)
	Male	28.2 (n/a)	31.1 (+ 2.9)	29.4 (- 1.7)	32.1 (+ 2.7)	37.8 (+ 5.7)	38.0 (+ 0.2)	+ 2.1 % (p<.05)			
	Female	6.8 (n/a)	7.4 (+ 0.6)	7.5 (+ 0.1)	8.5 (+ 1.0)	10.6 (+ 2.1)	12.6 (+ 2.0)	+ 4.4 % (p<.01)			
VT	Both	13.2 (n/a)	16.2 (+ 3.0)	14.9 (- 1.3)	16.6 (+ 1.7)	18.7 (+ 2.1)	19.7 (+ 1.0)	+ 2.4 % (p<.01)	18	+ 6.4 ( 9)	+ 48.6 % ( 2)
	Male	23.6 (n/a)	28.3 (+ 4.6)	24.3 (- 4.0)	27.3 (+ 3.0)	31.0 (+ 3.7)	32.5 (+ 1.5)	+ 1.9 % (p<.05)			
	Female	4.3 (n/a)	5.2 (+ 0.9)	6.4 (+ 1.3)	6.6 (+ 0.2)	7.3 (+ 0.7)	7.6 (+ 0.3)	+ 3.8 % (p<.01)			
VA	Both	12.8 (n/a)	12.7 (- 0.1)	12.9 (+ 0.3)	13.6 (+ 0.7)	14.6 (+ 0.9)	15.0 (+ 0.5)	+ 1.2 % (p<.01)	37	+ 2.2 (39)	+ 17.4 % (41)
	Male	21.6 (n/a)	21.3 (- 0.2)	21.0 (- 0.4)	22.5 (+ 1.5)	23.6 (+ 1.2)	23.9 (+ 0.2)	+ 0.9 % (p<.05)			
	Female	5.3 (n/a)	5.2 (- 0.1)	5.9 (+ 0.7)	5.6 (- 0.3)	6.4 (+ 0.8)	6.9 (+ 0.5)	+ 1.8 % (p<.05)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first and last periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.

### Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, 1999 – 2016

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
WA	Both	14.8 (n/a)	15.4 (+ 0.5)	14.8 (- 0.6)	15.7 (+ 0.9)	16.6 (+ 0.9)	17.6 (+ 1.0)	+ 1.1 % (p<.05)	24	+ 2.8 (33)	+ 18.8 % (37)
	Male	24.7 (n/a)	25.2 (+ 0.5)	24.1 (- 1.1)	25.1 (+ 1.0)	26.0 (+ 0.9)	27.1 (+ 1.1)	+ 0.6 % n/s			
	Female	5.9 (n/a)	6.4 (+ 0.6)	6.2 (- 0.2)	6.9 (+ 0.7)	7.7 (+ 0.8)	8.5 (+ 0.8)	+ 2.5 % (p<.01)			
WV	Both	15.6 (n/a)	17.2 (+ 1.6)	16.7 (- 0.5)	16.0 (- 0.7)	19.2 (+ 3.2)	21.4 (+ 2.2)	+ 1.8 % n/s	11	+ 5.8 (13)	+ 37.1 % (14)
	Male	27.2 (n/a)	30.1 (+ 2.9)	28.6 (- 1.5)	27.6 (- 1.0)	31.5 (+ 3.9)	33.5 (+ 2.0)	+ 1.1 % n/s			
	Female	5.3 (n/a)	5.5 (+ 0.1)	5.8 (+ 0.3)	5.3 (- 0.5)	7.6 (+ 2.3)	9.8 (+ 2.2)	+ 3.7 % n/s			
WI	Both	13.1 (n/a)	13.5 (+ 0.4)	14.0 (+ 0.5)	15.0 (+ 1.0)	15.3 (+ 0.3)	16.5 (+ 1.2)	+ 1.5 % (p<.01)	28	+ 3.4 (29)	+ 25.8 % (30)
	Male	21.7 (n/a)	22.2 (+ 0.5)	22.7 (+ 0.5)	24.0 (+ 1.2)	24.4 (+ 0.4)	25.7 (+ 1.3)	+ 1.1 % (p<.01)			
	Female	5.1 (n/a)	5.3 (+ 0.2)	5.6 (+ 0.4)	6.4 (+ 0.7)	6.5 (+ 0.1)	7.5 (+ 1.0)	+ 2.5 % (p<.01)			
WY	Both	20.7 (n/a)	23.4 (+ 2.7)	22.5 (- 0.9)	25.4 (+ 2.8)	28.9 (+ 3.5)	28.8 (- 0.1)	+ 2.3 % (p<.01)	3	+ 8.1 ( 1)	+ 39.0 % ( 9)
	Male	34.8 (n/a)	39.3 (+ 4.5)	36.3 (- 3.0)	41.5 (+ 5.2)	47.1 (+ 5.6)	44.6 (- 2.4)	+ 1.8 % (p<.05)			
	Female	7.7 (n/a)	8.2 (+ 0.6)	9.2 (+ 0.9)	9.4 (+ 0.2)	10.7 (+ 1.4)	12.6 (+ 1.9)	+ 3.2 % (p<.01)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first and last periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

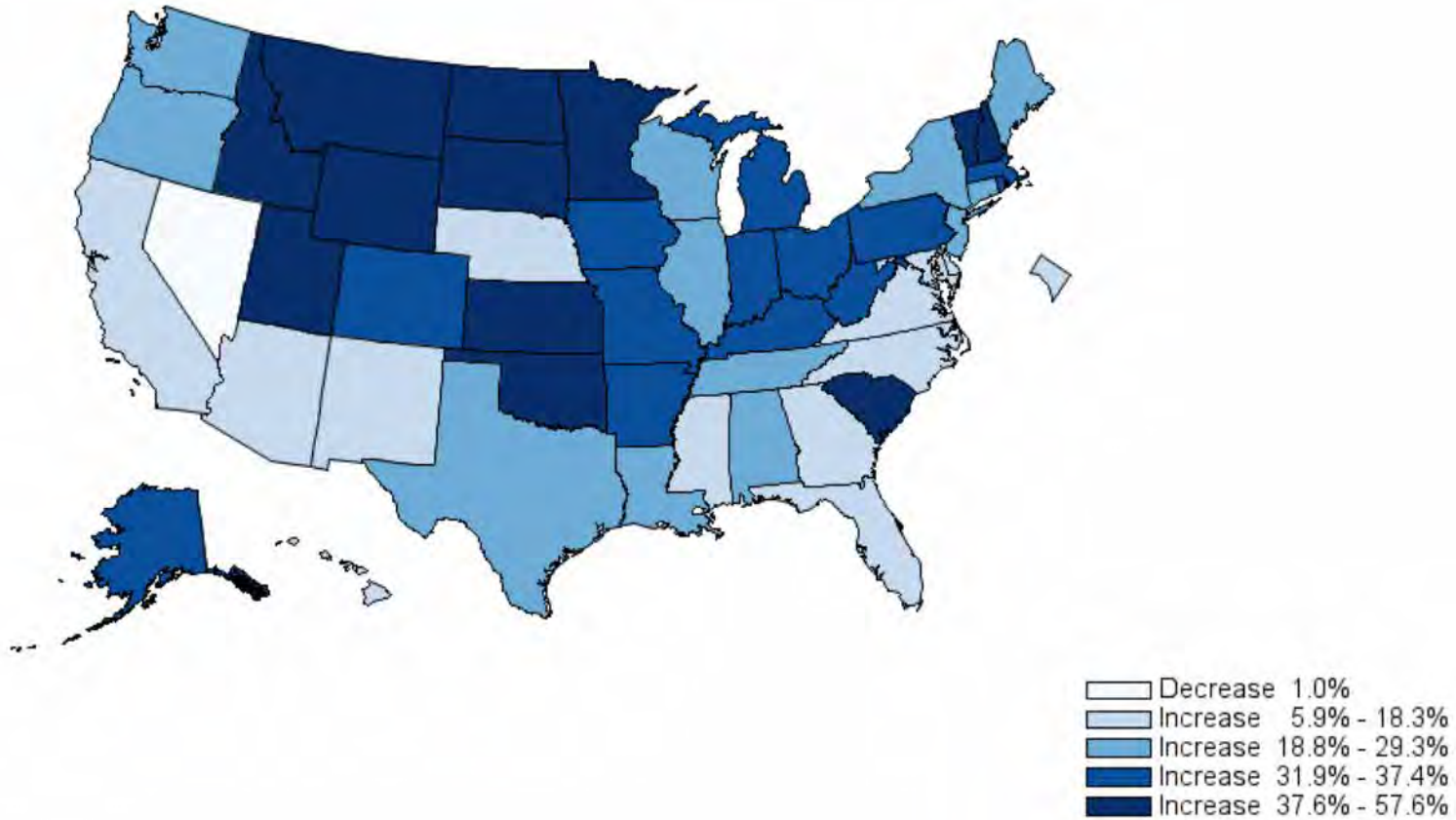
§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.



Figure 1.

**Percentage Changes in Annual Suicide Rates (per 100,000, Age-Adjusted)**  
2014-2016 Compared Against 1999-2001



**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
U.S.	Both	12.3 (n/a)	12.7 (+ 0.4)	12.9 (+ 0.2)	13.8 (+ 0.9)	14.5 (+ 0.8)	15.4 (+ 0.9)	+ 1.5 % (p<.01)	n/a	+ 3.1 (n/a)	+ 25.4 % (n/a)
	Male	20.9 (n/a)	21.2 (+ 0.4)	21.3 (+ 0.0)	22.5 (+1.3)	23.5 (+ 1.0)	24.5 (+ 1.0)	+ 1.1 % (p<.01)			
	Female	4.7 (n/a)	5.0 (+ 0.3)	5.3 (+ 0.2)	5.7 (+ 0.4)	6.2 (+ 0.5)	6.9 (+ 0.7)	+ 2.6 % (p<.01)			
AL	Both	14.3 (n/a)	13.4 (- 0.9)	14.1 (+ 0.6)	15.6 (+ 1.6)	16.4 (+ 0.7)	17.5 (+ 1.1)	+ 1.6 % (p<.05)	25	+ 3.1 (31)	+ 21.9 % (33)
	Male	25.1 (n/a)	23.4 (- 1.7)	24.4 (+ 1.0)	26.4 (+ 2.0)	27.6 (+ 1.1)	29.1 (+ 1.5)	+ 1.3 % (p<.05)			
	Female	5.1 (n/a)	4.8 (- 0.3)	5.0 (+ 0.2)	6.1 (+ 1.1)	6.4 (+ 0.3)	7.0 (+ 0.7)	+ 2.6 % (p<.01)			
AK	Both	21.0 (n/a)	24.8 (+ 3.8)	24.2 (- 0.6)	26.0 (+ 1.7)	25.4 (- 0.5)	28.8 (+ 3.4)	+ 1.7 % (p<.05)	2	+ 7.8 ( 4)	+ 37.4 % (13)
	Male	33.2 (n/a)	38.1 (+ 4.9)	38.9 (+ 0.8)	40.1 (+ 1.2)	40.1 (- 0.1)	42.9 (+ 2.8)	+ 1.4 % (p<.01)			
	Female	8.6 (n/a)	11.4 (+ 2.9)	9.8 (- 1.6)	11.1 (+ 1.2)	9.9 (- 1.2)	13.2 (+ 3.4)	+ 1.7 % n/s			
AZ	Both	17.8 (n/a)	18.5 (+ 0.7)	19.1 (+ 0.5)	19.1 (- 0.0)	20.4 (+ 1.3)	20.9 (+ 0.5)	+ 1.0 % (p<.01)	15	+ 3.1 (32)	+ 17.3 % (42)
	Male	29.3 (n/a)	30.2 (+ 1.0)	30.6 (+ 0.4)	30.2 (- 0.5)	32.0 (+ 1.9)	32.4 (+ 0.4)	+ 0.6 % (p<.05)			
	Female	7.1 (n/a)	7.5 (+ 0.4)	8.2 (+ 0.7)	8.6 (+ 0.5)	9.2 (+ 0.6)	9.9 (+ 0.6)	+ 2.2 % (p<.01)			
AR	Both	15.5 (n/a)	15.8 (+ 0.3)	16.2 (+ 0.5)	17.6 (+ 1.4)	19.2 (+ 1.6)	21.2 (+ 2.0)	+ 2.2 % (p<.01)	12	+ 5.7 (14)	+ 36.8 % (15)
	Male	26.7 (n/a)	26.7 (+ 0.0)	27.2 (+ 0.5)	28.2 (+ 1.0)	31.7 (+ 3.5)	33.5 (+ 1.9)	+ 1.6 % (p<.05)			
	Female	5.6 (n/a)	5.9 (+ 0.3)	6.2 (+ 0.4)	7.9 (+ 1.7)	7.5 (- 0.4)	9.6 (+ 2.1)	+ 3.6 % (p<.01)			
CA	Both	10.6 (n/a)	11.3 (+ 0.7)	11.0 (- 0.3)	12.0 (+ 1.0)	11.8 (- 0.1)	12.1 (+ 0.3)	+ 0.9 % (p<.05)	45	+ 1.6 (46)	+ 14.8 % (46)
	Male	17.9 (n/a)	18.4 (+ 0.5)	17.7 (- 0.7)	19.1 (+ 1.4)	18.9 (- 0.2)	19.2 (+ 0.3)	+ 0.5 % n/s			
	Female	4.1 (n/a)	5.0 (+ 0.9)	4.9 (- 0.1)	5.4 (+ 0.5)	5.3 (- 0.1)	5.6 (+ 0.3)	+ 1.7 % (p<.05)			
CO	Both	17.3 (n/a)	19.2 (+ 1.9)	19.0 (- 0.2)	20.0 (+ 1.0)	21.6 (+ 1.5)	23.2 (+ 1.6)	+ 1.8 % (p<.01)	8	+ 5.9 (12)	+ 34.1 % (22)
	Male	28.6 (n/a)	30.9 (+ 2.3)	30.5 (- 0.4)	31.5 (+ 1.0)	33.4 (+ 1.9)	36.3 (+ 2.9)	+ 1.4 % (p<.01)			
	Female	7.0 (n/a)	8.2 (+ 1.3)	8.2 (+ 0.0)	9.1 (+ 0.9)	10.1 (+ 1.0)	10.4 (+ 0.3)	+ 2.6 % (p<.01)			
CT	Both	9.6 (n/a)	8.9 (- 0.7)	9.1 (+ 0.2)	10.2 (+ 1.1)	11.0 (+ 0.8)	11.5 (+ 0.5)	+ 1.6 % (p<.05)	46	+ 1.9 (43)	+ 19.2 % (34)
	Male	16.4 (n/a)	14.6 (- 1.8)	15.0 (+ 0.4)	16.6 (+ 1.6)	17.6 (+ 1.0)	17.3 (- 0.3)	+ 0.9 % n/s			
	Female	3.6 (n/a)	3.8 (+ 0.2)	3.7 (- 0.2)	4.4 (+ 0.7)	4.9 (+ 0.5)	6.2 (+ 1.3)	+ 3.5 % (p<.05)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

**Comment [FC()]:** Wonder if in a revised title or footnote if it needs to be revised to reflect this also includes District of Columbia.

**Comment [FC()]:** Suggest being clear on what these period, similar to how done in another footnote.



### Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, 1999 – 2016

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
DE	Both	13.6 (n/a)	12.2 (- 1.4)	11.9 (- 0.3)	13.6 (+ 1.7)	14.2 (+ 0.6)	14.4 (+ 0.2)	+ 0.9 % n/s	42	+ 0.8 (50)	+ 5.9 % (50)
	Male	23.0 (n/a)	20.3 (- 2.7)	19.9 (- 0.4)	23.1 (+ 3.2)	22.7 (- 0.4)	23.5 (+ 0.8)	+ 0.6 % n/s			
	Female	5.3 (n/a)	5.0 (- 0.2)	4.6 (- 0.4)	4.9 (+ 0.3)	6.4 (+ 1.5)	6.2 (- 0.2)	+ 1.6 % n/s			
DC	Both	5.9 (n/a)	6.4 (+ 0.5)	6.4 (- 0.0)	7.3 (+ 0.8)	6.6 (- 0.7)	6.9 (+ 0.3)	+ 0.9 % n/s	51	+ 1.0 (48)	+ 16.1 % (45)
	Male	10.7 (n/a)	11.1 (+ 0.4)	10.3 (- 0.8)	12.7 (+ 2.4)	10.0 (- 2.6)	11.7 (+ 1.7)	+ 0.3 % n/s			
	Female	1.7 (n/a) ††	2.3 (+ 0.6) ††	3.3 (+ 1.0)	2.6 (- 0.7)	3.6 (+ 1.0)	2.8 (- 0.8)	+ 3.5 % n/s			
FL	Both	14.8 (n/a)	15.2 (+ 0.4)	14.9 (- 0.3)	16.3 (+ 1.4)	16.3 (- 0.0)	16.4 (+ 0.1)	+ 0.8 % (p<.05)	29	+ 1.6 (45)	+ 10.6 % (48)
	Male	24.3 (n/a)	24.4 (+ 0.1)	23.6 (- 0.8)	26.2 (+ 2.6)	25.6 (- 0.6)	25.6 (- 0.1)	+ 0.5 % n/s			
	Female	6.3 (n/a)	6.8 (+ 0.5)	6.8 (+ 0.0)	7.1 (+ 0.3)	7.6 (+ 0.5)	7.8 (+ 0.3)	+ 1.4 % (p<.01)			
GA	Both	12.9 (n/a)	13.2 (+ 0.3)	12.3 (- 0.9)	13.2 (+ 0.9)	13.7 (+ 0.5)	15.0 (+ 1.3)	+ 0.9 % n/s	39	+ 2.1 (40)	+ 16.2 % (44)
	Male	22.1 (n/a)	23.1 (+ 1.0)	21.3 (- 1.8)	21.9 (+ 0.6)	22.6 (+ 0.7)	24.4 (+ 1.7)	+ 0.5 % n/s			
	Female	5.0 (n/a)	4.8 (- 0.2)	4.6 (- 0.2)	5.5 (+ 0.9)	5.8 (+ 0.3)	6.6 (+ 0.8)	+ 2.1 % (p<.05)			
HI	Both	12.9 (n/a)	11.1 (- 1.8)	10.3 (- 0.7)	14.5 (+ 4.1)	14.4 (- 0.1)	15.2 (+ 0.8)	+ 2.0 % n/s	35	+ 2.4 (35)	+ 18.3 % (38)
	Male	20.4 (n/a)	17.2 (- 3.1)	15.3 (- 1.9)	21.9 (+ 6.7)	22.5 (+ 0.5)	24.3 (+ 1.8)	+ 2.1 % n/s			
	Female	5.4 (n/a)	5.0 (- 0.4)	5.5 (+ 0.5)	7.1 (+ 1.5)	6.2 (- 0.9)	5.9 (- 0.3)	+ 1.2 % n/s			
ID	Both	17.3 (n/a)	19.2 (+ 2.0)	18.3 (- 0.9)	21.6 (+ 3.3)	21.9 (+ 0.3)	24.7 (+ 2.8)	+ 2.3 % (p<.01)	6	+ 7.5 ( 6)	+ 43.2 % ( 7)
	Male	28.4 (n/a)	33.1 (+ 4.7)	31.1 (- 2.0)	34.9 (+ 3.8)	34.7 (- 0.2)	38.0 (+ 3.3)	+ 1.6 % (p<.05)			
	Female	7.2 (n/a)	6.1 (- 1.1)	6.1 (+ 0.0)	9.0 (+ 2.9)	9.5 (+ 0.5)	11.8 (+ 2.3)	+ 4.4 % (p<.05)			
IL	Both	9.9 (n/a)	9.8 (- 0.1)	9.7 (- 0.1)	10.6 (+ 0.8)	11.2 (+ 0.6)	12.2 (+ 1.0)	+ 1.5 % (p<.05)	44	+ 2.3 (38)	+ 22.8 % (32)
	Male	17.1 (n/a)	16.7 (- 0.4)	16.2 (- 0.4)	17.6 (+ 1.4)	18.5 (+ 0.9)	19.8 (+ 1.3)	+ 1.1 % (p<.05)			
	Female	3.7 (n/a)	3.6 (- 0.0)	3.8 (+ 0.2)	4.2 (+ 0.4)	4.5 (+ 0.4)	5.2 (+ 0.6)	+ 2.4 % (p<.01)			
IN	Both	13.0 (n/a)	13.7 (+ 0.7)	14.4 (+ 0.7)	14.9 (+ 0.5)	16.4 (+ 1.4)	17.1 (+ 0.7)	+ 1.9 % (p<.01)	26	+ 4.1 (23)	+ 31.9 % (25)
	Male	22.4 (n/a)	23.2 (+ 0.8)	24.4 (+ 1.2)	24.7 (+ 0.4)	26.7 (+ 2.0)	28.3 (+ 1.6)	+ 1.5 % (p<.01)			
	Female	4.6 (n/a)	5.0 (+ 0.4)	5.3 (+ 0.2)	5.9 (+ 0.6)	6.8 (+ 0.9)	6.6 (- 0.2)	+ 2.7 % (p<.01)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first and last periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.

### Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, 1999 – 2016

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
IA	Both	11.8 (n/a)	13.2 (+ 1.4)	12.8 (- 0.4)	14.2 (+ 1.4)	15.9 (+ 1.7)	16.0 (+ 0.1)	+ 2.1 % (p<.01)	31	+ 4.3 (20)	+ 36.2 % (18)
	Male	20.6 (n/a)	22.1 (+ 1.5)	20.8 (- 1.4)	23.3 (+ 2.5)	26.0 (+ 2.7)	25.7 (- 0.3)	+ 1.6 % (p<.05)			
	Female	3.7 (n/a)	4.7 (+ 1.0)	5.3 (+ 0.6)	5.5 (+ 0.2)	6.1 (+ 0.6)	6.7 (+ 0.6)	+ 3.8 % (p<.01)			
KS	Both	13.3 (n/a)	15.1 (+ 1.8)	15.8 (+ 0.7)	15.3 (- 0.5)	17.7 (+ 2.4)	19.4 (+ 1.6)	+ 2.2 % (p<.01)	19	+ 6.0 (11)	+ 45.0 % ( 5)
	Male	22.7 (n/a)	25.0 (+ 2.3)	26.5 (+ 1.5)	25.6 (- 0.9)	29.1 (+ 3.5)	30.7 (+ 1.6)	+ 1.9 % (p<.01)			
	Female	4.6 (n/a)	6.0 (+ 1.4)	5.7 (- 0.3)	5.4 (- 0.3)	6.8 (+ 1.4)	8.4 (+ 1.6)	+ 3.2 % (p<.05)			
KY	Both	14.1 (n/a)	15.4 (+ 1.3)	16.7 (+ 1.3)	16.2 (- 0.5)	18.2 (+ 2.0)	19.3 (+ 1.1)	+ 1.9 % (p<.01)	20	+ 5.2 (16)	+ 36.6 % (16)
	Male	25.0 (n/a)	26.8 (+ 1.9)	28.3 (+ 1.4)	27.2 (- 1.0)	30.1 (+ 2.9)	31.7 (+ 1.6)	+ 1.4 % (p<.01)			
	Female	4.8 (n/a)	5.2 (+ 0.4)	6.1 (+ 0.8)	6.1 (+ 0.1)	7.1 (+ 0.9)	7.7 (+ 0.6)	+ 3.2 % (p<.01)			
LA	Both	13.1 (n/a)	12.9 (- 0.2)	13.4 (+ 0.4)	13.6 (+ 0.3)	14.4 (+ 0.8)	17.0 (+ 2.5)	+ 1.6 % (p<.05)	27	+ 3.8 (27)	+ 29.3 % (26)
	Male	22.9 (n/a)	22.3 (- 0.6)	22.4 (+ 0.1)	23.3 (+ 0.8)	23.7 (+ 0.5)	27.3 (+ 3.6)	+ 1.1 % n/s			
	Female	4.8 (n/a)	4.7 (- 0.1)	5.2 (+ 0.5)	4.9 (- 0.2)	6.1 (+ 1.2)	7.5 (+ 1.4)	+ 2.8 % (p<.05)			
ME	Both	14.5 (n/a)	13.6 (- 0.9)	14.4 (+ 0.8)	15.4 (+ 1.0)	18.9 (+ 3.5)	18.5 (- 0.4)	+ 2.2 % (p<.05)	21	+ 4.0 (25)	+ 27.4 % (29)
	Male	25.0 (n/a)	22.9 (- 2.1)	24.6 (+ 1.7)	25.7 (+ 1.1)	31.1 (+ 5.4)	29.8 (- 1.3)	+ 1.8 % (p<.05)			
	Female	5.3 (n/a)	5.3 (- 0.0)	5.2 (- 0.1)	6.0 (+ 0.7)	7.6 (+ 1.6)	7.9 (+ 0.3)	+ 3.1 % (p<.05)			
MD	Both	10.0 (n/a)	10.3 (+ 0.3)	10.1 (- 0.2)	10.2 (+ 0.1)	10.7 (+ 0.5)	10.8 (+ 0.1)	+ 0.5 % (p<.05)	47 §§	+ 0.8 (49 §§)	+ 8.5 % (49 §§)
	Male	17.6 (n/a)	17.8 (+ 0.1)	17.3 (- 0.5)	17.7 (+ 0.4)	18.2 (+ 0.5)	18.0 (- 0.2)	+ 0.2 % n/s			
	Female	3.5 (n/a)	3.8 (+ 0.4)	3.9 (+ 0.0)	3.7 (- 0.2)	4.1 (+ 0.4)	4.5 (+ 0.4)	+ 1.3 % (p<.05)			
MA	Both	7.4 (n/a)	7.6 (+ 0.2)	8.4 (+ 0.8)	9.3 (+ 1.0)	9.8 (+ 0.4)	10.0 (+ 0.3)	+ 2.3 % (p<.01)	48	+ 2.6 (34 ¶¶)	+ 35.3 % (20 ¶¶)
	Male	12.1 (n/a)	12.8 (+ 0.7)	13.3 (+ 0.5)	15.4 (+ 2.1)	15.2 (- 0.2)	16.0 (+ 0.8)	+ 2.0 % (p<.01)			
	Female	3.3 (n/a)	2.9 (- 0.4)	4.0 (+ 1.0)	3.8 (- 0.1)	4.8 (+ 1.0)	4.6 (- 0.2)	+ 3.0 % (p<.05)			
MI	Both	11.8 (n/a)	12.5 (+ 0.7)	12.9 (+ 0.4)	13.9 (+ 1.0)	14.5 (+ 0.7)	15.6 (+ 1.1)	+ 1.9 % (p<.01)	33	+ 3.9 (26)	+ 32.9 % (24)
	Male	20.0 (n/a)	20.9 (+ 0.9)	21.6 (+ 0.7)	22.8 (+ 1.3)	23.9 (+ 1.0)	25.0 (+ 1.2)	+ 1.5 % (p<.01)			
	Female	4.4 (n/a)	4.8 (+ 0.4)	5.0 (+ 0.2)	5.6 (+ 0.6)	5.9 (+ 0.3)	6.7 (+ 0.9)	+ 2.8 % (p<.01)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first and last periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.



### Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, 1999 – 2016

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
MN	Both	10.7 (n/a)	11.5 (+ 0.9)	12.4 (+ 0.8)	12.9 (+ 0.5)	14.2 (+ 1.3)	15.0 (+ 0.9)	+ 2.3 % (p<.01)	38	+ 4.3 (19)	+ 40.6 % ( 8)
	Male	18.3 (n/a)	19.3 (+ 1.1)	20.4 (+ 1.0)	20.9 (+ 0.6)	22.9 (+ 1.9)	23.3 (+ 0.4)	+ 1.7 % (p<.01)			
	Female	3.6 (n/a)	4.2 (+ 0.6)	4.8 (+ 0.6)	5.1 (+ 0.4)	5.8 (+ 0.6)	6.9 (+ 1.2)	+ 4.2 % (p<.01)			
MS	Both	12.9 (n/a)	14.1 (+ 1.2)	14.7 (+ 0.6)	15.5 (+ 0.8)	15.6 (+ 0.1)	15.2 (- 0.3)	+ 1.1 % (p<.05)	36	+ 2.3 (36)	+ 17.8 % (40)
	Male	22.9 (n/a)	24.6 (+ 1.7)	25.1 (+ 0.6)	26.8 (+ 1.7)	25.9 (- 0.9)	25.3 (- 0.6)	+ 0.7 % n/s			
	Female	4.3 (n/a)	5.0 (+ 0.7)	5.5 (+ 0.5)	5.5 (- 0.0)	6.4 (+ 0.9)	6.2 (- 0.2)	+ 2.4 % (p<.01)			
MO	Both	14.7 (n/a)	14.1 (- 0.6)	15.4 (+ 1.3)	16.0 (+ 0.7)	17.8 (+ 1.7)	20.0 (+ 2.3)	+ 2.2 % (p<.01)	16	+ 5.3 (15)	+ 36.4 % (17)
	Male	25.3 (n/a)	23.7 (- 1.6)	25.6 (+ 1.9)	26.6 (+ 1.0)	28.9 (+ 2.3)	32.2 (+ 3.3)	+ 1.8 % (p<.05)			
	Female	5.4 (n/a)	5.4 (+ 0.1)	6.1 (+ 0.7)	6.3 (+ 0.2)	7.4 (+ 1.1)	8.6 (+ 1.2)	+ 3.2 % (p<.01)			
MT	Both	21.1 (n/a)	22.6 (+ 1.4)	23.6 (+ 1.0)	24.7 (+ 1.1)	26.7 (+ 2.0)	29.2 (+ 2.5)	+ 2.1 % (p<.01)	1	+ 8.0 ( 2)	+ 38.0 % (11)
	Male	36.9 (n/a)	37.3 (+ 0.4)	39.8 (+ 2.5)	39.7 (- 0.1)	41.0 (+ 1.4)	45.5 (+ 4.4)	+ 1.3 % (p<.01)			
	Female	6.7 (n/a)	8.4 (+ 1.8)	8.4 (- 0.1)	10.0 (+ 1.6)	12.6 (+ 2.6)	13.1 (+ 0.5)	+ 4.6 % (p<.01)			
NE	Both	12.7 (n/a)	12.2 (- 0.5)	12.6 (+ 0.4)	11.7 (- 0.8)	13.5 (+ 1.8)	14.8 (+ 1.3)	+ 1.0 % n/s	40	+ 2.1 (42)	+ 16.2 % (43)
	Male	22.2 (n/a)	20.7 (- 1.5)	20.3 (- 0.4)	19.8 (- 0.5)	22.0 (+ 2.2)	23.9 (+ 1.9)	+ 0.6 % n/s			
	Female	3.8 (n/a)	4.2 (+ 0.4)	5.1 (+ 0.9)	4.0 (- 1.1)	5.5 (+ 1.4)	5.8 (+ 0.3)	+ 2.6 % n/s			
NV	Both	23.3 (n/a)	22.6 (- 0.6)	22.1 (- 0.5)	22.6 (+ 0.5)	21.4 (- 1.2)	23.1 (+ 1.6)	- 0.2 % n/s	9	- 0.2 (51)	- 1.0 % (51)
	Male	38.3 (n/a)	36.7 (- 1.7)	35.1 (- 1.6)	35.6 (+ 0.5)	32.5 (- 3.0)	35.4 (+ 2.8)	- 0.7 % n/s			
	Female	8.9 (n/a)	9.5 (+ 0.5)	9.6 (+ 0.1)	10.0 (+ 0.4)	10.6 (+ 0.6)	11.2 (+ 0.6)	+ 1.5 % (p<.01)			
NH	Both	13.5 (n/a)	12.5 (- 1.0)	13.3 (+ 0.8)	15.2 (+ 1.9)	15.8 (+ 0.6)	20.0 (+ 4.2)	+ 2.7 % (p<.05)	17	+ 6.5 ( 8)	+ 48.3 % ( 3)
	Male	22.5 (n/a)	21.1 (- 1.4)	21.7 (+ 0.6)	24.8 (+ 3.1)	25.4 (+ 0.6)	30.6 (+ 5.2)	+ 2.2 % (p<.05)			
	Female	5.3 (n/a)	4.8 (- 0.5)	5.9 (+ 1.0)	6.2 (+ 0.4)	6.6 (+ 0.4)	9.8 (+ 3.2)	+ 3.9 % (p<.05)			
NJ	Both	7.8 (n/a)	7.7 (- 0.1)	7.5 (- 0.2)	8.0 (+ 0.5)	8.9 (+ 0.9)	9.2 (+ 0.4)	+ 1.3 % (p<.05)	50	+ 1.5 (47)	+ 19.2 % (35)
	Male	13.0 (n/a)	13.1 (+ 0.0)	12.6 (- 0.5)	13.7 (+ 1.1)	14.5 (+ 0.8)	14.6 (+ 0.1)	+ 0.9 % (p<.05)			
	Female	3.2 (n/a)	2.9 (- 0.3)	3.0 (+ 0.0)	2.9 (- 0.1)	3.8 (+ 0.9)	4.4 (+ 0.6)	+ 2.3 % n/s			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first and last periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.

### Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, 1999 – 2016

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
NM	Both	22.0 (n/a)	22.0 (- 0.1)	21.8 (- 0.2)	23.0 (+ 1.2)	24.1 (+ 1.1)	26.0 (+ 1.9)	+ 1.1 % (p<.05)	4	+ 4.0 (24)	+ 18.3 % (39)
	Male	36.8 (n/a)	37.7 (+ 0.9)	36.4 (- 1.2)	35.8 (- 0.6)	37.1 (+ 1.3)	40.7 (+ 3.6)	+ 0.4 % n/s			
	Female	8.5 (n/a)	7.4 (- 1.1)	8.2 (+ 0.7)	10.7 (+ 2.6)	11.7 (+ 0.9)	12.0 (+ 0.3)	+ 3.3 % (p<.05)			
NY	Both	7.2 (n/a)	7.1 (- 0.1)	7.7 (+ 0.6)	8.4 (+ 0.8)	9.5 (+ 1.1)	9.3 (- 0.1)	+ 2.1 % (p<.01)	49	+ 2.1 (41)	+ 28.8 % (27)
	Male	12.5 (n/a)	12.2 (- 0.3)	12.9 (+ 0.7)	13.9 (+ 1.0)	15.4 (+ 1.4)	14.5 (- 0.9)	+ 1.4 % (p<.05)			
	Female	2.7 (n/a)	2.6 (- 0.1)	3.0 (+ 0.3)	3.5 (+ 0.5)	4.2 (+ 0.7)	4.6 (+ 0.5)	+ 4.2 % (p<.01)			
NC	Both	13.6 (n/a)	13.5 (- 0.1)	13.7 (+ 0.1)	14.2 (+ 0.5)	14.5 (+ 0.4)	15.3 (+ 0.8)	+ 0.8 % (p<.01)	34	+ 1.7 (44)	+ 12.7 % (47)
	Male	22.7 (n/a)	22.7 (+ 0.0)	22.2 (- 0.6)	23.3 (+ 1.1)	23.3 (+ 0.0)	23.9 (+ 0.6)	+ 0.4 % n/s			
	Female	5.6 (n/a)	5.5 (- 0.2)	6.2 (+ 0.8)	6.0 (- 0.2)	6.7 (+ 0.7)	7.6 (+ 0.9)	+ 2.0 % (p<.05)			
ND	Both	13.3 (n/a)	14.6 (+ 1.3)	16.0 (+ 1.4)	16.6 (+ 0.6)	18.4 (+ 1.9)	20.9 (+ 2.5)	+ 2.9 % (p<.01)	14	+ 7.6 ( 5)	+ 57.6 % ( 1)
	Male	21.4 (n/a)	24.6 (+ 3.2)	28.0 (+ 3.4)	27.1 (- 0.9)	29.6 (+ 2.5)	32.7 (+ 3.0)	+ 2.5 % (p<.01)			
	Female	5.6 (n/a)	4.5 (- 1.0)	3.7 (- 0.8)	5.7 (+ 2.0)	6.7 (+ 1.0)	8.5 (+ 1.8)	+ 3.9 % n/s			
OH	Both	11.6 (n/a)	12.3 (+ 0.8)	13.1 (+ 0.8)	13.4 (+ 0.2)	14.8 (+ 1.4)	15.8 (+ 1.0)	+ 2.0 % (p<.01)	32	+ 4.2 (21)	+ 36.0 % (19)
	Male	20.4 (n/a)	20.9 (+ 0.5)	22.2 (+ 1.3)	22.1 (- 0.1)	24.2 (+ 2.1)	25.5 (+ 1.3)	+ 1.5 % (p<.01)			
	Female	4.0 (n/a)	4.7 (+ 0.7)	4.9 (+ 0.1)	5.3 (+ 0.5)	6.2 (+ 0.9)	6.7 (+ 0.6)	+ 3.4 % (p<.01)			
OK	Both	17.0 (n/a)	16.5 (- 0.6)	17.2 (+ 0.8)	18.4 (+ 1.1)	20.7 (+ 2.3)	23.5 (+ 2.8)	+ 2.3 % (p<.05)	7	+ 6.4 (10)	+ 37.6 % (12)
	Male	28.5 (n/a)	27.3 (- 1.2)	27.8 (+ 0.5)	30.3 (+ 2.5)	33.4 (+ 3.1)	37.3 (+ 3.8)	+ 2.0 % (p<.05)			
	Female	6.6 (n/a)	6.4 (- 0.2)	7.5 (+ 1.1)	7.0 (- 0.5)	8.5 (+ 1.6)	10.3 (+ 1.8)	+ 2.9 % (p<.05)			
OR	Both	16.4 (n/a)	17.7 (+ 1.3)	17.7 (- 0.0)	18.6 (+ 0.9)	19.8 (+ 1.2)	21.1 (+ 1.3)	+ 1.6 % (p<.01)	13	+ 4.6 (18)	+ 28.2 % (28)
	Male	27.4 (n/a)	29.5 (+ 2.1)	28.5 (- 0.9)	29.5 (+ 1.0)	31.4 (+ 1.8)	33.0 (+ 1.6)	+ 1.1 % (p<.01)			
	Female	6.5 (n/a)	7.1 (+ 0.6)	7.7 (+ 0.6)	8.4 (+ 0.7)	8.8 (+ 0.4)	9.8 (+ 0.9)	+ 2.7 % (p<.01)			
PA	Both	12.1 (n/a)	12.5 (+ 0.4)	12.8 (+ 0.3)	13.9 (+ 1.1)	15.0 (+ 1.1)	16.3 (+ 1.2)	+ 2.0 % (p<.01)	30	+ 4.1 (22)	+ 34.3 % (21)
	Male	21.0 (n/a)	21.3 (+ 0.3)	21.9 (+ 0.6)	23.1 (+ 1.2)	24.7 (+ 1.7)	26.1 (+ 1.3)	+ 1.5 % (p<.01)			
	Female	4.2 (n/a)	4.6 (+ 0.3)	4.6 (+ 0.0)	5.4 (+ 0.9)	6.0 (+ 0.6)	7.1 (+ 1.1)	+ 3.5 % (p<.01)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first and last periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.



### Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, 1999 – 2016

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
RI	Both	9.4 (n/a)	9.0 (- 0.3)	9.0 (- 0.0)	12.8 (+ 3.8)	11.9 (- 0.9)	12.6 (+ 0.7)	+ 2.6 % (p<.05)	43	+ 3.2 (30)	+ 34.1 % (23)
	Male	15.4 (n/a)	15.2 (- 0.2)	14.8 (- 0.3)	21.2 (+ 6.4)	19.2 (- 2.0)	19.6 (+ 0.4)	+ 2.2 % n/s			
	Female	4.0 (n/a)	3.3 (- 0.7)	3.8 (+ 0.4)	5.1 (+ 1.3)	5.1 (+ 0.0)	6.1 (+ 1.0)	+ 3.7 % (p<.05)			
SC	Both	12.8 (n/a)	13.0 (+ 0.2)	13.7 (+ 0.7)	14.9 (+ 1.2)	16.0 (+ 1.1)	17.7 (+ 1.7)	+ 2.3 % (p<.01)	23	+ 4.9 (17)	+ 38.3 % (10)
	Male	21.3 (n/a)	22.5 (+ 1.2)	22.3 (- 0.1)	24.6 (+ 2.2)	26.1 (+ 1.5)	28.0 (+ 1.9)	+ 1.8 % (p<.01)			
	Female	5.4 (n/a)	4.7 (- 0.7)	6.0 (+ 1.3)	6.2 (+ 0.2)	7.0 (+ 0.8)	8.4 (+ 1.4)	+ 3.4 % (p<.05)			
SD	Both	15.7 (n/a)	15.8 (+ 0.1)	17.1 (+ 1.3)	19.3 (+ 2.2)	19.7 (+ 0.4)	22.6 (+ 2.9)	+ 2.5 % (p<.01)	10	+ 7.0 ( 7)	+ 44.5 % ( 6)
	Male	27.6 (n/a)	26.3 (- 1.3)	27.9 (+ 1.6)	30.1 (+ 2.2)	32.0 (+ 1.9)	33.6 (+ 1.6)	+ 1.6 % (p<.01)			
	Female	4.2 (n/a)	5.8 (+ 1.6)	6.4 (+ 0.6)	8.3 (+ 2.0)	7.3 (- 1.0)	11.3 (+ 4.0)	+ 5.8 % (p<.01)			
TN	Both	14.6 (n/a)	15.2 (+ 0.6)	16.1 (+ 0.8)	17.2 (+ 1.1)	17.2 (+ 0.0)	18.2 (+ 1.0)	+ 1.4 % (p<.01)	22	+ 3.5 (28)	+ 24.2 % (31)
	Male	25.1 (n/a)	25.4 (+ 0.3)	26.8 (+ 1.3)	28.0 (+ 1.2)	28.6 (+ 0.6)	29.8 (+ 1.2)	+ 1.2 % (p<.01)			
	Female	5.4 (n/a)	6.3 (+ 0.9)	6.7 (+ 0.4)	7.5 (+ 0.8)	6.9 (- 0.6)	7.6 (+ 0.7)	+ 1.9 % (p<.05)			
TX	Both	12.2 (n/a)	12.7 (+ 0.6)	12.3 (- 0.4)	13.2 (+ 0.9)	13.6 (+ 0.3)	14.5 (+ 0.9)	+ 1.1 % (p<.01)	41	+ 2.3 (37)	+ 18.9 % (36)
	Male	20.4 (n/a)	20.9 (+ 0.5)	20.4 (- 0.6)	22.0 (+ 1.6)	22.2 (+ 0.3)	23.1 (+ 0.9)	+ 0.9 % (p<.05)			
	Female	4.8 (n/a)	5.4 (+ 0.6)	5.0 (- 0.4)	5.2 (+ 0.2)	5.6 (+ 0.4)	6.4 (+ 0.8)	+ 1.6 % (p<.05)			
UT	Both	17.2 (n/a)	19.0 (+ 1.8)	18.2 (- 0.7)	20.2 (+ 2.0)	24.0 (+ 3.8)	25.2 (+ 1.2)	+ 2.7 % (p<.01)	5	+ 8.0 ( 3)	+ 46.5 % ( 4)
	Male	28.2 (n/a)	31.1 (+ 2.9)	29.4 (- 1.7)	32.1 (+ 2.7)	37.8 (+ 5.7)	38.0 (+ 0.2)	+ 2.1 % (p<.05)			
	Female	6.8 (n/a)	7.4 (+ 0.6)	7.5 (+ 0.1)	8.5 (+ 1.0)	10.6 (+ 2.1)	12.6 (+ 2.0)	+ 4.4 % (p<.01)			
VT	Both	13.2 (n/a)	16.2 (+ 3.0)	14.9 (- 1.3)	16.6 (+ 1.7)	18.7 (+ 2.1)	19.7 (+ 1.0)	+ 2.4 % (p<.01)	18	+ 6.4 ( 9)	+ 48.6 % ( 2)
	Male	23.6 (n/a)	28.3 (+ 4.6)	24.3 (- 4.0)	27.3 (+ 3.0)	31.0 (+ 3.7)	32.5 (+ 1.5)	+ 1.9 % (p<.05)			
	Female	4.3 (n/a)	5.2 (+ 0.9)	6.4 (+ 1.3)	6.6 (+ 0.2)	7.3 (+ 0.7)	7.6 (+ 0.3)	+ 3.8 % (p<.01)			
VA	Both	12.8 (n/a)	12.7 (- 0.1)	12.9 (+ 0.3)	13.6 (+ 0.7)	14.6 (+ 0.9)	15.0 (+ 0.5)	+ 1.2 % (p<.01)	37	+ 2.2 (39)	+ 17.4 % (41)
	Male	21.6 (n/a)	21.3 (- 0.2)	21.0 (- 0.4)	22.5 (+ 1.5)	23.6 (+ 1.2)	23.9 (+ 0.2)	+ 0.9 % (p<.05)			
	Female	5.3 (n/a)	5.2 (- 0.1)	5.9 (+ 0.7)	5.6 (- 0.3)	6.4 (+ 0.8)	6.9 (+ 0.5)	+ 1.8 % (p<.05)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first and last periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.

### Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, 1999 – 2016

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
WA	Both	14.8 (n/a)	15.4 (+ 0.5)	14.8 (- 0.6)	15.7 (+ 0.9)	16.6 (+ 0.9)	17.6 (+ 1.0)	+ 1.1 % (p<.05)	24	+ 2.8 (33)	+ 18.8 % (37)
	Male	24.7 (n/a)	25.2 (+ 0.5)	24.1 (- 1.1)	25.1 (+ 1.0)	26.0 (+ 0.9)	27.1 (+ 1.1)	+ 0.6 % n/s			
	Female	5.9 (n/a)	6.4 (+ 0.6)	6.2 (- 0.2)	6.9 (+ 0.7)	7.7 (+ 0.8)	8.5 (+ 0.8)	+ 2.5 % (p<.01)			
WV	Both	15.6 (n/a)	17.2 (+ 1.6)	16.7 (- 0.5)	16.0 (- 0.7)	19.2 (+ 3.2)	21.4 (+ 2.2)	+ 1.8 % n/s	11	+ 5.8 (13)	+ 37.1 % (14)
	Male	27.2 (n/a)	30.1 (+ 2.9)	28.6 (- 1.5)	27.6 (- 1.0)	31.5 (+ 3.9)	33.5 (+ 2.0)	+ 1.1 % n/s			
	Female	5.3 (n/a)	5.5 (+ 0.1)	5.8 (+ 0.3)	5.3 (- 0.5)	7.6 (+ 2.3)	9.8 (+ 2.2)	+ 3.7 % n/s			
WI	Both	13.1 (n/a)	13.5 (+ 0.4)	14.0 (+ 0.5)	15.0 (+ 1.0)	15.3 (+ 0.3)	16.5 (+ 1.2)	+ 1.5 % (p<.01)	28	+ 3.4 (29)	+ 25.8 % (30)
	Male	21.7 (n/a)	22.2 (+ 0.5)	22.7 (+ 0.5)	24.0 (+ 1.2)	24.4 (+ 0.4)	25.7 (+ 1.3)	+ 1.1 % (p<.01)			
	Female	5.1 (n/a)	5.3 (+ 0.2)	5.6 (+ 0.4)	6.4 (+ 0.7)	6.5 (+ 0.1)	7.5 (+ 1.0)	+ 2.5 % (p<.01)			
WY	Both	20.7 (n/a)	23.4 (+ 2.7)	22.5 (- 0.9)	25.4 (+ 2.8)	28.9 (+ 3.5)	28.8 (- 0.1)	+ 2.3 % (p<.01)	3	+ 8.1 ( 1)	+ 39.0 % ( 9)
	Male	34.8 (n/a)	39.3 (+ 4.5)	36.3 (- 3.0)	41.5 (+ 5.2)	47.1 (+ 5.6)	44.6 (- 2.4)	+ 1.8 % (p<.05)			
	Female	7.7 (n/a)	8.2 (+ 0.6)	9.2 (+ 0.9)	9.4 (+ 0.2)	10.7 (+ 1.4)	12.6 (+ 1.9)	+ 3.2 % (p<.01)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first and last periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

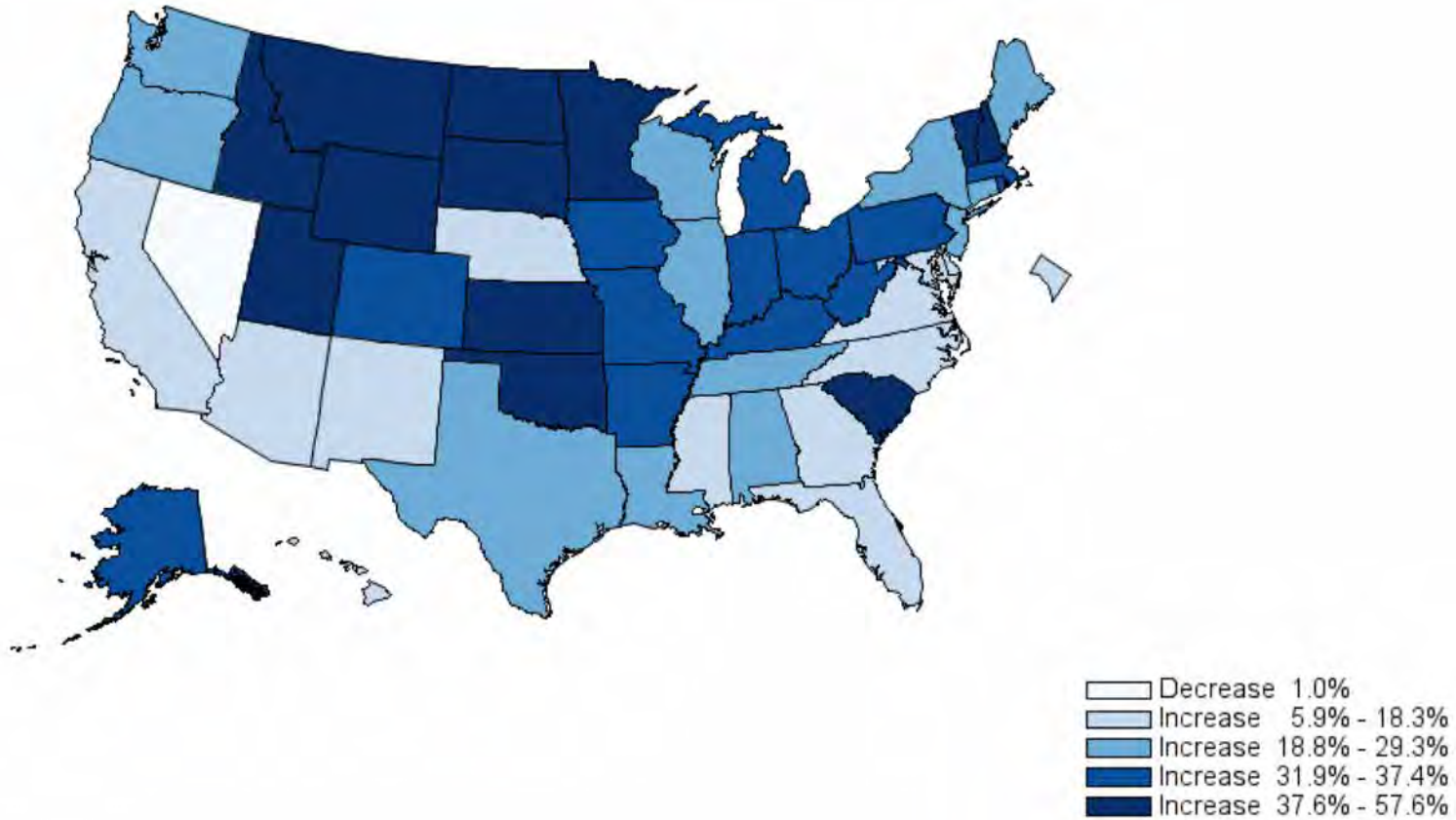
§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.



Figure 1.

**Percentage Changes in Annual Suicide Rates (per 100,000, Age-Adjusted)**  
2014-2016 Compared Against 1999-2001



**Table 2. Select Demographic and Descriptive Characteristics of Suicides among Decedents  $\geq 10$  years of age with and without Known Mental Health Problems--National Violent Death Reporting System, 27 states\*, 2015**

Characteristics	Total (n=20,446)	Mental Health Problem <sup>†</sup> (n=9,407)	No Known Mental Health Problem (n=11,039)	Chi- Square	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>¶</sup> (95% CI)
<b>Sex</b>						
Male	15,702(76.8)	6,469(68.8)	9,233(83.6)	p<.01	2.3(2.2-2.5)	
Female	4,744(23.2)	2,938(31.2)	1,806(16.4)	p<.01	0.4(0.4-0.5)	
<b>Age**</b>						
10-24	2,804(13.7)	1,211(12.9)	1,593(14.4)	p<.01	1.1(1.1-1.2)	
25-44	6,456(31.6)	3,036(32.3)	3,420(31.0)	p<.05	0.9(0.9-1.0)	
45-64	7,718(37.7)	3,820(40.6)	3,898(35.3)	p<.01	0.8(0.8-0.8)	
65+	3,468(17.0)	1,340(14.2)	2,128(19.3)	p<.01	1.4(1.3-1.5)	
<b>Race/ethnicity</b>						
White, non-Hispanic	17,102(83.6)	8,165(86.8)	8,937(81.0)	p<.01	0.6(0.6-0.7)	
Black, non-Hispanic	1,228(6.0)	411(4.4)	817(7.4)	p<.01	1.7(1.5-2.0)	
American Indian/Alaska Native, non-Hispanic	378(1.8)	112(1.2)	266(2.4)	p<.01	2.0(1.6-2.6)	
Asian, non-Hispanic	576(2.8)	235(2.5)	341(3.1)	p<.05	1.2(1.1-1.5)	
Hispanic	1,096(5.4)	463(4.9)	633(5.7)	p<.05	1.2(1.0-1.3)	
Other	66(0.3)	21(0.2)	45(0.4)	p<.05	1.8(1.1-3.1)	
<b>Extended demographics</b>						
Ever served in military <sup>††</sup>	3,429(17.8)	1,354(15.3)	2,075(20.1)	p<.01	1.4(1.3-1.5)	1.1(1.0-1.1)
Homeless	240(1.2)	104(1.1)	136(1.3)		1.1(0.9-1.5)	1.2(0.9-1.5)
<b>Incident Type</b>						
Single suicide	20,063(98.2)	9,318(99.1)	10,745(97.4)	p<.01	0.3(0.3-0.4)	0.4(0.3-0.5)
Homicide followed by suicide	319(1.6)	64(0.7)	255(2.3)	p<.01	3.5(2.6-4.5)	2.9(2.2-3.8)
Multiple suicides	64(0.3)	25(0.3)	39(0.4)		1.3(0.8-2.2)	1.6(0.9-2.6)
<b>Method</b>						
Firearm	9,909(48.5)	3,821(40.6)	6,088(55.3)	p<.01	1.8(1.7-1.9)	1.6(1.5-1.7)
Hanging/Strangulation/Suffocation	5,907(28.9)	2,940(31.3)	2,967(26.9)	p<.01	0.8(0.8-0.9)	0.8(0.7-0.8)



Poisoning		3,003(14.7)	1,861(19.8)	1,142(10.4)	p<.01	0.5(0.4-0.5)	0.6(0.6-0.7)
Substance class causing death <sup>§§</sup>							
Other (e.g., over-the-counter)		1,021(34.0)	666(35.8)	355(31.1)	p<.01	0.8(0.7-0.9)	0.9(0.7-1.0)
Opioids		944(31.4)	608(32.7)	336(29.4)		0.9(0.7-1.0)	0.9(0.8-1.1)
Antidepressants		800(26.6)	644(34.6)	156(13.7)	p<.01	0.3(0.2-0.4)	0.3(0.3-0.4)
Benzodiazepines		624(20.8)	468(25.1)	156(13.7)	p<.01	0.5(0.4-0.6)	0.5(0.4-0.6)
Antipsychotics		219(7.3)	195(10.5)	24(2.1)	p<.01	0.2(0.1-0.3)	0.2(0.1-0.3)
Other		1,595(7.8)	780(8.3)	815(7.4)	p<.05	0.9(0.8-1.0)	0.9(0.8-1.0)
<b>Toxicology Results</b>							
Any toxicology testing		13,317(65.1)	6,658(70.8)	6,659(60.3)	p<.01	0.6(0.6-0.7)	0.7(0.6-0.7)
<b>Positive for ≥ 1 substance<sup>¶¶</sup></b>		9,913(74.4)	5,192(78.0)	4,721(70.9)	p<.01	0.7(0.6-0.7)	0.8(0.7-0.8)
Substance detected***							
Alcohol							
	Tested	10,950(53.6)	5,409(57.5)	5,541(50.2)	p<.01	0.7(0.7-0.8)	0.8(0.7-0.8)
	Positive	4,442(40.6)	2,115(39.1)	2,327(42.0)	p<.01	1.1(1.0-1.2)	1.2(1.1-1.3)
Opioids							
	Tested	8,554(41.8)	4,258(45.3)	4,296(38.9)	p<.01	0.8(0.7-0.8)	0.8(0.8-0.9)
	Positive	2,279(26.6)	1,238(29.1)	1,041(24.2)	p<.01	0.8(0.7-0.9)	0.9(0.8-.99)
Benzodiazepines							
	Tested	8,124(39.7)	4,226(44.9)	3,898(35.3)	p<.01	0.7(0.6-0.7)	0.7(0.7-0.8)
	Positive	2,464(30.3)	1,639(38.8)	825(21.2)	p<.01	0.4(0.4-0.5)	0.5(0.5-0.6)
Cocaine							
	Tested	7,978(39.0)	3,866(41.1)	4,112(37.2)	p<.01	0.9(0.8-0.9)	0.9(0.9-1.0)
	Positive	499(6.3)	216(5.6)	283(6.9)	p<.05	1.2(1.0-1.5)	1.2(1.0-1.5)
Amphetamines							
	Tested	7,615(37.2)	3,696(39.3)	3,919(35.5)	p<.01	0.9(0.8-0.9)	0.9(0.8-0.9)
	Positive	736(9.7)	376(10.2)	360(9.2)		0.9(0.8-1.0)	1.0(0.8-1.1)
Marijuana							
	Tested	6,569(32.1)	3,127(33.2)	3,442(31.2)	p<.01	0.9(0.9-1.0)	0.9(0.9-1.0)
	Positive	1,471(22.4)	710(22.7)	761(22.1)		1.0(0.9-1.1)	0.9(0.8-1.0)
Antidepressants							
	Tested	5,425(26.5)	3,103(33.0)	2,322(21.0)	p<.01	0.5(0.5-0.6)	0.6(0.6-0.7)
	Positive	2,214(40.8)	1,735(55.9)	479(20.6)	p<.01	0.2(0.2-0.2)	0.2(0.2-0.3)

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

† Decedent had been identified as having a current diagnosis of mental health problem in coroner/medical examiner or law enforcement reports.

§ Odds ratio reflects the risk among those without known mental health problem relative to those with known MHP.

¶ Logistic regression was used to estimate adjusted odds ratio with 95% CIs after controlling for age, sex, race and ethnicity. Known MHP was used as the reference group.

\*\* Decedents were aged 10 years and older, as per standard in the suicide prevention literature.

†† Denominator is decedents aged 18 years of age and older with reported military service status.

§§ Denominator is decedents who died by poisoning, including overdose.

¶¶ Denominator is decedents with any toxicology tested.

\*\*\* Denominator for each positive group is the number tested for the substance in that group.

---



**Table 3. Circumstances Preceding Suicide among Decedents  $\geq 10$  years of age with and without Known Mental Health Problems--National Violent Death Reporting System, 27 states\*, 2015**

Characteristics	Total	Mental Health Problem <sup>†</sup>	No Known Mental Health Problem	Chi-Square	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>¶</sup> (95% CI)
Suicide with known circumstances	18,764(91.8)	9,407(100)	9,357(84.8)	p<.01		
<b>Mental Health</b>						
Any Current Diagnosed Mental Health Problem**						
Depression/dysthymia		7,076(75.2)				
Anxiety disorder		1,579(16.8)				
Bipolar disorder		1,431(15.2)				
Schizophrenia		509(5.4)				
PTSD		424(4.5)				
ADD/ADHD		226(2.4)				
Unknown		760(8.1)				
Current depressed mood		3,962(42.1)	3,076(32.9)	p<.01	0.7(0.6-0.7)	0.7(0.6-0.7)
<b>Substance Problems</b>						
<b>Any Current substance problem</b>	5,319(28.3)	2,976(31.6)	2,343(25.0)	p<.01	0.7(0.7-0.8)	0.7(0.7-0.8)
Alcohol problem	3,268(17.4)	1,862(19.8)	1,406(15.0)	p<.01	0.7(0.7-0.8)	0.7(0.7-0.8)
Other substance problem	3,084(16.4)	1,768(18.8)	1,316(14.1)	p<.01	0.7(0.7-0.8)	0.7(0.7-0.8)
<b>Treatment</b>						
Current mental health/substance abuse treatment	5,141(27.4)	5,077(54.0)	64(0.7)	p<.01	0.01(0.01-0.01)	0.01(0.01-0.01)
Ever treated for mental health/substance problem	6,717(35.8)	6,323(67.2)	394(4.2)	p<.01	0.02(0.02-0.02)	0.02(0.02-0.03)
<b>Relationship Problems/Loss</b>						
<b>Any relationship problem/loss</b>	7,948(42.4)	3,726(39.6)	4,222(45.1)	p<.01	1.3(1.2-1.3)	1.3(1.2-1.4)
Intimate partner problem	5,098(27.2)	2,270(24.1)	2,828(30.2)	p<.01	1.4(1.3-1.5)	1.4(1.3-1.5)
Perpetrator of interpersonal violence past month	414(2.2)	131(1.4)	283(3.0)	p<.01	2.2(1.8-2.7)	2.0(1.6-2.4)
Victim of interpersonal violence within past month	84(0.4)	53(0.6)	31(0.3)	p<.05	0.6(0.4-0.9)	0.8(0.5-1.2)
Family relationship problem	1,671(8.9)	873(9.3)	798(8.5)		0.9(0.8-1.0)	1.0(0.9-1.1)

Other relationship problem (non-intimate)	403(2.1)	202(2.1)	201(2.1)		1.0(0.8-1.2)	1.1(0.9-1.3)
Argument or conflict (not specified)	2,914(15.5)	1,278(13.6)	1,636(17.5)	p<.01	1.3(1.2-1.5)	1.4(1.3-1.5)
<b>Death of a loved one (any)</b>	1,497(8.0)	826(8.8)	671(7.2)	p<.01	0.8(0.7-0.9)	0.9(0.8-0.9)
Non-suicide death	1,181(6.3)	647(6.9)	534(5.7)	p<.01	0.8(0.7-0.9)	0.9(0.8-1.0)
Suicide of family or friend	379(2.0)	217(2.3)	162(1.7)	p<.01	0.7(0.6-0.9)	0.8(0.7-1.0)
<b>Other Life Stressors</b>						
<b>Any life stressor</b>	9,743(51.9)	4,675(49.7)	5,068(54.2)	p<.01	1.2(1.1-1.3)	1.1(1.1-1.2)
Recent criminal legal problem	1,588(8.5)	586(6.2)	1,002(10.7)	p<.01	1.8(1.6-2.0)	1.7(1.5-1.9)
Other legal problem	748(4.0)	378(4.0)	370(4.0)		1.0(0.8-1.1)	1.0(0.9-1.2)
Physical health problem	4,179(22.3)	2,012(21.4)	2,167(23.2)	p<.01	1.1(1.0-1.2)	1.0(1.0-1.1)
Job/Financial problem <sup>††</sup>	2941(16.2)	1530(16.8)	1411(15.6)	p<.05	0.9(0.8-1.0)	0.9(0.8-1.0)
Eviction or loss of home	722(3.8)	317(3.4)	405(4.3)	p<.01	1.3(1.1-1.5)	1.4(1.2-1.6)
School problem <sup>§§</sup>	162(19.9)	70(17.8)	92(21.9)		1.3(0.9-1.8)	1.3(0.9-1.9)
Recent release from an institution <sup>¶¶</sup>	1,412(7.6)	941(10.2)	471(5.1)	p<.01	0.5(0.4-0.5)	0.5(0.4-0.5)
Jail/prison/detention facility	203(14.4)	82(8.7)	121(25.7)	p<.01	3.6(2.7-4.9)	4.5(3.2-6.4)
Hospital	517(36.6)	311(33.0)	206(43.7)	p<.01	1.6(1.3-2.0)	1.3(1.0-1.7)
Psychiatric hospital/institution	469(33.2)	439(46.7)	30(6.4)	p<.01	0.1(0.1-0.1)	0.1(0.1-0.1)
Other (includes alc/SA treatment facilities)	223(15.8)	109(11.6)	114(24.2)	p<.01	2.4(1.8-3.3)	2.5(1.8-3.3)
<b>Recent or Impending Crisis</b>						
Crisis within past or upcoming two weeks <sup>***</sup>	5,525(29.4)	2,444(26.0)	3,081(32.9)	p<.01	1.4(1.3-1.5)	1.4(1.3-1.5)
Intimate partner problem crisis	1968(35.6)	854(34.9)	1114(36.2)		1.1(0.9-1.2)	1.1(0.9-1.2)
Physical health problem crisis	739(13.4)	315(12.9)	424(13.8)		1.1(0.9-1.3)	1.0(0.8-1.2)
Criminal legal problem crisis	621(11.2)	203(8.3)	418(13.6)	p<.01	1.7(1.5-2.1)	1.6(1.3-1.9)
Family relationship problem crisis	430(7.8)	212(8.7)	218(7.1)	p<.05	0.8(0.7-1.0)	0.9(0.7-1.1)
Job problem crisis	354(6.4)	191(7.8)	163(5.3)	p<.01	0.7(0.5-0.8)	0.7(0.5-0.8)
<b>Suicide Event/History</b>						
Left a note	6,468(34.5)	3,182(33.8)	3,286(35.1)		1.1(1.0-1.1)	1.2(1.1-1.2)
Disclosed suicide intent	4,405(23.5)	2,306(24.5)	2,099(22.4)	p<.01	0.9(0.8-1.0)	0.9(0.8-0.9)
History of ideation	5,990(31.9)	3,838(40.8)	2,152(23.0)	p<.01	0.4(0.4-0.5)	0.4(0.4-0.5)
History of attempts	3,732(19.9)	2,770(29.4)	962(10.3)	p<.01	0.3(0.3-0.3)	0.3(0.3-0.3)

\*Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

<sup>†</sup> Decedent had been identified as having a current diagnosis of mental health problem in coroner/medical examiner or law enforcement reports.



§ Odds ratio reflects the risk among those without known mental health problem relative to those with known MHP.

¶ Logistic regression was used to estimate adjusted odds ratio with 95% CIs after controlling for age, sex, race and ethnicity. Known MHP was used as the reference group.

\*\* Includes decedents with one or more diagnosed current mental health problems, which are not mutually exclusive. Therefore sums of percentages for the diagnosed conditions exceed 100%. Denominator includes the number of decedents with one or more current diagnosed mental health problems.

†† Denominator is decedents aged 18 years of age and older.

§§ Denominator is decedents aged 10-18 years.

¶¶ Denominator of institution subgroup is decedents with recent release from an institution. Recent release from an institution is defined as having occurred within the past month.

\*\*\* Denominator of crisis subgroup is decedents with any crisis within past or upcoming two weeks. Crises depicted here represent the most commonly occurring categories.

---

April 10, 2018

**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, National Vital Statistics System, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
U.S.	Both	12.3 (n/a)	12.7 (+ 0.4)	12.9 (+ 0.2)	13.8 (+ 0.9)	14.5 (+ 0.8)	15.4 (+ 0.9)	+ 1.5 % (p<.01)	n/a	+ 3.1 (n/a)	+ 25.4 % (n/a)
	Male	20.9 (n/a)	21.2 (+ 0.4)	21.3 (+ 0.0)	22.5 (+1.3)	23.5 (+ 1.0)	24.5 (+ 1.0)	+ 1.1 % (p<.01)			
	Female	4.7 (n/a)	5.0 (+ 0.3)	5.3 (+ 0.2)	5.7 (+ 0.4)	6.2 (+ 0.5)	6.9 (+ 0.7)	+ 2.6 % (p<.01)			
AL	Both	14.3 (n/a)	13.4 (- 0.9)	14.1 (+ 0.6)	15.6 (+ 1.6)	16.4 (+ 0.7)	17.5 (+ 1.1)	+ 1.6 % (p<.05)	25	+ 3.1 (31)	+ 21.9 % (33)
	Male	25.1 (n/a)	23.4 (- 1.7)	24.4 (+ 1.0)	26.4 (+ 2.0)	27.6 (+ 1.1)	29.1 (+ 1.5)	+ 1.3 % (p<.05)			
	Female	5.1 (n/a)	4.8 (- 0.3)	5.0 (+ 0.2)	6.1 (+ 1.1)	6.4 (+ 0.3)	7.0 (+ 0.7)	+ 2.6 % (p<.01)			
AK	Both	21.0 (n/a)	24.8 (+ 3.8)	24.2 (- 0.6)	26.0 (+ 1.7)	25.4 (- 0.5)	28.8 (+ 3.4)	+ 1.7 % (p<.05)	2	+ 7.8 ( 4)	+ 37.4 % (13)
	Male	33.2 (n/a)	38.1 (+ 4.9)	38.9 (+ 0.8)	40.1 (+ 1.2)	40.1 (- 0.1)	42.9 (+ 2.8)	+ 1.4 % (p<.01)			
	Female	8.6 (n/a)	11.4 (+ 2.9)	9.8 (- 1.6)	11.1 (+ 1.2)	9.9 (- 1.2)	13.2 (+ 3.4)	+ 1.7 % n/s			
AZ	Both	17.8 (n/a)	18.5 (+ 0.7)	19.1 (+ 0.5)	19.1 (- 0.0)	20.4 (+ 1.3)	20.9 (+ 0.5)	+ 1.0 % (p<.01)	15	+ 3.1 (32)	+ 17.3 % (42)
	Male	29.3 (n/a)	30.2 (+ 1.0)	30.6 (+ 0.4)	30.2 (- 0.5)	32.0 (+ 1.9)	32.4 (+ 0.4)	+ 0.6 % (p<.05)			
	Female	7.1 (n/a)	7.5 (+ 0.4)	8.2 (+ 0.7)	8.6 (+ 0.5)	9.2 (+ 0.6)	9.9 (+ 0.6)	+ 2.2 % (p<.01)			
AR	Both	15.5 (n/a)	15.8 (+ 0.3)	16.2 (+ 0.5)	17.6 (+ 1.4)	19.2 (+ 1.6)	21.2 (+ 2.0)	+ 2.2 % (p<.01)	12	+ 5.7 (14)	+ 36.8 % (15)
	Male	26.7 (n/a)	26.7 (+ 0.0)	27.2 (+ 0.5)	28.2 (+ 1.0)	31.7 (+ 3.5)	33.5 (+ 1.9)	+ 1.6 % (p<.05)			
	Female	5.6 (n/a)	5.9 (+ 0.3)	6.2 (+ 0.4)	7.9 (+ 1.7)	7.5 (- 0.4)	9.6 (+ 2.1)	+ 3.6 % (p<.01)			
CA	Both	10.6 (n/a)	11.3 (+ 0.7)	11.0 (- 0.3)	12.0 (+ 1.0)	11.8 (- 0.1)	12.1 (+ 0.3)	+ 0.9 % (p<.05)	45	+ 1.6 (46)	+ 14.8 % (46)
	Male	17.9 (n/a)	18.4 (+ 0.5)	17.7 (- 0.7)	19.1 (+ 1.4)	18.9 (- 0.2)	19.2 (+ 0.3)	+ 0.5 % n/s			
	Female	4.1 (n/a)	5.0 (+ 0.9)	4.9 (- 0.1)	5.4 (+ 0.5)	5.3 (- 0.1)	5.6 (+ 0.3)	+ 1.7 % (p<.05)			
CO	Both	17.3 (n/a)	19.2 (+ 1.9)	19.0 (- 0.2)	20.0 (+ 1.0)	21.6 (+ 1.5)	23.2 (+ 1.6)	+ 1.8 % (p<.01)	8	+ 5.9 (12)	+ 34.1 % (22)
	Male	28.6 (n/a)	30.9 (+ 2.3)	30.5 (- 0.4)	31.5 (+ 1.0)	33.4 (+ 1.9)	36.3 (+ 2.9)	+ 1.4 % (p<.01)			
	Female	7.0 (n/a)	8.2 (+ 1.3)	8.2 (+ 0.0)	9.1 (+ 0.9)	10.1 (+ 1.0)	10.4 (+ 0.3)	+ 2.6 % (p<.01)			
CT	Both	9.6 (n/a)	8.9 (- 0.7)	9.1 (+ 0.2)	10.2 (+ 1.1)	11.0 (+ 0.8)	11.5 (+ 0.5)	+ 1.6 % (p<.05)	46	+ 1.9 (43)	+ 19.2 % (34)
	Male	16.4 (n/a)	14.6 (- 1.8)	15.0 (+ 0.4)	16.6 (+ 1.6)	17.6 (+ 1.0)	17.3 (- 0.3)	+ 0.9 % n/s			
	Female	3.6 (n/a)	3.8 (+ 0.2)	3.7 (- 0.2)	4.4 (+ 0.7)	4.9 (+ 0.5)	6.2 (+ 1.3)	+ 3.5 % (p<.05)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.



**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, National Vital Statistics System, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
DE	Both	13.6 (n/a)	12.2 (- 1.4)	11.9 (- 0.3)	13.6 (+ 1.7)	14.2 (+ 0.6)	14.4 (+ 0.2)	+ 0.9 % n/s	42	+ 0.8 (50)	+ 5.9 % (50)
	Male	23.0 (n/a)	20.3 (- 2.7)	19.9 (- 0.4)	23.1 (+ 3.2)	22.7 (- 0.4)	23.5 (+ 0.8)	+ 0.6 % n/s			
	Female	5.3 (n/a)	5.0 (- 0.2)	4.6 (- 0.4)	4.9 (+ 0.3)	6.4 (+ 1.5)	6.2 (- 0.2)	+ 1.6 % n/s			
DC	Both	5.9 (n/a)	6.4 (+ 0.5)	6.4 (- 0.0)	7.3 (+ 0.8)	6.6 (- 0.7)	6.9 (+ 0.3)	+ 0.9 % n/s	51	+ 1.0 (48)	+ 16.1 % (45)
	Male	10.7 (n/a)	11.1 (+ 0.4)	10.3 (- 0.8)	12.7 (+ 2.4)	10.0 (- 2.6)	11.7 (+ 1.7)	+ 0.3 % n/s			
	Female	1.7 (n/a) ††	2.3 (+ 0.6) ††	3.3 (+ 1.0)	2.6 (- 0.7)	3.6 (+ 1.0)	2.8 (- 0.8)	+ 3.5 % n/s			
FL	Both	14.8 (n/a)	15.2 (+ 0.4)	14.9 (- 0.3)	16.3 (+ 1.4)	16.3 (- 0.0)	16.4 (+ 0.1)	+ 0.8 % (p<.05)	29	+ 1.6 (45)	+ 10.6 % (48)
	Male	24.3 (n/a)	24.4 (+ 0.1)	23.6 (- 0.8)	26.2 (+ 2.6)	25.6 (- 0.6)	25.6 (- 0.1)	+ 0.5 % n/s			
	Female	6.3 (n/a)	6.8 (+ 0.5)	6.8 (+ 0.0)	7.1 (+ 0.3)	7.6 (+ 0.5)	7.8 (+ 0.3)	+ 1.4 % (p<.01)			
GA	Both	12.9 (n/a)	13.2 (+ 0.3)	12.3 (- 0.9)	13.2 (+ 0.9)	13.7 (+ 0.5)	15.0 (+ 1.3)	+ 0.9 % n/s	39	+ 2.1 (40)	+ 16.2 % (44)
	Male	22.1 (n/a)	23.1 (+ 1.0)	21.3 (- 1.8)	21.9 (+ 0.6)	22.6 (+ 0.7)	24.4 (+ 1.7)	+ 0.5 % n/s			
	Female	5.0 (n/a)	4.8 (- 0.2)	4.6 (- 0.2)	5.5 (+ 0.9)	5.8 (+ 0.3)	6.6 (+ 0.8)	+ 2.1 % (p<.05)			
HI	Both	12.9 (n/a)	11.1 (- 1.8)	10.3 (- 0.7)	14.5 (+ 4.1)	14.4 (- 0.1)	15.2 (+ 0.8)	+ 2.0 % n/s	35	+ 2.4 (35)	+ 18.3 % (38)
	Male	20.4 (n/a)	17.2 (- 3.1)	15.3 (- 1.9)	21.9 (+ 6.7)	22.5 (+ 0.5)	24.3 (+ 1.8)	+ 2.1 % n/s			
	Female	5.4 (n/a)	5.0 (- 0.4)	5.5 (+ 0.5)	7.1 (+ 1.5)	6.2 (- 0.9)	5.9 (- 0.3)	+ 1.2 % n/s			
ID	Both	17.3 (n/a)	19.2 (+ 2.0)	18.3 (- 0.9)	21.6 (+ 3.3)	21.9 (+ 0.3)	24.7 (+ 2.8)	+ 2.3 % (p<.01)	6	+ 7.5 ( 6)	+ 43.2 % ( 7)
	Male	28.4 (n/a)	33.1 (+ 4.7)	31.1 (- 2.0)	34.9 (+ 3.8)	34.7 (- 0.2)	38.0 (+ 3.3)	+ 1.6 % (p<.05)			
	Female	7.2 (n/a)	6.1 (- 1.1)	6.1 (+ 0.0)	9.0 (+ 2.9)	9.5 (+ 0.5)	11.8 (+ 2.3)	+ 4.4 % (p<.05)			
IL	Both	9.9 (n/a)	9.8 (- 0.1)	9.7 (- 0.1)	10.6 (+ 0.8)	11.2 (+ 0.6)	12.2 (+ 1.0)	+ 1.5 % (p<.05)	44	+ 2.3 (38)	+ 22.8 % (32)
	Male	17.1 (n/a)	16.7 (- 0.4)	16.2 (- 0.4)	17.6 (+ 1.4)	18.5 (+ 0.9)	19.8 (+ 1.3)	+ 1.1 % (p<.05)			
	Female	3.7 (n/a)	3.6 (- 0.0)	3.8 (+ 0.2)	4.2 (+ 0.4)	4.5 (+ 0.4)	5.2 (+ 0.6)	+ 2.4 % (p<.01)			
IN	Both	13.0 (n/a)	13.7 (+ 0.7)	14.4 (+ 0.7)	14.9 (+ 0.5)	16.4 (+ 1.4)	17.1 (+ 0.7)	+ 1.9 % (p<.01)	26	+ 4.1 (23)	+ 31.9 % (25)
	Male	22.4 (n/a)	23.2 (+ 0.8)	24.4 (+ 1.2)	24.7 (+ 0.4)	26.7 (+ 2.0)	28.3 (+ 1.6)	+ 1.5 % (p<.01)			
	Female	4.6 (n/a)	5.0 (+ 0.4)	5.3 (+ 0.2)	5.9 (+ 0.6)	6.8 (+ 0.9)	6.6 (- 0.2)	+ 2.7 % (p<.01)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.

**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, National Vital Statistics System, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
IA	Both	11.8 (n/a)	13.2 (+ 1.4)	12.8 (- 0.4)	14.2 (+ 1.4)	15.9 (+ 1.7)	16.0 (+ 0.1)	+ 2.1 % (p<.01)	31	+ 4.3 (20)	+ 36.2 % (18)
	Male	20.6 (n/a)	22.1 (+ 1.5)	20.8 (- 1.4)	23.3 (+ 2.5)	26.0 (+ 2.7)	25.7 (- 0.3)	+ 1.6 % (p<.05)			
	Female	3.7 (n/a)	4.7 (+ 1.0)	5.3 (+ 0.6)	5.5 (+ 0.2)	6.1 (+ 0.6)	6.7 (+ 0.6)	+ 3.8 % (p<.01)			
KS	Both	13.3 (n/a)	15.1 (+ 1.8)	15.8 (+ 0.7)	15.3 (- 0.5)	17.7 (+ 2.4)	19.4 (+ 1.6)	+ 2.2 % (p<.01)	19	+ 6.0 (11)	+ 45.0 % ( 5)
	Male	22.7 (n/a)	25.0 (+ 2.3)	26.5 (+ 1.5)	25.6 (- 0.9)	29.1 (+ 3.5)	30.7 (+ 1.6)	+ 1.9 % (p<.01)			
	Female	4.6 (n/a)	6.0 (+ 1.4)	5.7 (- 0.3)	5.4 (- 0.3)	6.8 (+ 1.4)	8.4 (+ 1.6)	+ 3.2 % (p<.05)			
KY	Both	14.1 (n/a)	15.4 (+ 1.3)	16.7 (+ 1.3)	16.2 (- 0.5)	18.2 (+ 2.0)	19.3 (+ 1.1)	+ 1.9 % (p<.01)	20	+ 5.2 (16)	+ 36.6 % (16)
	Male	25.0 (n/a)	26.8 (+ 1.9)	28.3 (+ 1.4)	27.2 (- 1.0)	30.1 (+ 2.9)	31.7 (+ 1.6)	+ 1.4 % (p<.01)			
	Female	4.8 (n/a)	5.2 (+ 0.4)	6.1 (+ 0.8)	6.1 (+ 0.1)	7.1 (+ 0.9)	7.7 (+ 0.6)	+ 3.2 % (p<.01)			
LA	Both	13.1 (n/a)	12.9 (- 0.2)	13.4 (+ 0.4)	13.6 (+ 0.3)	14.4 (+ 0.8)	17.0 (+ 2.5)	+ 1.6 % (p<.05)	27	+ 3.8 (27)	+ 29.3 % (26)
	Male	22.9 (n/a)	22.3 (- 0.6)	22.4 (+ 0.1)	23.3 (+ 0.8)	23.7 (+ 0.5)	27.3 (+ 3.6)	+ 1.1 % n/s			
	Female	4.8 (n/a)	4.7 (- 0.1)	5.2 (+ 0.5)	4.9 (- 0.2)	6.1 (+ 1.2)	7.5 (+ 1.4)	+ 2.8 % (p<.05)			
ME	Both	14.5 (n/a)	13.6 (- 0.9)	14.4 (+ 0.8)	15.4 (+ 1.0)	18.9 (+ 3.5)	18.5 (- 0.4)	+ 2.2 % (p<.05)	21	+ 4.0 (25)	+ 27.4 % (29)
	Male	25.0 (n/a)	22.9 (- 2.1)	24.6 (+ 1.7)	25.7 (+ 1.1)	31.1 (+ 5.4)	29.8 (- 1.3)	+ 1.8 % (p<.05)			
	Female	5.3 (n/a)	5.3 (- 0.0)	5.2 (- 0.1)	6.0 (+ 0.7)	7.6 (+ 1.6)	7.9 (+ 0.3)	+ 3.1 % (p<.05)			
MD	Both	10.0 (n/a)	10.3 (+ 0.3)	10.1 (- 0.2)	10.2 (+ 0.1)	10.7 (+ 0.5)	10.8 (+ 0.1)	+ 0.5 % (p<.05)	47 §§	+ 0.8 (49 §§)	+ 8.5 % (49 §§)
	Male	17.6 (n/a)	17.8 (+ 0.1)	17.3 (- 0.5)	17.7 (+ 0.4)	18.2 (+ 0.5)	18.0 (- 0.2)	+ 0.2 % n/s			
	Female	3.5 (n/a)	3.8 (+ 0.4)	3.9 (+ 0.0)	3.7 (- 0.2)	4.1 (+ 0.4)	4.5 (+ 0.4)	+ 1.3 % (p<.05)			
MA	Both	7.4 (n/a)	7.6 (+ 0.2)	8.4 (+ 0.8)	9.3 (+ 1.0)	9.8 (+ 0.4)	10.0 (+ 0.3)	+ 2.3 % (p<.01)	48	+ 2.6 (34 ¶¶)	+ 35.3 % (20 ¶¶)
	Male	12.1 (n/a)	12.8 (+ 0.7)	13.3 (+ 0.5)	15.4 (+ 2.1)	15.2 (- 0.2)	16.0 (+ 0.8)	+ 2.0 % (p<.01)			
	Female	3.3 (n/a)	2.9 (- 0.4)	4.0 (+ 1.0)	3.8 (- 0.1)	4.8 (+ 1.0)	4.6 (- 0.2)	+ 3.0 % (p<.05)			
MI	Both	11.8 (n/a)	12.5 (+ 0.7)	12.9 (+ 0.4)	13.9 (+ 1.0)	14.5 (+ 0.7)	15.6 (+ 1.1)	+ 1.9 % (p<.01)	33	+ 3.9 (26)	+ 32.9 % (24)
	Male	20.0 (n/a)	20.9 (+ 0.9)	21.6 (+ 0.7)	22.8 (+ 1.3)	23.9 (+ 1.0)	25.0 (+ 1.2)	+ 1.5 % (p<.01)			
	Female	4.4 (n/a)	4.8 (+ 0.4)	5.0 (+ 0.2)	5.6 (+ 0.6)	5.9 (+ 0.3)	6.7 (+ 0.9)	+ 2.8 % (p<.01)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.



**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, National Vital Statistics System, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
MN	Both	10.7 (n/a)	11.5 (+ 0.9)	12.4 (+ 0.8)	12.9 (+ 0.5)	14.2 (+ 1.3)	15.0 (+ 0.9)	+ 2.3 % (p<.01)	38	+ 4.3 (19)	+ 40.6 % ( 8)
	Male	18.3 (n/a)	19.3 (+ 1.1)	20.4 (+ 1.0)	20.9 (+ 0.6)	22.9 (+ 1.9)	23.3 (+ 0.4)	+ 1.7 % (p<.01)			
	Female	3.6 (n/a)	4.2 (+ 0.6)	4.8 (+ 0.6)	5.1 (+ 0.4)	5.8 (+ 0.6)	6.9 (+ 1.2)	+ 4.2 % (p<.01)			
MS	Both	12.9 (n/a)	14.1 (+ 1.2)	14.7 (+ 0.6)	15.5 (+ 0.8)	15.6 (+ 0.1)	15.2 (- 0.3)	+ 1.1 % (p<.05)	36	+ 2.3 (36)	+ 17.8 % (40)
	Male	22.9 (n/a)	24.6 (+ 1.7)	25.1 (+ 0.6)	26.8 (+ 1.7)	25.9 (- 0.9)	25.3 (- 0.6)	+ 0.7 % n/s			
	Female	4.3 (n/a)	5.0 (+ 0.7)	5.5 (+ 0.5)	5.5 (- 0.0)	6.4 (+ 0.9)	6.2 (- 0.2)	+ 2.4 % (p<.01)			
MO	Both	14.7 (n/a)	14.1 (- 0.6)	15.4 (+ 1.3)	16.0 (+ 0.7)	17.8 (+ 1.7)	20.0 (+ 2.3)	+ 2.2 % (p<.01)	16	+ 5.3 (15)	+ 36.4 % (17)
	Male	25.3 (n/a)	23.7 (- 1.6)	25.6 (+ 1.9)	26.6 (+ 1.0)	28.9 (+ 2.3)	32.2 (+ 3.3)	+ 1.8 % (p<.05)			
	Female	5.4 (n/a)	5.4 (+ 0.1)	6.1 (+ 0.7)	6.3 (+ 0.2)	7.4 (+ 1.1)	8.6 (+ 1.2)	+ 3.2 % (p<.01)			
MT	Both	21.1 (n/a)	22.6 (+ 1.4)	23.6 (+ 1.0)	24.7 (+ 1.1)	26.7 (+ 2.0)	29.2 (+ 2.5)	+ 2.1 % (p<.01)	1	+ 8.0 ( 2)	+ 38.0 % (11)
	Male	36.9 (n/a)	37.3 (+ 0.4)	39.8 (+ 2.5)	39.7 (- 0.1)	41.0 (+ 1.4)	45.5 (+ 4.4)	+ 1.3 % (p<.01)			
	Female	6.7 (n/a)	8.4 (+ 1.8)	8.4 (- 0.1)	10.0 (+ 1.6)	12.6 (+ 2.6)	13.1 (+ 0.5)	+ 4.6 % (p<.01)			
NE	Both	12.7 (n/a)	12.2 (- 0.5)	12.6 (+ 0.4)	11.7 (- 0.8)	13.5 (+ 1.8)	14.8 (+ 1.3)	+ 1.0 % n/s	40	+ 2.1 (42)	+ 16.2 % (43)
	Male	22.2 (n/a)	20.7 (- 1.5)	20.3 (- 0.4)	19.8 (- 0.5)	22.0 (+ 2.2)	23.9 (+ 1.9)	+ 0.6 % n/s			
	Female	3.8 (n/a)	4.2 (+ 0.4)	5.1 (+ 0.9)	4.0 (- 1.1)	5.5 (+ 1.4)	5.8 (+ 0.3)	+ 2.6 % n/s			
NV	Both	23.3 (n/a)	22.6 (- 0.6)	22.1 (- 0.5)	22.6 (+ 0.5)	21.4 (- 1.2)	23.1 (+ 1.6)	- 0.2 % n/s	9	- 0.2 (51)	- 1.0 % (51)
	Male	38.3 (n/a)	36.7 (- 1.7)	35.1 (- 1.6)	35.6 (+ 0.5)	32.5 (- 3.0)	35.4 (+ 2.8)	- 0.7 % n/s			
	Female	8.9 (n/a)	9.5 (+ 0.5)	9.6 (+ 0.1)	10.0 (+ 0.4)	10.6 (+ 0.6)	11.2 (+ 0.6)	+ 1.5 % (p<.01)			
NH	Both	13.5 (n/a)	12.5 (- 1.0)	13.3 (+ 0.8)	15.2 (+ 1.9)	15.8 (+ 0.6)	20.0 (+ 4.2)	+ 2.7 % (p<.05)	17	+ 6.5 ( 8)	+ 48.3 % ( 3)
	Male	22.5 (n/a)	21.1 (- 1.4)	21.7 (+ 0.6)	24.8 (+ 3.1)	25.4 (+ 0.6)	30.6 (+ 5.2)	+ 2.2 % (p<.05)			
	Female	5.3 (n/a)	4.8 (- 0.5)	5.9 (+ 1.0)	6.2 (+ 0.4)	6.6 (+ 0.4)	9.8 (+ 3.2)	+ 3.9 % (p<.05)			
NJ	Both	7.8 (n/a)	7.7 (- 0.1)	7.5 (- 0.2)	8.0 (+ 0.5)	8.9 (+ 0.9)	9.2 (+ 0.4)	+ 1.3 % (p<.05)	50	+ 1.5 (47)	+ 19.2 % (35)
	Male	13.0 (n/a)	13.1 (+ 0.0)	12.6 (- 0.5)	13.7 (+ 1.1)	14.5 (+ 0.8)	14.6 (+ 0.1)	+ 0.9 % (p<.05)			
	Female	3.2 (n/a)	2.9 (- 0.3)	3.0 (+ 0.0)	2.9 (- 0.1)	3.8 (+ 0.9)	4.4 (+ 0.6)	+ 2.3 % n/s			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.

**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, National Vital Statistics System, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
NM	Both	22.0 (n/a)	22.0 (- 0.1)	21.8 (- 0.2)	23.0 (+ 1.2)	24.1 (+ 1.1)	26.0 (+ 1.9)	+ 1.1 % (p<.05)	4	+ 4.0 (24)	+ 18.3 % (39)
	Male	36.8 (n/a)	37.7 (+ 0.9)	36.4 (- 1.2)	35.8 (- 0.6)	37.1 (+ 1.3)	40.7 (+ 3.6)	+ 0.4 % n/s			
	Female	8.5 (n/a)	7.4 (- 1.1)	8.2 (+ 0.7)	10.7 (+ 2.6)	11.7 (+ 0.9)	12.0 (+ 0.3)	+ 3.3 % (p<.05)			
NY	Both	7.2 (n/a)	7.1 (- 0.1)	7.7 (+ 0.6)	8.4 (+ 0.8)	9.5 (+ 1.1)	9.3 (- 0.1)	+ 2.1 % (p<.01)	49	+ 2.1 (41)	+ 28.8 % (27)
	Male	12.5 (n/a)	12.2 (- 0.3)	12.9 (+ 0.7)	13.9 (+ 1.0)	15.4 (+ 1.4)	14.5 (- 0.9)	+ 1.4 % (p<.05)			
	Female	2.7 (n/a)	2.6 (- 0.1)	3.0 (+ 0.3)	3.5 (+ 0.5)	4.2 (+ 0.7)	4.6 (+ 0.5)	+ 4.2 % (p<.01)			
NC	Both	13.6 (n/a)	13.5 (- 0.1)	13.7 (+ 0.1)	14.2 (+ 0.5)	14.5 (+ 0.4)	15.3 (+ 0.8)	+ 0.8 % (p<.01)	34	+ 1.7 (44)	+ 12.7 % (47)
	Male	22.7 (n/a)	22.7 (+ 0.0)	22.2 (- 0.6)	23.3 (+ 1.1)	23.3 (+ 0.0)	23.9 (+ 0.6)	+ 0.4 % n/s			
	Female	5.6 (n/a)	5.5 (- 0.2)	6.2 (+ 0.8)	6.0 (- 0.2)	6.7 (+ 0.7)	7.6 (+ 0.9)	+ 2.0 % (p<.05)			
ND	Both	13.3 (n/a)	14.6 (+ 1.3)	16.0 (+ 1.4)	16.6 (+ 0.6)	18.4 (+ 1.9)	20.9 (+ 2.5)	+ 2.9 % (p<.01)	14	+ 7.6 ( 5)	+ 57.6 % ( 1)
	Male	21.4 (n/a)	24.6 (+ 3.2)	28.0 (+ 3.4)	27.1 (- 0.9)	29.6 (+ 2.5)	32.7 (+ 3.0)	+ 2.5 % (p<.01)			
	Female	5.6 (n/a)	4.5 (- 1.0)	3.7 (- 0.8)	5.7 (+ 2.0)	6.7 (+ 1.0)	8.5 (+ 1.8)	+ 3.9 % n/s			
OH	Both	11.6 (n/a)	12.3 (+ 0.8)	13.1 (+ 0.8)	13.4 (+ 0.2)	14.8 (+ 1.4)	15.8 (+ 1.0)	+ 2.0 % (p<.01)	32	+ 4.2 (21)	+ 36.0 % (19)
	Male	20.4 (n/a)	20.9 (+ 0.5)	22.2 (+ 1.3)	22.1 (- 0.1)	24.2 (+ 2.1)	25.5 (+ 1.3)	+ 1.5 % (p<.01)			
	Female	4.0 (n/a)	4.7 (+ 0.7)	4.9 (+ 0.1)	5.3 (+ 0.5)	6.2 (+ 0.9)	6.7 (+ 0.6)	+ 3.4 % (p<.01)			
OK	Both	17.0 (n/a)	16.5 (- 0.6)	17.2 (+ 0.8)	18.4 (+ 1.1)	20.7 (+ 2.3)	23.5 (+ 2.8)	+ 2.3 % (p<.05)	7	+ 6.4 (10)	+ 37.6 % (12)
	Male	28.5 (n/a)	27.3 (- 1.2)	27.8 (+ 0.5)	30.3 (+ 2.5)	33.4 (+ 3.1)	37.3 (+ 3.8)	+ 2.0 % (p<.05)			
	Female	6.6 (n/a)	6.4 (- 0.2)	7.5 (+ 1.1)	7.0 (- 0.5)	8.5 (+ 1.6)	10.3 (+ 1.8)	+ 2.9 % (p<.05)			
OR	Both	16.4 (n/a)	17.7 (+ 1.3)	17.7 (- 0.0)	18.6 (+ 0.9)	19.8 (+ 1.2)	21.1 (+ 1.3)	+ 1.6 % (p<.01)	13	+ 4.6 (18)	+ 28.2 % (28)
	Male	27.4 (n/a)	29.5 (+ 2.1)	28.5 (- 0.9)	29.5 (+ 1.0)	31.4 (+ 1.8)	33.0 (+ 1.6)	+ 1.1 % (p<.01)			
	Female	6.5 (n/a)	7.1 (+ 0.6)	7.7 (+ 0.6)	8.4 (+ 0.7)	8.8 (+ 0.4)	9.8 (+ 0.9)	+ 2.7 % (p<.01)			
PA	Both	12.1 (n/a)	12.5 (+ 0.4)	12.8 (+ 0.3)	13.9 (+ 1.1)	15.0 (+ 1.1)	16.3 (+ 1.2)	+ 2.0 % (p<.01)	30	+ 4.1 (22)	+ 34.3 % (21)
	Male	21.0 (n/a)	21.3 (+ 0.3)	21.9 (+ 0.6)	23.1 (+ 1.2)	24.7 (+ 1.7)	26.1 (+ 1.3)	+ 1.5 % (p<.01)			
	Female	4.2 (n/a)	4.6 (+ 0.3)	4.6 (+ 0.0)	5.4 (+ 0.9)	6.0 (+ 0.6)	7.1 (+ 1.1)	+ 3.5 % (p<.01)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.



**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, National Vital Statistics System, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
RI	Both	9.4 (n/a)	9.0 (- 0.3)	9.0 (- 0.0)	12.8 (+ 3.8)	11.9 (- 0.9)	12.6 (+ 0.7)	+ 2.6 % (p<.05)	43	+ 3.2 (30 ¶¶)	+ 34.1 % (23 ¶¶)
	Male	15.4 (n/a)	15.2 (- 0.2)	14.8 (- 0.3)	21.2 (+ 6.4)	19.2 (- 2.0)	19.6 (+ 0.4)	+ 2.2 % n/s			
	Female	4.0 (n/a)	3.3 (- 0.7)	3.8 (+ 0.4)	5.1 (+ 1.3)	5.1 (+ 0.0)	6.1 (+ 1.0)	+ 3.7 % (p<.05)			
SC	Both	12.8 (n/a)	13.0 (+ 0.2)	13.7 (+ 0.7)	14.9 (+ 1.2)	16.0 (+ 1.1)	17.7 (+ 1.7)	+ 2.3 % (p<.01)	23	+ 4.9 (17)	+ 38.3 % (10)
	Male	21.3 (n/a)	22.5 (+ 1.2)	22.3 (- 0.1)	24.6 (+ 2.2)	26.1 (+ 1.5)	28.0 (+ 1.9)	+ 1.8 % (p<.01)			
	Female	5.4 (n/a)	4.7 (- 0.7)	6.0 (+ 1.3)	6.2 (+ 0.2)	7.0 (+ 0.8)	8.4 (+ 1.4)	+ 3.4 % (p<.05)			
SD	Both	15.7 (n/a)	15.8 (+ 0.1)	17.1 (+ 1.3)	19.3 (+ 2.2)	19.7 (+ 0.4)	22.6 (+ 2.9)	+ 2.5 % (p<.01)	10	+ 7.0 ( 7)	+ 44.5 % ( 6)
	Male	27.6 (n/a)	26.3 (- 1.3)	27.9 (+ 1.6)	30.1 (+ 2.2)	32.0 (+ 1.9)	33.6 (+ 1.6)	+ 1.6 % (p<.01)			
	Female	4.2 (n/a)	5.8 (+ 1.6)	6.4 (+ 0.6)	8.3 (+ 2.0)	7.3 (- 1.0)	11.3 (+ 4.0)	+ 5.8 % (p<.01)			
TN	Both	14.6 (n/a)	15.2 (+ 0.6)	16.1 (+ 0.8)	17.2 (+ 1.1)	17.2 (+ 0.0)	18.2 (+ 1.0)	+ 1.4 % (p<.01)	22	+ 3.5 (28)	+ 24.2 % (31)
	Male	25.1 (n/a)	25.4 (+ 0.3)	26.8 (+ 1.3)	28.0 (+ 1.2)	28.6 (+ 0.6)	29.8 (+ 1.2)	+ 1.2 % (p<.01)			
	Female	5.4 (n/a)	6.3 (+ 0.9)	6.7 (+ 0.4)	7.5 (+ 0.8)	6.9 (- 0.6)	7.6 (+ 0.7)	+ 1.9 % (p<.05)			
TX	Both	12.2 (n/a)	12.7 (+ 0.6)	12.3 (- 0.4)	13.2 (+ 0.9)	13.6 (+ 0.3)	14.5 (+ 0.9)	+ 1.1 % (p<.01)	41	+ 2.3 (37)	+ 18.9 % (36)
	Male	20.4 (n/a)	20.9 (+ 0.5)	20.4 (- 0.6)	22.0 (+ 1.6)	22.2 (+ 0.3)	23.1 (+ 0.9)	+ 0.9 % (p<.05)			
	Female	4.8 (n/a)	5.4 (+ 0.6)	5.0 (- 0.4)	5.2 (+ 0.2)	5.6 (+ 0.4)	6.4 (+ 0.8)	+ 1.6 % (p<.05)			
UT	Both	17.2 (n/a)	19.0 (+ 1.8)	18.2 (- 0.7)	20.2 (+ 2.0)	24.0 (+ 3.8)	25.2 (+ 1.2)	+ 2.7 % (p<.01)	5	+ 8.0 ( 3 ¶¶)	+ 46.5 % ( 4 ¶¶)
	Male	28.2 (n/a)	31.1 (+ 2.9)	29.4 (- 1.7)	32.1 (+ 2.7)	37.8 (+ 5.7)	38.0 (+ 0.2)	+ 2.1 % (p<.05)			
	Female	6.8 (n/a)	7.4 (+ 0.6)	7.5 (+ 0.1)	8.5 (+ 1.0)	10.6 (+ 2.1)	12.6 (+ 2.0)	+ 4.4 % (p<.01)			
VT	Both	13.2 (n/a)	16.2 (+ 3.0)	14.9 (- 1.3)	16.6 (+ 1.7)	18.7 (+ 2.1)	19.7 (+ 1.0)	+ 2.4 % (p<.01)	18	+ 6.4 ( 9)	+ 48.6 % ( 2)
	Male	23.6 (n/a)	28.3 (+ 4.6)	24.3 (- 4.0)	27.3 (+ 3.0)	31.0 (+ 3.7)	32.5 (+ 1.5)	+ 1.9 % (p<.05)			
	Female	4.3 (n/a)	5.2 (+ 0.9)	6.4 (+ 1.3)	6.6 (+ 0.2)	7.3 (+ 0.7)	7.6 (+ 0.3)	+ 3.8 % (p<.01)			
VA	Both	12.8 (n/a)	12.7 (- 0.1)	12.9 (+ 0.3)	13.6 (+ 0.7)	14.6 (+ 0.9)	15.0 (+ 0.5)	+ 1.2 % (p<.01)	37	+ 2.2 (39)	+ 17.4 % (41)
	Male	21.6 (n/a)	21.3 (- 0.2)	21.0 (- 0.4)	22.5 (+ 1.5)	23.6 (+ 1.2)	23.9 (+ 0.2)	+ 0.9 % (p<.05)			
	Female	5.3 (n/a)	5.2 (- 0.1)	5.9 (+ 0.7)	5.6 (- 0.3)	6.4 (+ 0.8)	6.9 (+ 0.5)	+ 1.8 % (p<.05)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.

**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, National Vital Statistics System, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
WA	Both	14.8 (n/a)	15.4 (+ 0.5)	14.8 (- 0.6)	15.7 (+ 0.9)	16.6 (+ 0.9)	17.6 (+ 1.0)	+ 1.1 % (p<.05)	24	+ 2.8 (33)	+ 18.8 % (37)
	Male	24.7 (n/a)	25.2 (+ 0.5)	24.1 (- 1.1)	25.1 (+ 1.0)	26.0 (+ 0.9)	27.1 (+ 1.1)	+ 0.6 % n/s			
	Female	5.9 (n/a)	6.4 (+ 0.6)	6.2 (- 0.2)	6.9 (+ 0.7)	7.7 (+ 0.8)	8.5 (+ 0.8)	+ 2.5 % (p<.01)			
WV	Both	15.6 (n/a)	17.2 (+ 1.6)	16.7 (- 0.5)	16.0 (- 0.7)	19.2 (+ 3.2)	21.4 (+ 2.2)	+ 1.8 % n/s	11	+ 5.8 (13)	+ 37.1 % (14)
	Male	27.2 (n/a)	30.1 (+ 2.9)	28.6 (- 1.5)	27.6 (- 1.0)	31.5 (+ 3.9)	33.5 (+ 2.0)	+ 1.1 % n/s			
	Female	5.3 (n/a)	5.5 (+ 0.1)	5.8 (+ 0.3)	5.3 (- 0.5)	7.6 (+ 2.3)	9.8 (+ 2.2)	+ 3.7 % n/s			
WI	Both	13.1 (n/a)	13.5 (+ 0.4)	14.0 (+ 0.5)	15.0 (+ 1.0)	15.3 (+ 0.3)	16.5 (+ 1.2)	+ 1.5 % (p<.01)	28	+ 3.4 (29)	+ 25.8 % (30)
	Male	21.7 (n/a)	22.2 (+ 0.5)	22.7 (+ 0.5)	24.0 (+ 1.2)	24.4 (+ 0.4)	25.7 (+ 1.3)	+ 1.1 % (p<.01)			
	Female	5.1 (n/a)	5.3 (+ 0.2)	5.6 (+ 0.4)	6.4 (+ 0.7)	6.5 (+ 0.1)	7.5 (+ 1.0)	+ 2.5 % (p<.01)			
WY	Both	20.7 (n/a)	23.4 (+ 2.7)	22.5 (- 0.9)	25.4 (+ 2.8)	28.9 (+ 3.5)	28.8 (- 0.1)	+ 2.3 % (p<.01)	3	+ 8.1 ( 1)	+ 39.0 % ( 9)
	Male	34.8 (n/a)	39.3 (+ 4.5)	36.3 (- 3.0)	41.5 (+ 5.2)	47.1 (+ 5.6)	44.6 (- 2.4)	+ 1.8 % (p<.05)			
	Female	7.7 (n/a)	8.2 (+ 0.6)	9.2 (+ 0.9)	9.4 (+ 0.2)	10.7 (+ 1.4)	12.6 (+ 1.9)	+ 3.2 % (p<.01)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

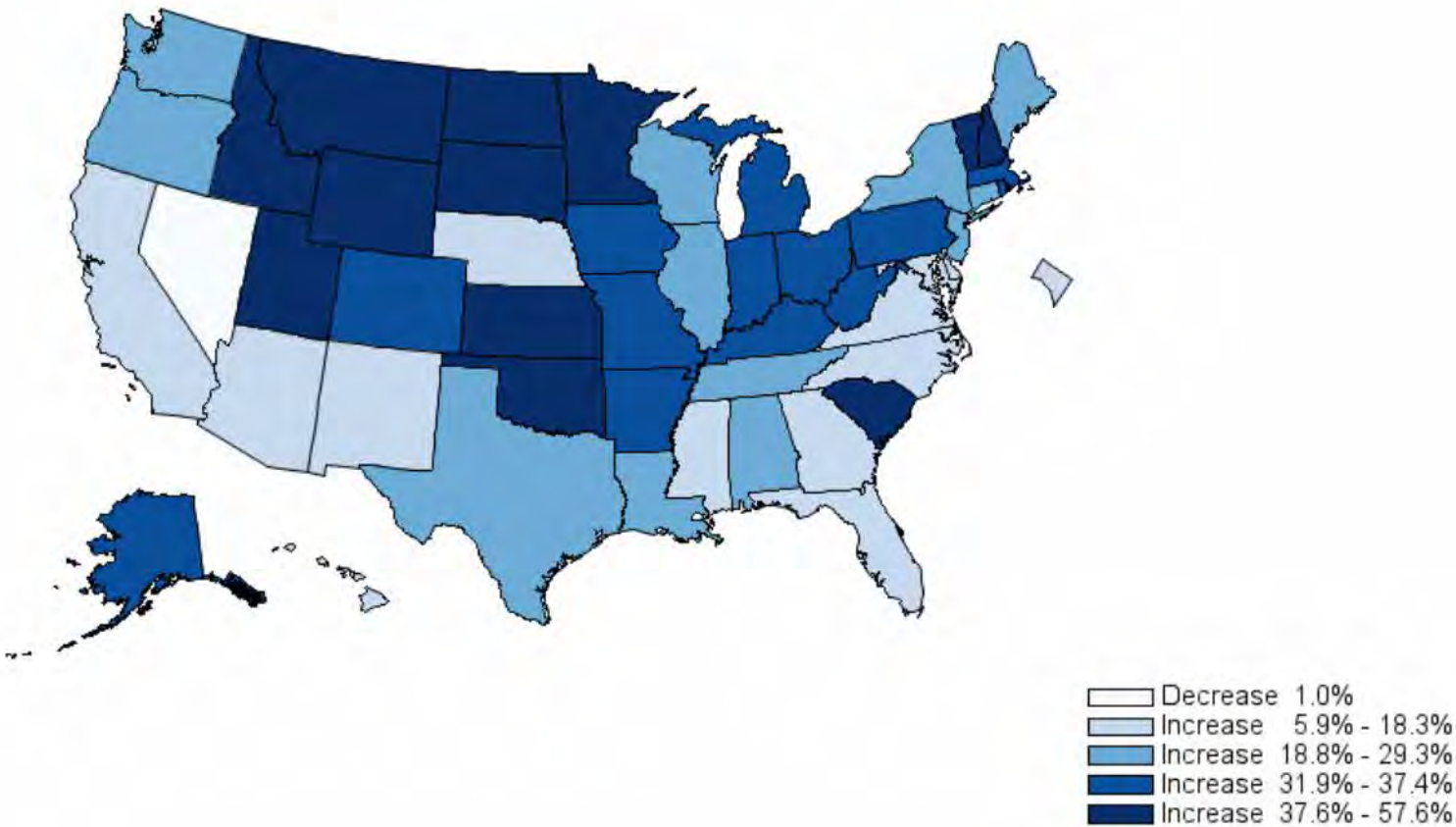
§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.



Figure 1

**Percentage Changes in Annual Suicide Rates (per 100,000, Age-Adjusted)**  
2014-2016 Compared Against 1999-2001



**Table 2. Select Demographic and Descriptive Characteristics of Suicides among Decedents  $\geq 10$  years of age with and without Known Mental Health Problems--National Violent Death Reporting System, 27 states\*, 2015**

Characteristics	Total (n=20,446)	Mental Health Problem <sup>†</sup> (n=9,407)	No Known Mental Health Problem (n=11,039)	Chi- Square	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>¶</sup> (95% CI)
<b>Sex</b>						
Male	15,702(76.8)	6,469(68.8)	9,233(83.6)	p<.01	2.3(2.2-2.5)	
Female	4,744(23.2)	2,938(31.2)	1,806(16.4)	p<.01	0.4(0.4-0.5)	
<b>Age**</b>						
10-24	2,804(13.7)	1,211(12.9)	1,593(14.4)	p<.01	1.1(1.1-1.2)	
25-44	6,456(31.6)	3,036(32.3)	3,420(31.0)	p<.05	0.9(0.9-1.0)	
45-64	7,718(37.7)	3,820(40.6)	3,898(35.3)	p<.01	0.8(0.8-0.8)	
65+	3,468(17.0)	1,340(14.2)	2,128(19.3)	p<.01	1.4(1.3-1.5)	
<b>Race/ethnicity</b>						
White, non-Hispanic	17,102(83.6)	8,165(86.8)	8,937(81.0)	p<.01	0.6(0.6-0.7)	
Black, non-Hispanic	1,228(6.0)	411(4.4)	817(7.4)	p<.01	1.7(1.5-2.0)	
American Indian/Alaska Native, non-Hispanic	378(1.8)	112(1.2)	266(2.4)	p<.01	2.0(1.6-2.6)	
Asian, non-Hispanic	576(2.8)	235(2.5)	341(3.1)	p<.05	1.2(1.1-1.5)	
Hispanic	1,096(5.4)	463(4.9)	633(5.7)	p<.05	1.2(1.0-1.3)	
Other	66(0.3)	21(0.2)	45(0.4)	p<.05	1.8(1.1-3.1)	
<b>Extended demographics</b>						
Ever served in military <sup>††</sup>	3,429(17.8)	1,354(15.3)	2,075(20.1)	p<.01	1.4(1.3-1.5)	1.1(1.0-1.1)
Homeless	240(1.2)	104(1.1)	136(1.3)		1.1(0.9-1.5)	1.2(0.9-1.5)
<b>Incident Type</b>						
Single suicide	20,063(98.2)	9,318(99.1)	10,745(97.4)	p<.01	0.3(0.3-0.4)	0.4(0.3-0.5)
Homicide followed by suicide	319(1.6)	64(0.7)	255(2.3)	p<.01	3.5(2.6-4.5)	2.9(2.2-3.8)
Multiple suicides	64(0.3)	25(0.3)	39(0.4)		1.3(0.8-2.2)	1.6(0.9-2.6)
<b>Method</b>						
Firearm	9,909(48.5)	3,821(40.6)	6,088(55.3)	p<.01	1.8(1.7-1.9)	1.6(1.5-1.7)
Hanging/Strangulation/Suffocation	5,907(28.9)	2,940(31.3)	2,967(26.9)	p<.01	0.8(0.8-0.9)	0.8(0.7-0.8)



Poisoning		3,003(14.7)	1,861(19.8)	1,142(10.4)	p<.01	0.5(0.4-0.5)	0.6(0.6-0.7)
Substance class causing death <sup>§§</sup>							
Other (e.g., over-the-counter)		1,021(34.0)	666(35.8)	355(31.1)	p<.01	0.8(0.7-0.9)	0.9(0.7-1.0)
Opioids		944(31.4)	608(32.7)	336(29.4)		0.9(0.7-1.0)	0.9(0.8-1.1)
Antidepressants		800(26.6)	644(34.6)	156(13.7)	p<.01	0.3(0.2-0.4)	0.3(0.3-0.4)
Benzodiazepines		624(20.8)	468(25.1)	156(13.7)	p<.01	0.5(0.4-0.6)	0.5(0.4-0.6)
Antipsychotics		219(7.3)	195(10.5)	24(2.1)	p<.01	0.2(0.1-0.3)	0.2(0.1-0.3)
Other		1,595(7.8)	780(8.3)	815(7.4)	p<.05	0.9(0.8-1.0)	0.9(0.8-1.0)
<b>Toxicology Results</b>							
Any toxicology testing		13,317(65.1)	6,658(70.8)	6,659(60.3)	p<.01	0.6(0.6-0.7)	0.7(0.6-0.7)
<b>Positive for ≥ 1 substance<sup>¶¶</sup></b>		9,913(74.4)	5,192(78.0)	4,721(70.9)	p<.01	0.7(0.6-0.7)	0.8(0.7-0.8)
Substance detected***							
Alcohol							
	Tested	10,950(53.6)	5,409(57.5)	5,541(50.2)	p<.01	0.7(0.7-0.8)	0.8(0.7-0.8)
	Positive	4,442(40.6)	2,115(39.1)	2,327(42.0)	p<.01	1.1(1.0-1.2)	1.2(1.1-1.3)
Opioids							
	Tested	8,554(41.8)	4,258(45.3)	4,296(38.9)	p<.01	0.8(0.7-0.8)	0.8(0.8-0.9)
	Positive	2,279(26.6)	1,238(29.1)	1,041(24.2)	p<.01	0.8(0.7-0.9)	0.9(0.8-.99)
Benzodiazepines							
	Tested	8,124(39.7)	4,226(44.9)	3,898(35.3)	p<.01	0.7(0.6-0.7)	0.7(0.7-0.8)
	Positive	2,464(30.3)	1,639(38.8)	825(21.2)	p<.01	0.4(0.4-0.5)	0.5(0.5-0.6)
Cocaine							
	Tested	7,978(39.0)	3,866(41.1)	4,112(37.2)	p<.01	0.9(0.8-0.9)	0.9(0.9-1.0)
	Positive	499(6.3)	216(5.6)	283(6.9)	p<.05	1.2(1.0-1.5)	1.2(1.0-1.5)
Amphetamines							
	Tested	7,615(37.2)	3,696(39.3)	3,919(35.5)	p<.01	0.9(0.8-0.9)	0.9(0.8-0.9)
	Positive	736(9.7)	376(10.2)	360(9.2)		0.9(0.8-1.0)	1.0(0.8-1.1)
Marijuana							
	Tested	6,569(32.1)	3,127(33.2)	3,442(31.2)	p<.01	0.9(0.9-1.0)	0.9(0.9-1.0)
	Positive	1,471(22.4)	710(22.7)	761(22.1)		1.0(0.9-1.1)	0.9(0.8-1.0)
Antidepressants							
	Tested	5,425(26.5)	3,103(33.0)	2,322(21.0)	p<.01	0.5(0.5-0.6)	0.6(0.6-0.7)
	Positive	2,214(40.8)	1,735(55.9)	479(20.6)	p<.01	0.2(0.2-0.2)	0.2(0.2-0.3)

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

† Decedent had been identified as having a current diagnosis of mental health problem in coroner/medical examiner or law enforcement reports.

§ Odds ratio reflects the risk among those without known mental health problem relative to those with known MHP.

¶ Logistic regression was used to estimate adjusted odds ratio with 95% CIs after controlling for age, sex, race and ethnicity. Known MHP was used as the reference group.

\*\* Decedents were aged 10 years and older, as per standard in the suicide prevention literature.

†† Denominator is decedents aged 18 years of age and older with reported military service status.

§§ Denominator is decedents who died by poisoning, including overdose.

¶¶ Denominator is decedents with any toxicology tested.

\*\*\* Denominator for each positive group is the number tested for the substance in that group.

---



**Table 3. Circumstances Preceding Suicide among Decedents  $\geq 10$  years of age with and without Known Mental Health Problems--National Violent Death Reporting System, 27 states\*, 2015**

Characteristics	Total	Mental Health Problem <sup>†</sup>	No Known Mental Health Problem	Chi-Square	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>¶</sup> (95% CI)
Suicide with known circumstances	18,764(91.8)	9,407(100)	9,357(84.8)	p<.01		
<b>Mental Health</b>						
Any Current Diagnosed Mental Health Problem**						
Depression/dysthymia		7,076(75.2)				
Anxiety disorder		1,579(16.8)				
Bipolar disorder		1,431(15.2)				
Schizophrenia		509(5.4)				
PTSD		424(4.5)				
ADD/ADHD		226(2.4)				
Unknown		760(8.1)				
Current depressed mood		3,962(42.1)	3,076(32.9)	p<.01	0.7(0.6-0.7)	0.7(0.6-0.7)
<b>Substance Problems</b>						
<b>Any Current substance problem</b>	5,319(28.3)	2,976(31.6)	2,343(25.0)	p<.01	0.7(0.7-0.8)	0.7(0.7-0.8)
Alcohol problem	3,268(17.4)	1,862(19.8)	1,406(15.0)	p<.01	0.7(0.7-0.8)	0.7(0.7-0.8)
Other substance problem	3,084(16.4)	1,768(18.8)	1,316(14.1)	p<.01	0.7(0.7-0.8)	0.7(0.7-0.8)
<b>Treatment</b>						
Current mental health/substance abuse treatment	5,141(27.4)	5,077(54.0)	64(0.7)	p<.01	0.01(0.01-0.01)	0.01(0.01-0.01)
Ever treated for mental health/substance problem	6,717(35.8)	6,323(67.2)	394(4.2)	p<.01	0.02(0.02-0.02)	0.02(0.02-0.03)
<b>Relationship Problems/Loss</b>						
<b>Any relationship problem/loss</b>	7,948(42.4)	3,726(39.6)	4,222(45.1)	p<.01	1.3(1.2-1.3)	1.3(1.2-1.4)
Intimate partner problem	5,098(27.2)	2,270(24.1)	2,828(30.2)	p<.01	1.4(1.3-1.5)	1.4(1.3-1.5)
Perpetrator of interpersonal violence past month	414(2.2)	131(1.4)	283(3.0)	p<.01	2.2(1.8-2.7)	2.0(1.6-2.4)
Victim of interpersonal violence within past month	84(0.4)	53(0.6)	31(0.3)	p<.05	0.6(0.4-0.9)	0.8(0.5-1.2)
Family relationship problem	1,671(8.9)	873(9.3)	798(8.5)		0.9(0.8-1.0)	1.0(0.9-1.1)

Other relationship problem (non-intimate)	403(2.1)	202(2.1)	201(2.1)		1.0(0.8-1.2)	1.1(0.9-1.3)
Argument or conflict (not specified)	2,914(15.5)	1,278(13.6)	1,636(17.5)	p<.01	1.3(1.2-1.5)	1.4(1.3-1.5)
<b>Death of a loved one (any)</b>	1,497(8.0)	826(8.8)	671(7.2)	p<.01	0.8(0.7-0.9)	0.9(0.8-0.9)
Non-suicide death	1,181(6.3)	647(6.9)	534(5.7)	p<.01	0.8(0.7-0.9)	0.9(0.8-1.0)
Suicide of family or friend	379(2.0)	217(2.3)	162(1.7)	p<.01	0.7(0.6-0.9)	0.8(0.7-1.0)
<b>Other Life Stressors</b>						
<b>Any life stressor</b>	9,743(51.9)	4,675(49.7)	5,068(54.2)	p<.01	1.2(1.1-1.3)	1.1(1.1-1.2)
Recent criminal legal problem	1,588(8.5)	586(6.2)	1,002(10.7)	p<.01	1.8(1.6-2.0)	1.7(1.5-1.9)
Other legal problem	748(4.0)	378(4.0)	370(4.0)		1.0(0.8-1.1)	1.0(0.9-1.2)
Physical health problem	4,179(22.3)	2,012(21.4)	2,167(23.2)	p<.01	1.1(1.0-1.2)	1.0(1.0-1.1)
Job/Financial problem <sup>††</sup>	2941(16.2)	1530(16.8)	1411(15.6)	p<.05	0.9(0.8-1.0)	0.9(0.8-1.0)
Eviction or loss of home	722(3.8)	317(3.4)	405(4.3)	p<.01	1.3(1.1-1.5)	1.4(1.2-1.6)
School problem <sup>§§</sup>	162(19.9)	70(17.8)	92(21.9)		1.3(0.9-1.8)	1.3(0.9-1.9)
Recent release from an institution <sup>¶¶</sup>	1,412(7.6)	941(10.2)	471(5.1)	p<.01	0.5(0.4-0.5)	0.5(0.4-0.5)
Jail/prison/detention facility	203(14.4)	82(8.7)	121(25.7)	p<.01	3.6(2.7-4.9)	4.5(3.2-6.4)
Hospital	517(36.6)	311(33.0)	206(43.7)	p<.01	1.6(1.3-2.0)	1.3(1.0-1.7)
Psychiatric hospital/institution	469(33.2)	439(46.7)	30(6.4)	p<.01	0.1(0.1-0.1)	0.1(0.1-0.1)
Other (includes alc/SA treatment facilities)	223(15.8)	109(11.6)	114(24.2)	p<.01	2.4(1.8-3.3)	2.5(1.8-3.3)
<b>Recent or Impending Crisis</b>						
Crisis within past or upcoming two weeks <sup>***</sup>	5,525(29.4)	2,444(26.0)	3,081(32.9)	p<.01	1.4(1.3-1.5)	1.4(1.3-1.5)
Intimate partner problem crisis	1968(35.6)	854(34.9)	1114(36.2)		1.1(0.9-1.2)	1.1(0.9-1.2)
Physical health problem crisis	739(13.4)	315(12.9)	424(13.8)		1.1(0.9-1.3)	1.0(0.8-1.2)
Criminal legal problem crisis	621(11.2)	203(8.3)	418(13.6)	p<.01	1.7(1.5-2.1)	1.6(1.3-1.9)
Family relationship problem crisis	430(7.8)	212(8.7)	218(7.1)	p<.05	0.8(0.7-1.0)	0.9(0.7-1.1)
Job problem crisis	354(6.4)	191(7.8)	163(5.3)	p<.01	0.7(0.5-0.8)	0.7(0.5-0.8)
<b>Suicide Event/History</b>						
Left a note	6,468(34.5)	3,182(33.8)	3,286(35.1)		1.1(1.0-1.1)	1.2(1.1-1.2)
Disclosed suicide intent	4,405(23.5)	2,306(24.5)	2,099(22.4)	p<.01	0.9(0.8-1.0)	0.9(0.8-0.9)
History of ideation	5,990(31.9)	3,838(40.8)	2,152(23.0)	p<.01	0.4(0.4-0.5)	0.4(0.4-0.5)
History of attempts	3,732(19.9)	2,770(29.4)	962(10.3)	p<.01	0.3(0.3-0.3)	0.3(0.3-0.3)

\*Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

<sup>†</sup> Decedent had been identified as having a current diagnosis of mental health problem in coroner/medical examiner or law enforcement reports.



§ Odds ratio reflects the risk among those without known mental health problem relative to those with known MHP.

¶ Logistic regression was used to estimate adjusted odds ratio with 95% CIs after controlling for age, sex, race and ethnicity. Known MHP was used as the reference group.

\*\* Includes decedents with one or more diagnosed current mental health problems, which are not mutually exclusive. Therefore sums of percentages for the diagnosed conditions exceed 100%. Denominator includes the number of decedents with one or more current diagnosed mental health problems.

†† Denominator is decedents aged 18 years of age and older.

§§ Denominator is decedents aged 10-18 years.

¶¶ Denominator of institution subgroup is decedents with recent release from an institution. Recent release from an institution is defined as having occurred within the past month.

\*\*\* Denominator of crisis subgroup is decedents with any crisis within past or upcoming two weeks. Crises depicted here represent the most commonly occurring categories.

---

April 10, 2018

**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, National Vital Statistics System, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
U.S.	Both	12.3 (n/a)	12.7 (+ 0.4)	12.9 (+ 0.2)	13.8 (+ 0.9)	14.5 (+ 0.8)	15.4 (+ 0.9)	+ 1.5 % (p<.01)	n/a	+ 3.1 (n/a)	+ 25.4 % (n/a)
	Male	20.9 (n/a)	21.2 (+ 0.4)	21.3 (+ 0.0)	22.5 (+1.3)	23.5 (+ 1.0)	24.5 (+ 1.0)	+ 1.1 % (p<.01)			
	Female	4.7 (n/a)	5.0 (+ 0.3)	5.3 (+ 0.2)	5.7 (+ 0.4)	6.2 (+ 0.5)	6.9 (+ 0.7)	+ 2.6 % (p<.01)			
AL	Both	14.3 (n/a)	13.4 (- 0.9)	14.1 (+ 0.6)	15.6 (+ 1.6)	16.4 (+ 0.7)	17.5 (+ 1.1)	+ 1.6 % (p<.05)	25	+ 3.1 (31)	+ 21.9 % (33)
	Male	25.1 (n/a)	23.4 (- 1.7)	24.4 (+ 1.0)	26.4 (+ 2.0)	27.6 (+ 1.1)	29.1 (+ 1.5)	+ 1.3 % (p<.05)			
	Female	5.1 (n/a)	4.8 (- 0.3)	5.0 (+ 0.2)	6.1 (+ 1.1)	6.4 (+ 0.3)	7.0 (+ 0.7)	+ 2.6 % (p<.01)			
AK	Both	21.0 (n/a)	24.8 (+ 3.8)	24.2 (- 0.6)	26.0 (+ 1.7)	25.4 (- 0.5)	28.8 (+ 3.4)	+ 1.7 % (p<.05)	2	+ 7.8 ( 4)	+ 37.4 % (13)
	Male	33.2 (n/a)	38.1 (+ 4.9)	38.9 (+ 0.8)	40.1 (+ 1.2)	40.1 (- 0.1)	42.9 (+ 2.8)	+ 1.4 % (p<.01)			
	Female	8.6 (n/a)	11.4 (+ 2.9)	9.8 (- 1.6)	11.1 (+ 1.2)	9.9 (- 1.2)	13.2 (+ 3.4)	+ 1.7 % n/s			
AZ	Both	17.8 (n/a)	18.5 (+ 0.7)	19.1 (+ 0.5)	19.1 (- 0.0)	20.4 (+ 1.3)	20.9 (+ 0.5)	+ 1.0 % (p<.01)	15	+ 3.1 (32)	+ 17.3 % (42)
	Male	29.3 (n/a)	30.2 (+ 1.0)	30.6 (+ 0.4)	30.2 (- 0.5)	32.0 (+ 1.9)	32.4 (+ 0.4)	+ 0.6 % (p<.05)			
	Female	7.1 (n/a)	7.5 (+ 0.4)	8.2 (+ 0.7)	8.6 (+ 0.5)	9.2 (+ 0.6)	9.9 (+ 0.6)	+ 2.2 % (p<.01)			
AR	Both	15.5 (n/a)	15.8 (+ 0.3)	16.2 (+ 0.5)	17.6 (+ 1.4)	19.2 (+ 1.6)	21.2 (+ 2.0)	+ 2.2 % (p<.01)	12	+ 5.7 (14)	+ 36.8 % (15)
	Male	26.7 (n/a)	26.7 (+ 0.0)	27.2 (+ 0.5)	28.2 (+ 1.0)	31.7 (+ 3.5)	33.5 (+ 1.9)	+ 1.6 % (p<.05)			
	Female	5.6 (n/a)	5.9 (+ 0.3)	6.2 (+ 0.4)	7.9 (+ 1.7)	7.5 (- 0.4)	9.6 (+ 2.1)	+ 3.6 % (p<.01)			
CA	Both	10.6 (n/a)	11.3 (+ 0.7)	11.0 (- 0.3)	12.0 (+ 1.0)	11.8 (- 0.1)	12.1 (+ 0.3)	+ 0.9 % (p<.05)	45	+ 1.6 (46)	+ 14.8 % (46)
	Male	17.9 (n/a)	18.4 (+ 0.5)	17.7 (- 0.7)	19.1 (+ 1.4)	18.9 (- 0.2)	19.2 (+ 0.3)	+ 0.5 % n/s			
	Female	4.1 (n/a)	5.0 (+ 0.9)	4.9 (- 0.1)	5.4 (+ 0.5)	5.3 (- 0.1)	5.6 (+ 0.3)	+ 1.7 % (p<.05)			
CO	Both	17.3 (n/a)	19.2 (+ 1.9)	19.0 (- 0.2)	20.0 (+ 1.0)	21.6 (+ 1.5)	23.2 (+ 1.6)	+ 1.8 % (p<.01)	8	+ 5.9 (12)	+ 34.1 % (22)
	Male	28.6 (n/a)	30.9 (+ 2.3)	30.5 (- 0.4)	31.5 (+ 1.0)	33.4 (+ 1.9)	36.3 (+ 2.9)	+ 1.4 % (p<.01)			
	Female	7.0 (n/a)	8.2 (+ 1.3)	8.2 (+ 0.0)	9.1 (+ 0.9)	10.1 (+ 1.0)	10.4 (+ 0.3)	+ 2.6 % (p<.01)			
CT	Both	9.6 (n/a)	8.9 (- 0.7)	9.1 (+ 0.2)	10.2 (+ 1.1)	11.0 (+ 0.8)	11.5 (+ 0.5)	+ 1.6 % (p<.05)	46	+ 1.9 (43)	+ 19.2 % (34)
	Male	16.4 (n/a)	14.6 (- 1.8)	15.0 (+ 0.4)	16.6 (+ 1.6)	17.6 (+ 1.0)	17.3 (- 0.3)	+ 0.9 % n/s			
	Female	3.6 (n/a)	3.8 (+ 0.2)	3.7 (- 0.2)	4.4 (+ 0.7)	4.9 (+ 0.5)	6.2 (+ 1.3)	+ 3.5 % (p<.05)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.



**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, National Vital Statistics System, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
DE	Both	13.6 (n/a)	12.2 (- 1.4)	11.9 (- 0.3)	13.6 (+ 1.7)	14.2 (+ 0.6)	14.4 (+ 0.2)	+ 0.9 % n/s	42	+ 0.8 (50)	+ 5.9 % (50)
	Male	23.0 (n/a)	20.3 (- 2.7)	19.9 (- 0.4)	23.1 (+ 3.2)	22.7 (- 0.4)	23.5 (+ 0.8)	+ 0.6 % n/s			
	Female	5.3 (n/a)	5.0 (- 0.2)	4.6 (- 0.4)	4.9 (+ 0.3)	6.4 (+ 1.5)	6.2 (- 0.2)	+ 1.6 % n/s			
DC	Both	5.9 (n/a)	6.4 (+ 0.5)	6.4 (- 0.0)	7.3 (+ 0.8)	6.6 (- 0.7)	6.9 (+ 0.3)	+ 0.9 % n/s	51	+ 1.0 (48)	+ 16.1 % (45)
	Male	10.7 (n/a)	11.1 (+ 0.4)	10.3 (- 0.8)	12.7 (+ 2.4)	10.0 (- 2.6)	11.7 (+ 1.7)	+ 0.3 % n/s			
	Female	1.7 (n/a) ††	2.3 (+ 0.6) ††	3.3 (+ 1.0)	2.6 (- 0.7)	3.6 (+ 1.0)	2.8 (- 0.8)	+ 3.5 % n/s			
FL	Both	14.8 (n/a)	15.2 (+ 0.4)	14.9 (- 0.3)	16.3 (+ 1.4)	16.3 (- 0.0)	16.4 (+ 0.1)	+ 0.8 % (p<.05)	29	+ 1.6 (45)	+ 10.6 % (48)
	Male	24.3 (n/a)	24.4 (+ 0.1)	23.6 (- 0.8)	26.2 (+ 2.6)	25.6 (- 0.6)	25.6 (- 0.1)	+ 0.5 % n/s			
	Female	6.3 (n/a)	6.8 (+ 0.5)	6.8 (+ 0.0)	7.1 (+ 0.3)	7.6 (+ 0.5)	7.8 (+ 0.3)	+ 1.4 % (p<.01)			
GA	Both	12.9 (n/a)	13.2 (+ 0.3)	12.3 (- 0.9)	13.2 (+ 0.9)	13.7 (+ 0.5)	15.0 (+ 1.3)	+ 0.9 % n/s	39	+ 2.1 (40)	+ 16.2 % (44)
	Male	22.1 (n/a)	23.1 (+ 1.0)	21.3 (- 1.8)	21.9 (+ 0.6)	22.6 (+ 0.7)	24.4 (+ 1.7)	+ 0.5 % n/s			
	Female	5.0 (n/a)	4.8 (- 0.2)	4.6 (- 0.2)	5.5 (+ 0.9)	5.8 (+ 0.3)	6.6 (+ 0.8)	+ 2.1 % (p<.05)			
HI	Both	12.9 (n/a)	11.1 (- 1.8)	10.3 (- 0.7)	14.5 (+ 4.1)	14.4 (- 0.1)	15.2 (+ 0.8)	+ 2.0 % n/s	35	+ 2.4 (35)	+ 18.3 % (38)
	Male	20.4 (n/a)	17.2 (- 3.1)	15.3 (- 1.9)	21.9 (+ 6.7)	22.5 (+ 0.5)	24.3 (+ 1.8)	+ 2.1 % n/s			
	Female	5.4 (n/a)	5.0 (- 0.4)	5.5 (+ 0.5)	7.1 (+ 1.5)	6.2 (- 0.9)	5.9 (- 0.3)	+ 1.2 % n/s			
ID	Both	17.3 (n/a)	19.2 (+ 2.0)	18.3 (- 0.9)	21.6 (+ 3.3)	21.9 (+ 0.3)	24.7 (+ 2.8)	+ 2.3 % (p<.01)	6	+ 7.5 ( 6)	+ 43.2 % ( 7)
	Male	28.4 (n/a)	33.1 (+ 4.7)	31.1 (- 2.0)	34.9 (+ 3.8)	34.7 (- 0.2)	38.0 (+ 3.3)	+ 1.6 % (p<.05)			
	Female	7.2 (n/a)	6.1 (- 1.1)	6.1 (+ 0.0)	9.0 (+ 2.9)	9.5 (+ 0.5)	11.8 (+ 2.3)	+ 4.4 % (p<.05)			
IL	Both	9.9 (n/a)	9.8 (- 0.1)	9.7 (- 0.1)	10.6 (+ 0.8)	11.2 (+ 0.6)	12.2 (+ 1.0)	+ 1.5 % (p<.05)	44	+ 2.3 (38)	+ 22.8 % (32)
	Male	17.1 (n/a)	16.7 (- 0.4)	16.2 (- 0.4)	17.6 (+ 1.4)	18.5 (+ 0.9)	19.8 (+ 1.3)	+ 1.1 % (p<.05)			
	Female	3.7 (n/a)	3.6 (- 0.0)	3.8 (+ 0.2)	4.2 (+ 0.4)	4.5 (+ 0.4)	5.2 (+ 0.6)	+ 2.4 % (p<.01)			
IN	Both	13.0 (n/a)	13.7 (+ 0.7)	14.4 (+ 0.7)	14.9 (+ 0.5)	16.4 (+ 1.4)	17.1 (+ 0.7)	+ 1.9 % (p<.01)	26	+ 4.1 (23)	+ 31.9 % (25)
	Male	22.4 (n/a)	23.2 (+ 0.8)	24.4 (+ 1.2)	24.7 (+ 0.4)	26.7 (+ 2.0)	28.3 (+ 1.6)	+ 1.5 % (p<.01)			
	Female	4.6 (n/a)	5.0 (+ 0.4)	5.3 (+ 0.2)	5.9 (+ 0.6)	6.8 (+ 0.9)	6.6 (- 0.2)	+ 2.7 % (p<.01)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.

**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, National Vital Statistics System, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
IA	Both	11.8 (n/a)	13.2 (+ 1.4)	12.8 (- 0.4)	14.2 (+ 1.4)	15.9 (+ 1.7)	16.0 (+ 0.1)	+ 2.1 % (p<.01)	31	+ 4.3 (20)	+ 36.2 % (18)
	Male	20.6 (n/a)	22.1 (+ 1.5)	20.8 (- 1.4)	23.3 (+ 2.5)	26.0 (+ 2.7)	25.7 (- 0.3)	+ 1.6 % (p<.05)			
	Female	3.7 (n/a)	4.7 (+ 1.0)	5.3 (+ 0.6)	5.5 (+ 0.2)	6.1 (+ 0.6)	6.7 (+ 0.6)	+ 3.8 % (p<.01)			
KS	Both	13.3 (n/a)	15.1 (+ 1.8)	15.8 (+ 0.7)	15.3 (- 0.5)	17.7 (+ 2.4)	19.4 (+ 1.6)	+ 2.2 % (p<.01)	19	+ 6.0 (11)	+ 45.0 % ( 5)
	Male	22.7 (n/a)	25.0 (+ 2.3)	26.5 (+ 1.5)	25.6 (- 0.9)	29.1 (+ 3.5)	30.7 (+ 1.6)	+ 1.9 % (p<.01)			
	Female	4.6 (n/a)	6.0 (+ 1.4)	5.7 (- 0.3)	5.4 (- 0.3)	6.8 (+ 1.4)	8.4 (+ 1.6)	+ 3.2 % (p<.05)			
KY	Both	14.1 (n/a)	15.4 (+ 1.3)	16.7 (+ 1.3)	16.2 (- 0.5)	18.2 (+ 2.0)	19.3 (+ 1.1)	+ 1.9 % (p<.01)	20	+ 5.2 (16)	+ 36.6 % (16)
	Male	25.0 (n/a)	26.8 (+ 1.9)	28.3 (+ 1.4)	27.2 (- 1.0)	30.1 (+ 2.9)	31.7 (+ 1.6)	+ 1.4 % (p<.01)			
	Female	4.8 (n/a)	5.2 (+ 0.4)	6.1 (+ 0.8)	6.1 (+ 0.1)	7.1 (+ 0.9)	7.7 (+ 0.6)	+ 3.2 % (p<.01)			
LA	Both	13.1 (n/a)	12.9 (- 0.2)	13.4 (+ 0.4)	13.6 (+ 0.3)	14.4 (+ 0.8)	17.0 (+ 2.5)	+ 1.6 % (p<.05)	27	+ 3.8 (27)	+ 29.3 % (26)
	Male	22.9 (n/a)	22.3 (- 0.6)	22.4 (+ 0.1)	23.3 (+ 0.8)	23.7 (+ 0.5)	27.3 (+ 3.6)	+ 1.1 % n/s			
	Female	4.8 (n/a)	4.7 (- 0.1)	5.2 (+ 0.5)	4.9 (- 0.2)	6.1 (+ 1.2)	7.5 (+ 1.4)	+ 2.8 % (p<.05)			
ME	Both	14.5 (n/a)	13.6 (- 0.9)	14.4 (+ 0.8)	15.4 (+ 1.0)	18.9 (+ 3.5)	18.5 (- 0.4)	+ 2.2 % (p<.05)	21	+ 4.0 (25)	+ 27.4 % (29)
	Male	25.0 (n/a)	22.9 (- 2.1)	24.6 (+ 1.7)	25.7 (+ 1.1)	31.1 (+ 5.4)	29.8 (- 1.3)	+ 1.8 % (p<.05)			
	Female	5.3 (n/a)	5.3 (- 0.0)	5.2 (- 0.1)	6.0 (+ 0.7)	7.6 (+ 1.6)	7.9 (+ 0.3)	+ 3.1 % (p<.05)			
MD	Both	10.0 (n/a)	10.3 (+ 0.3)	10.1 (- 0.2)	10.2 (+ 0.1)	10.7 (+ 0.5)	10.8 (+ 0.1)	+ 0.5 % (p<.05)	47 §§	+ 0.8 (49 §§)	+ 8.5 % (49 §§)
	Male	17.6 (n/a)	17.8 (+ 0.1)	17.3 (- 0.5)	17.7 (+ 0.4)	18.2 (+ 0.5)	18.0 (- 0.2)	+ 0.2 % n/s			
	Female	3.5 (n/a)	3.8 (+ 0.4)	3.9 (+ 0.0)	3.7 (- 0.2)	4.1 (+ 0.4)	4.5 (+ 0.4)	+ 1.3 % (p<.05)			
MA	Both	7.4 (n/a)	7.6 (+ 0.2)	8.4 (+ 0.8)	9.3 (+ 1.0)	9.8 (+ 0.4)	10.0 (+ 0.3)	+ 2.3 % (p<.01)	48	+ 2.6 (34 ¶¶)	+ 35.3 % (20 ¶¶)
	Male	12.1 (n/a)	12.8 (+ 0.7)	13.3 (+ 0.5)	15.4 (+ 2.1)	15.2 (- 0.2)	16.0 (+ 0.8)	+ 2.0 % (p<.01)			
	Female	3.3 (n/a)	2.9 (- 0.4)	4.0 (+ 1.0)	3.8 (- 0.1)	4.8 (+ 1.0)	4.6 (- 0.2)	+ 3.0 % (p<.05)			
MI	Both	11.8 (n/a)	12.5 (+ 0.7)	12.9 (+ 0.4)	13.9 (+ 1.0)	14.5 (+ 0.7)	15.6 (+ 1.1)	+ 1.9 % (p<.01)	33	+ 3.9 (26)	+ 32.9 % (24)
	Male	20.0 (n/a)	20.9 (+ 0.9)	21.6 (+ 0.7)	22.8 (+ 1.3)	23.9 (+ 1.0)	25.0 (+ 1.2)	+ 1.5 % (p<.01)			
	Female	4.4 (n/a)	4.8 (+ 0.4)	5.0 (+ 0.2)	5.6 (+ 0.6)	5.9 (+ 0.3)	6.7 (+ 0.9)	+ 2.8 % (p<.01)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.



**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, National Vital Statistics System, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
MN	Both	10.7 (n/a)	11.5 (+ 0.9)	12.4 (+ 0.8)	12.9 (+ 0.5)	14.2 (+ 1.3)	15.0 (+ 0.9)	+ 2.3 % (p<.01)	38	+ 4.3 (19)	+ 40.6 % ( 8)
	Male	18.3 (n/a)	19.3 (+ 1.1)	20.4 (+ 1.0)	20.9 (+ 0.6)	22.9 (+ 1.9)	23.3 (+ 0.4)	+ 1.7 % (p<.01)			
	Female	3.6 (n/a)	4.2 (+ 0.6)	4.8 (+ 0.6)	5.1 (+ 0.4)	5.8 (+ 0.6)	6.9 (+ 1.2)	+ 4.2 % (p<.01)			
MS	Both	12.9 (n/a)	14.1 (+ 1.2)	14.7 (+ 0.6)	15.5 (+ 0.8)	15.6 (+ 0.1)	15.2 (- 0.3)	+ 1.1 % (p<.05)	36	+ 2.3 (36)	+ 17.8 % (40)
	Male	22.9 (n/a)	24.6 (+ 1.7)	25.1 (+ 0.6)	26.8 (+ 1.7)	25.9 (- 0.9)	25.3 (- 0.6)	+ 0.7 % n/s			
	Female	4.3 (n/a)	5.0 (+ 0.7)	5.5 (+ 0.5)	5.5 (- 0.0)	6.4 (+ 0.9)	6.2 (- 0.2)	+ 2.4 % (p<.01)			
MO	Both	14.7 (n/a)	14.1 (- 0.6)	15.4 (+ 1.3)	16.0 (+ 0.7)	17.8 (+ 1.7)	20.0 (+ 2.3)	+ 2.2 % (p<.01)	16	+ 5.3 (15)	+ 36.4 % (17)
	Male	25.3 (n/a)	23.7 (- 1.6)	25.6 (+ 1.9)	26.6 (+ 1.0)	28.9 (+ 2.3)	32.2 (+ 3.3)	+ 1.8 % (p<.05)			
	Female	5.4 (n/a)	5.4 (+ 0.1)	6.1 (+ 0.7)	6.3 (+ 0.2)	7.4 (+ 1.1)	8.6 (+ 1.2)	+ 3.2 % (p<.01)			
MT	Both	21.1 (n/a)	22.6 (+ 1.4)	23.6 (+ 1.0)	24.7 (+ 1.1)	26.7 (+ 2.0)	29.2 (+ 2.5)	+ 2.1 % (p<.01)	1	+ 8.0 ( 2)	+ 38.0 % (11)
	Male	36.9 (n/a)	37.3 (+ 0.4)	39.8 (+ 2.5)	39.7 (- 0.1)	41.0 (+ 1.4)	45.5 (+ 4.4)	+ 1.3 % (p<.01)			
	Female	6.7 (n/a)	8.4 (+ 1.8)	8.4 (- 0.1)	10.0 (+ 1.6)	12.6 (+ 2.6)	13.1 (+ 0.5)	+ 4.6 % (p<.01)			
NE	Both	12.7 (n/a)	12.2 (- 0.5)	12.6 (+ 0.4)	11.7 (- 0.8)	13.5 (+ 1.8)	14.8 (+ 1.3)	+ 1.0 % n/s	40	+ 2.1 (42)	+ 16.2 % (43)
	Male	22.2 (n/a)	20.7 (- 1.5)	20.3 (- 0.4)	19.8 (- 0.5)	22.0 (+ 2.2)	23.9 (+ 1.9)	+ 0.6 % n/s			
	Female	3.8 (n/a)	4.2 (+ 0.4)	5.1 (+ 0.9)	4.0 (- 1.1)	5.5 (+ 1.4)	5.8 (+ 0.3)	+ 2.6 % n/s			
NV	Both	23.3 (n/a)	22.6 (- 0.6)	22.1 (- 0.5)	22.6 (+ 0.5)	21.4 (- 1.2)	23.1 (+ 1.6)	- 0.2 % n/s	9	- 0.2 (51)	- 1.0 % (51)
	Male	38.3 (n/a)	36.7 (- 1.7)	35.1 (- 1.6)	35.6 (+ 0.5)	32.5 (- 3.0)	35.4 (+ 2.8)	- 0.7 % n/s			
	Female	8.9 (n/a)	9.5 (+ 0.5)	9.6 (+ 0.1)	10.0 (+ 0.4)	10.6 (+ 0.6)	11.2 (+ 0.6)	+ 1.5 % (p<.01)			
NH	Both	13.5 (n/a)	12.5 (- 1.0)	13.3 (+ 0.8)	15.2 (+ 1.9)	15.8 (+ 0.6)	20.0 (+ 4.2)	+ 2.7 % (p<.05)	17	+ 6.5 ( 8)	+ 48.3 % ( 3)
	Male	22.5 (n/a)	21.1 (- 1.4)	21.7 (+ 0.6)	24.8 (+ 3.1)	25.4 (+ 0.6)	30.6 (+ 5.2)	+ 2.2 % (p<.05)			
	Female	5.3 (n/a)	4.8 (- 0.5)	5.9 (+ 1.0)	6.2 (+ 0.4)	6.6 (+ 0.4)	9.8 (+ 3.2)	+ 3.9 % (p<.05)			
NJ	Both	7.8 (n/a)	7.7 (- 0.1)	7.5 (- 0.2)	8.0 (+ 0.5)	8.9 (+ 0.9)	9.2 (+ 0.4)	+ 1.3 % (p<.05)	50	+ 1.5 (47)	+ 19.2 % (35)
	Male	13.0 (n/a)	13.1 (+ 0.0)	12.6 (- 0.5)	13.7 (+ 1.1)	14.5 (+ 0.8)	14.6 (+ 0.1)	+ 0.9 % (p<.05)			
	Female	3.2 (n/a)	2.9 (- 0.3)	3.0 (+ 0.0)	2.9 (- 0.1)	3.8 (+ 0.9)	4.4 (+ 0.6)	+ 2.3 % n/s			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.

**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, National Vital Statistics System, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
NM	Both	22.0 (n/a)	22.0 (- 0.1)	21.8 (- 0.2)	23.0 (+ 1.2)	24.1 (+ 1.1)	26.0 (+ 1.9)	+ 1.1 % (p<.05)	4	+ 4.0 (24)	+ 18.3 % (39)
	Male	36.8 (n/a)	37.7 (+ 0.9)	36.4 (- 1.2)	35.8 (- 0.6)	37.1 (+ 1.3)	40.7 (+ 3.6)	+ 0.4 % n/s			
	Female	8.5 (n/a)	7.4 (- 1.1)	8.2 (+ 0.7)	10.7 (+ 2.6)	11.7 (+ 0.9)	12.0 (+ 0.3)	+ 3.3 % (p<.05)			
NY	Both	7.2 (n/a)	7.1 (- 0.1)	7.7 (+ 0.6)	8.4 (+ 0.8)	9.5 (+ 1.1)	9.3 (- 0.1)	+ 2.1 % (p<.01)	49	+ 2.1 (41)	+ 28.8 % (27)
	Male	12.5 (n/a)	12.2 (- 0.3)	12.9 (+ 0.7)	13.9 (+ 1.0)	15.4 (+ 1.4)	14.5 (- 0.9)	+ 1.4 % (p<.05)			
	Female	2.7 (n/a)	2.6 (- 0.1)	3.0 (+ 0.3)	3.5 (+ 0.5)	4.2 (+ 0.7)	4.6 (+ 0.5)	+ 4.2 % (p<.01)			
NC	Both	13.6 (n/a)	13.5 (- 0.1)	13.7 (+ 0.1)	14.2 (+ 0.5)	14.5 (+ 0.4)	15.3 (+ 0.8)	+ 0.8 % (p<.01)	34	+ 1.7 (44)	+ 12.7 % (47)
	Male	22.7 (n/a)	22.7 (+ 0.0)	22.2 (- 0.6)	23.3 (+ 1.1)	23.3 (+ 0.0)	23.9 (+ 0.6)	+ 0.4 % n/s			
	Female	5.6 (n/a)	5.5 (- 0.2)	6.2 (+ 0.8)	6.0 (- 0.2)	6.7 (+ 0.7)	7.6 (+ 0.9)	+ 2.0 % (p<.05)			
ND	Both	13.3 (n/a)	14.6 (+ 1.3)	16.0 (+ 1.4)	16.6 (+ 0.6)	18.4 (+ 1.9)	20.9 (+ 2.5)	+ 2.9 % (p<.01)	14	+ 7.6 ( 5)	+ 57.6 % ( 1)
	Male	21.4 (n/a)	24.6 (+ 3.2)	28.0 (+ 3.4)	27.1 (- 0.9)	29.6 (+ 2.5)	32.7 (+ 3.0)	+ 2.5 % (p<.01)			
	Female	5.6 (n/a)	4.5 (- 1.0)	3.7 (- 0.8)	5.7 (+ 2.0)	6.7 (+ 1.0)	8.5 (+ 1.8)	+ 3.9 % n/s			
OH	Both	11.6 (n/a)	12.3 (+ 0.8)	13.1 (+ 0.8)	13.4 (+ 0.2)	14.8 (+ 1.4)	15.8 (+ 1.0)	+ 2.0 % (p<.01)	32	+ 4.2 (21)	+ 36.0 % (19)
	Male	20.4 (n/a)	20.9 (+ 0.5)	22.2 (+ 1.3)	22.1 (- 0.1)	24.2 (+ 2.1)	25.5 (+ 1.3)	+ 1.5 % (p<.01)			
	Female	4.0 (n/a)	4.7 (+ 0.7)	4.9 (+ 0.1)	5.3 (+ 0.5)	6.2 (+ 0.9)	6.7 (+ 0.6)	+ 3.4 % (p<.01)			
OK	Both	17.0 (n/a)	16.5 (- 0.6)	17.2 (+ 0.8)	18.4 (+ 1.1)	20.7 (+ 2.3)	23.5 (+ 2.8)	+ 2.3 % (p<.05)	7	+ 6.4 (10)	+ 37.6 % (12)
	Male	28.5 (n/a)	27.3 (- 1.2)	27.8 (+ 0.5)	30.3 (+ 2.5)	33.4 (+ 3.1)	37.3 (+ 3.8)	+ 2.0 % (p<.05)			
	Female	6.6 (n/a)	6.4 (- 0.2)	7.5 (+ 1.1)	7.0 (- 0.5)	8.5 (+ 1.6)	10.3 (+ 1.8)	+ 2.9 % (p<.05)			
OR	Both	16.4 (n/a)	17.7 (+ 1.3)	17.7 (- 0.0)	18.6 (+ 0.9)	19.8 (+ 1.2)	21.1 (+ 1.3)	+ 1.6 % (p<.01)	13	+ 4.6 (18)	+ 28.2 % (28)
	Male	27.4 (n/a)	29.5 (+ 2.1)	28.5 (- 0.9)	29.5 (+ 1.0)	31.4 (+ 1.8)	33.0 (+ 1.6)	+ 1.1 % (p<.01)			
	Female	6.5 (n/a)	7.1 (+ 0.6)	7.7 (+ 0.6)	8.4 (+ 0.7)	8.8 (+ 0.4)	9.8 (+ 0.9)	+ 2.7 % (p<.01)			
PA	Both	12.1 (n/a)	12.5 (+ 0.4)	12.8 (+ 0.3)	13.9 (+ 1.1)	15.0 (+ 1.1)	16.3 (+ 1.2)	+ 2.0 % (p<.01)	30	+ 4.1 (22)	+ 34.3 % (21)
	Male	21.0 (n/a)	21.3 (+ 0.3)	21.9 (+ 0.6)	23.1 (+ 1.2)	24.7 (+ 1.7)	26.1 (+ 1.3)	+ 1.5 % (p<.01)			
	Female	4.2 (n/a)	4.6 (+ 0.3)	4.6 (+ 0.0)	5.4 (+ 0.9)	6.0 (+ 0.6)	7.1 (+ 1.1)	+ 3.5 % (p<.01)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.



**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, National Vital Statistics System, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
RI	Both	9.4 (n/a)	9.0 (- 0.3)	9.0 (- 0.0)	12.8 (+ 3.8)	11.9 (- 0.9)	12.6 (+ 0.7)	+ 2.6 % (p<.05)	43	+ 3.2 (30 ¶¶)	+ 34.1 % (23 ¶¶)
	Male	15.4 (n/a)	15.2 (- 0.2)	14.8 (- 0.3)	21.2 (+ 6.4)	19.2 (- 2.0)	19.6 (+ 0.4)	+ 2.2 % n/s			
	Female	4.0 (n/a)	3.3 (- 0.7)	3.8 (+ 0.4)	5.1 (+ 1.3)	5.1 (+ 0.0)	6.1 (+ 1.0)	+ 3.7 % (p<.05)			
SC	Both	12.8 (n/a)	13.0 (+ 0.2)	13.7 (+ 0.7)	14.9 (+ 1.2)	16.0 (+ 1.1)	17.7 (+ 1.7)	+ 2.3 % (p<.01)	23	+ 4.9 (17)	+ 38.3 % (10)
	Male	21.3 (n/a)	22.5 (+ 1.2)	22.3 (- 0.1)	24.6 (+ 2.2)	26.1 (+ 1.5)	28.0 (+ 1.9)	+ 1.8 % (p<.01)			
	Female	5.4 (n/a)	4.7 (- 0.7)	6.0 (+ 1.3)	6.2 (+ 0.2)	7.0 (+ 0.8)	8.4 (+ 1.4)	+ 3.4 % (p<.05)			
SD	Both	15.7 (n/a)	15.8 (+ 0.1)	17.1 (+ 1.3)	19.3 (+ 2.2)	19.7 (+ 0.4)	22.6 (+ 2.9)	+ 2.5 % (p<.01)	10	+ 7.0 ( 7)	+ 44.5 % ( 6)
	Male	27.6 (n/a)	26.3 (- 1.3)	27.9 (+ 1.6)	30.1 (+ 2.2)	32.0 (+ 1.9)	33.6 (+ 1.6)	+ 1.6 % (p<.01)			
	Female	4.2 (n/a)	5.8 (+ 1.6)	6.4 (+ 0.6)	8.3 (+ 2.0)	7.3 (- 1.0)	11.3 (+ 4.0)	+ 5.8 % (p<.01)			
TN	Both	14.6 (n/a)	15.2 (+ 0.6)	16.1 (+ 0.8)	17.2 (+ 1.1)	17.2 (+ 0.0)	18.2 (+ 1.0)	+ 1.4 % (p<.01)	22	+ 3.5 (28)	+ 24.2 % (31)
	Male	25.1 (n/a)	25.4 (+ 0.3)	26.8 (+ 1.3)	28.0 (+ 1.2)	28.6 (+ 0.6)	29.8 (+ 1.2)	+ 1.2 % (p<.01)			
	Female	5.4 (n/a)	6.3 (+ 0.9)	6.7 (+ 0.4)	7.5 (+ 0.8)	6.9 (- 0.6)	7.6 (+ 0.7)	+ 1.9 % (p<.05)			
TX	Both	12.2 (n/a)	12.7 (+ 0.6)	12.3 (- 0.4)	13.2 (+ 0.9)	13.6 (+ 0.3)	14.5 (+ 0.9)	+ 1.1 % (p<.01)	41	+ 2.3 (37)	+ 18.9 % (36)
	Male	20.4 (n/a)	20.9 (+ 0.5)	20.4 (- 0.6)	22.0 (+ 1.6)	22.2 (+ 0.3)	23.1 (+ 0.9)	+ 0.9 % (p<.05)			
	Female	4.8 (n/a)	5.4 (+ 0.6)	5.0 (- 0.4)	5.2 (+ 0.2)	5.6 (+ 0.4)	6.4 (+ 0.8)	+ 1.6 % (p<.05)			
UT	Both	17.2 (n/a)	19.0 (+ 1.8)	18.2 (- 0.7)	20.2 (+ 2.0)	24.0 (+ 3.8)	25.2 (+ 1.2)	+ 2.7 % (p<.01)	5	+ 8.0 ( 3 ¶¶)	+ 46.5 % ( 4 ¶¶)
	Male	28.2 (n/a)	31.1 (+ 2.9)	29.4 (- 1.7)	32.1 (+ 2.7)	37.8 (+ 5.7)	38.0 (+ 0.2)	+ 2.1 % (p<.05)			
	Female	6.8 (n/a)	7.4 (+ 0.6)	7.5 (+ 0.1)	8.5 (+ 1.0)	10.6 (+ 2.1)	12.6 (+ 2.0)	+ 4.4 % (p<.01)			
VT	Both	13.2 (n/a)	16.2 (+ 3.0)	14.9 (- 1.3)	16.6 (+ 1.7)	18.7 (+ 2.1)	19.7 (+ 1.0)	+ 2.4 % (p<.01)	18	+ 6.4 ( 9)	+ 48.6 % ( 2)
	Male	23.6 (n/a)	28.3 (+ 4.6)	24.3 (- 4.0)	27.3 (+ 3.0)	31.0 (+ 3.7)	32.5 (+ 1.5)	+ 1.9 % (p<.05)			
	Female	4.3 (n/a)	5.2 (+ 0.9)	6.4 (+ 1.3)	6.6 (+ 0.2)	7.3 (+ 0.7)	7.6 (+ 0.3)	+ 3.8 % (p<.01)			
VA	Both	12.8 (n/a)	12.7 (- 0.1)	12.9 (+ 0.3)	13.6 (+ 0.7)	14.6 (+ 0.9)	15.0 (+ 0.5)	+ 1.2 % (p<.01)	37	+ 2.2 (39)	+ 17.4 % (41)
	Male	21.6 (n/a)	21.3 (- 0.2)	21.0 (- 0.4)	22.5 (+ 1.5)	23.6 (+ 1.2)	23.9 (+ 0.2)	+ 0.9 % (p<.05)			
	Female	5.3 (n/a)	5.2 (- 0.1)	5.9 (+ 0.7)	5.6 (- 0.3)	6.4 (+ 0.8)	6.9 (+ 0.5)	+ 1.8 % (p<.05)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.

**Table 1. Trends in Suicide Rates among Persons ≥ 10 Years of Age, by State and Sex, National Vital Statistics System, 1999 – 2016**

State	Sex	Age-Adjusted Annual Rate per 100,000 Persons (Change from Prior Period) *						Modeled AAPC †	Current State Rank §	Overall Rate Change (State Rank) ¶	Overall Percent Change (State Rank) **
		1999 – 2001	2002 – 2004	2005 – 2007	2008 – 2010	2011 – 2013	2014 – 2016				
WA	Both	14.8 (n/a)	15.4 (+ 0.5)	14.8 (- 0.6)	15.7 (+ 0.9)	16.6 (+ 0.9)	17.6 (+ 1.0)	+ 1.1 % (p<.05)	24	+ 2.8 (33)	+ 18.8 % (37)
	Male	24.7 (n/a)	25.2 (+ 0.5)	24.1 (- 1.1)	25.1 (+ 1.0)	26.0 (+ 0.9)	27.1 (+ 1.1)	+ 0.6 % n/s			
	Female	5.9 (n/a)	6.4 (+ 0.6)	6.2 (- 0.2)	6.9 (+ 0.7)	7.7 (+ 0.8)	8.5 (+ 0.8)	+ 2.5 % (p<.01)			
WV	Both	15.6 (n/a)	17.2 (+ 1.6)	16.7 (- 0.5)	16.0 (- 0.7)	19.2 (+ 3.2)	21.4 (+ 2.2)	+ 1.8 % n/s	11	+ 5.8 (13)	+ 37.1 % (14)
	Male	27.2 (n/a)	30.1 (+ 2.9)	28.6 (- 1.5)	27.6 (- 1.0)	31.5 (+ 3.9)	33.5 (+ 2.0)	+ 1.1 % n/s			
	Female	5.3 (n/a)	5.5 (+ 0.1)	5.8 (+ 0.3)	5.3 (- 0.5)	7.6 (+ 2.3)	9.8 (+ 2.2)	+ 3.7 % n/s			
WI	Both	13.1 (n/a)	13.5 (+ 0.4)	14.0 (+ 0.5)	15.0 (+ 1.0)	15.3 (+ 0.3)	16.5 (+ 1.2)	+ 1.5 % (p<.01)	28	+ 3.4 (29)	+ 25.8 % (30)
	Male	21.7 (n/a)	22.2 (+ 0.5)	22.7 (+ 0.5)	24.0 (+ 1.2)	24.4 (+ 0.4)	25.7 (+ 1.3)	+ 1.1 % (p<.01)			
	Female	5.1 (n/a)	5.3 (+ 0.2)	5.6 (+ 0.4)	6.4 (+ 0.7)	6.5 (+ 0.1)	7.5 (+ 1.0)	+ 2.5 % (p<.01)			
WY	Both	20.7 (n/a)	23.4 (+ 2.7)	22.5 (- 0.9)	25.4 (+ 2.8)	28.9 (+ 3.5)	28.8 (- 0.1)	+ 2.3 % (p<.01)	3	+ 8.1 ( 1)	+ 39.0 % ( 9)
	Male	34.8 (n/a)	39.3 (+ 4.5)	36.3 (- 3.0)	41.5 (+ 5.2)	47.1 (+ 5.6)	44.6 (- 2.4)	+ 1.8 % (p<.05)			
	Female	7.7 (n/a)	8.2 (+ 0.6)	9.2 (+ 0.9)	9.4 (+ 0.2)	10.7 (+ 1.4)	12.6 (+ 1.9)	+ 3.2 % (p<.01)			

\* Rates are age-adjusted to the U.S. year 2000 standard.

† Model-estimated average annual percentage change (AAPC) based on all reporting periods; p-value indicates statistical significance of trend; n/s indicates trend not significant.

§ Current state rank (50 states and the District of Columbia) is for the reporting period 2014 – 2016. Ranks are from highest rate (1) to lowest rate (51). Differences between ranks do not necessarily imply a statistically significant difference.

¶ Overall rate change is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest increase (1) to largest decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

\*\* Overall percent change in rates is between the first (1999 – 2001) and last (2014 – 2016) reporting periods. Ranks are from largest percentage increase (1) to largest percentage decrease (51). Differences between ranks do not necessarily imply a statistically significant difference.

†† Rate based on < 20 suicides.

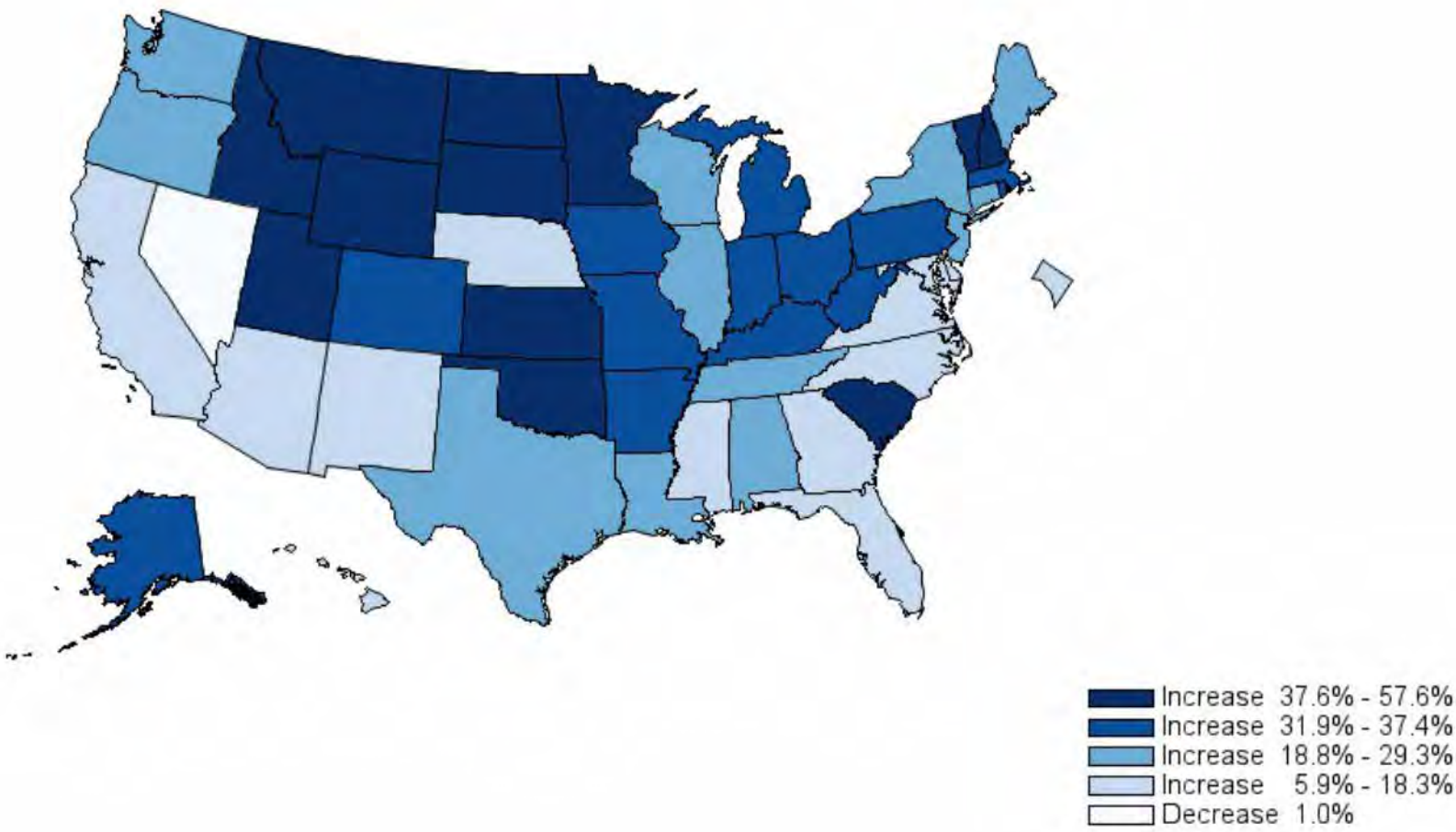
§§ Percentage of injury deaths for which intent was not determined exceeded 20% for both the first and last periods and might have contributed to lower reported rates.

¶¶ Percentage of injury deaths for which intent was not determined declined notably between the first and last periods and might have contributed to the reported rate increase.



Figure 1

**Percentage Change in Annual Suicide Rates (per 100,000, Age-Adjusted) by State**  
2014-2016 Compared Against 1999-2001



**Table 2. Select Demographic and Descriptive Characteristics of Suicides among Decedents  $\geq 10$  years of age with and without Known Mental Health Problems--National Violent Death Reporting System, 27 states\*, 2015**

Characteristics	Total (n=20,446)	Mental Health Problem <sup>†</sup> (n=9,407)	No Known Mental Health Problem (n=11,039)	Chi- Square	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>¶</sup> (95% CI)
<b>Sex</b>						
Male	15,702(76.8)	6,469(68.8)	9,233(83.6)	p<.01	2.3(2.2-2.5)	
Female	4,744(23.2)	2,938(31.2)	1,806(16.4)	p<.01	0.4(0.4-0.5)	
<b>Age**</b>						
10-24	2,804(13.7)	1,211(12.9)	1,593(14.4)	p<.01	1.1(1.1-1.2)	
25-44	6,456(31.6)	3,036(32.3)	3,420(31.0)	p<.05	0.9(0.9-1.0)	
45-64	7,718(37.7)	3,820(40.6)	3,898(35.3)	p<.01	0.8(0.8-0.8)	
65+	3,468(17.0)	1,340(14.2)	2,128(19.3)	p<.01	1.4(1.3-1.5)	
<b>Race/ethnicity</b>						
White, non-Hispanic	17,102(83.6)	8,165(86.8)	8,937(81.0)	p<.01	0.6(0.6-0.7)	
Black, non-Hispanic	1,228(6.0)	411(4.4)	817(7.4)	p<.01	1.7(1.5-2.0)	
American Indian/Alaska Native, non-Hispanic	378(1.8)	112(1.2)	266(2.4)	p<.01	2.0(1.6-2.6)	
Asian, non-Hispanic	576(2.8)	235(2.5)	341(3.1)	p<.05	1.2(1.1-1.5)	
Hispanic	1,096(5.4)	463(4.9)	633(5.7)	p<.05	1.2(1.0-1.3)	
Other	66(0.3)	21(0.2)	45(0.4)	p<.05	1.8(1.1-3.1)	
<b>Extended demographics</b>						
Ever served in military <sup>††</sup>	3,429(17.8)	1,354(15.3)	2,075(20.1)	p<.01	1.4(1.3-1.5)	1.1(1.0-1.1)
Homeless	240(1.2)	104(1.1)	136(1.3)		1.1(0.9-1.5)	1.2(0.9-1.5)
<b>Incident Type</b>						
Single suicide	20,063(98.2)	9,318(99.1)	10,745(97.4)	p<.01	0.3(0.3-0.4)	0.4(0.3-0.5)
Homicide followed by suicide	319(1.6)	64(0.7)	255(2.3)	p<.01	3.5(2.6-4.5)	2.9(2.2-3.8)
Multiple suicides	64(0.3)	25(0.3)	39(0.4)		1.3(0.8-2.2)	1.6(0.9-2.6)
<b>Method</b>						
Firearm	9,909(48.5)	3,821(40.6)	6,088(55.3)	p<.01	1.8(1.7-1.9)	1.6(1.5-1.7)
Hanging/Strangulation/Suffocation	5,907(28.9)	2,940(31.3)	2,967(26.9)	p<.01	0.8(0.8-0.9)	0.8(0.7-0.8)



Poisoning		3,003(14.7)	1,861(19.8)	1,142(10.4)	p<.01	0.5(0.4-0.5)	0.6(0.6-0.7)
Substance class causing death <sup>§§</sup>							
Other (e.g., over-the-counter)		1,021(34.0)	666(35.8)	355(31.1)	p<.01	0.8(0.7-0.9)	0.9(0.7-1.0)
Opioids		944(31.4)	608(32.7)	336(29.4)		0.9(0.7-1.0)	0.9(0.8-1.1)
Antidepressants		800(26.6)	644(34.6)	156(13.7)	p<.01	0.3(0.2-0.4)	0.3(0.3-0.4)
Benzodiazepines		624(20.8)	468(25.1)	156(13.7)	p<.01	0.5(0.4-0.6)	0.5(0.4-0.6)
Antipsychotics		219(7.3)	195(10.5)	24(2.1)	p<.01	0.2(0.1-0.3)	0.2(0.1-0.3)
Other		1,595(7.8)	780(8.3)	815(7.4)	p<.05	0.9(0.8-1.0)	0.9(0.8-1.0)
<b>Toxicology Results</b>							
Any toxicology testing		13,317(65.1)	6,658(70.8)	6,659(60.3)	p<.01	0.6(0.6-0.7)	0.7(0.6-0.7)
<b>Positive for ≥ 1 substance<sup>¶¶</sup></b>		9,913(74.4)	5,192(78.0)	4,721(70.9)	p<.01	0.7(0.6-0.7)	0.8(0.7-0.8)
Substance detected***							
Alcohol							
	Tested	10,950(53.6)	5,409(57.5)	5,541(50.2)	p<.01	0.7(0.7-0.8)	0.8(0.7-0.8)
	Positive	4,442(40.6)	2,115(39.1)	2,327(42.0)	p<.01	1.1(1.0-1.2)	1.2(1.1-1.3)
Opioids							
	Tested	8,554(41.8)	4,258(45.3)	4,296(38.9)	p<.01	0.8(0.7-0.8)	0.8(0.8-0.9)
	Positive	2,279(26.6)	1,238(29.1)	1,041(24.2)	p<.01	0.8(0.7-0.9)	0.9(0.8-.99)
Benzodiazepines							
	Tested	8,124(39.7)	4,226(44.9)	3,898(35.3)	p<.01	0.7(0.6-0.7)	0.7(0.7-0.8)
	Positive	2,464(30.3)	1,639(38.8)	825(21.2)	p<.01	0.4(0.4-0.5)	0.5(0.5-0.6)
Cocaine							
	Tested	7,978(39.0)	3,866(41.1)	4,112(37.2)	p<.01	0.9(0.8-0.9)	0.9(0.9-1.0)
	Positive	499(6.3)	216(5.6)	283(6.9)	p<.05	1.2(1.0-1.5)	1.2(1.0-1.5)
Amphetamines							
	Tested	7,615(37.2)	3,696(39.3)	3,919(35.5)	p<.01	0.9(0.8-0.9)	0.9(0.8-0.9)
	Positive	736(9.7)	376(10.2)	360(9.2)		0.9(0.8-1.0)	1.0(0.8-1.1)
Marijuana							
	Tested	6,569(32.1)	3,127(33.2)	3,442(31.2)	p<.01	0.9(0.9-1.0)	0.9(0.9-1.0)
	Positive	1,471(22.4)	710(22.7)	761(22.1)		1.0(0.9-1.1)	0.9(0.8-1.0)
Antidepressants							
	Tested	5,425(26.5)	3,103(33.0)	2,322(21.0)	p<.01	0.5(0.5-0.6)	0.6(0.6-0.7)
	Positive	2,214(40.8)	1,735(55.9)	479(20.6)	p<.01	0.2(0.2-0.2)	0.2(0.2-0.3)

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

† Decedent had been identified as having a current diagnosis of mental health problem in coroner/medical examiner or law enforcement reports.

§ Odds ratio reflects the risk among those without known mental health problem relative to those with known MHP.

¶ Logistic regression was used to estimate adjusted odds ratio with 95% CIs after controlling for age, sex, race and ethnicity. Known MHP was used as the reference group.

\*\* Decedents were aged 10 years and older, as per standard in the suicide prevention literature.

†† Denominator is decedents aged 18 years of age and older with reported military service status.

§§ Denominator is decedents who died by poisoning, including overdose.

¶¶ Denominator is decedents with any toxicology tested.

\*\*\* Denominator for each positive group is the number tested for the substance in that group.

---



**Table 3. Circumstances Preceding Suicide among Decedents  $\geq 10$  years of age with and without Known Mental Health Problems--National Violent Death Reporting System, 27 states\*, 2015**

Characteristics	Total	Mental Health Problem <sup>†</sup>	No Known Mental Health Problem	Chi-Square	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>¶</sup> (95% CI)
Suicide with known circumstances	18,764(91.8)	9,407(100)	9,357(84.8)	p<.01		
<b>Mental Health</b>						
Any Current Diagnosed Mental Health Problem**						
Depression/dysthymia		7,076(75.2)				
Anxiety disorder		1,579(16.8)				
Bipolar disorder		1,431(15.2)				
Schizophrenia		509(5.4)				
PTSD		424(4.5)				
ADD/ADHD		226(2.4)				
Unknown		760(8.1)				
Current depressed mood		3,962(42.1)	3,076(32.9)	p<.01	0.7(0.6-0.7)	0.7(0.6-0.7)
<b>Substance Problems</b>						
<b>Any Current substance problem</b>	5,319(28.3)	2,976(31.6)	2,343(25.0)	p<.01	0.7(0.7-0.8)	0.7(0.7-0.8)
Alcohol problem	3,268(17.4)	1,862(19.8)	1,406(15.0)	p<.01	0.7(0.7-0.8)	0.7(0.7-0.8)
Other substance problem	3,084(16.4)	1,768(18.8)	1,316(14.1)	p<.01	0.7(0.7-0.8)	0.7(0.7-0.8)
<b>Treatment</b>						
Current mental health/substance abuse treatment	5,141(27.4)	5,077(54.0)	64(0.7)	p<.01	0.01(0.01-0.01)	0.01(0.01-0.01)
Ever treated for mental health/substance problem	6,717(35.8)	6,323(67.2)	394(4.2)	p<.01	0.02(0.02-0.02)	0.02(0.02-0.03)
<b>Relationship Problems/Loss</b>						
<b>Any relationship problem/loss</b>	7,948(42.4)	3,726(39.6)	4,222(45.1)	p<.01	1.3(1.2-1.3)	1.3(1.2-1.4)
Intimate partner problem	5,098(27.2)	2,270(24.1)	2,828(30.2)	p<.01	1.4(1.3-1.5)	1.4(1.3-1.5)
Perpetrator of interpersonal violence past month	414(2.2)	131(1.4)	283(3.0)	p<.01	2.2(1.8-2.7)	2.0(1.6-2.4)
Victim of interpersonal violence within past month	84(0.4)	53(0.6)	31(0.3)	p<.05	0.6(0.4-0.9)	0.8(0.5-1.2)
Family relationship problem	1,671(8.9)	873(9.3)	798(8.5)		0.9(0.8-1.0)	1.0(0.9-1.1)

Other relationship problem (non-intimate)	403(2.1)	202(2.1)	201(2.1)		1.0(0.8-1.2)	1.1(0.9-1.3)
Argument or conflict (not specified)	2,914(15.5)	1,278(13.6)	1,636(17.5)	p<.01	1.3(1.2-1.5)	1.4(1.3-1.5)
<b>Death of a loved one (any)</b>	1,497(8.0)	826(8.8)	671(7.2)	p<.01	0.8(0.7-0.9)	0.9(0.8-0.9)
Non-suicide death	1,181(6.3)	647(6.9)	534(5.7)	p<.01	0.8(0.7-0.9)	0.9(0.8-1.0)
Suicide of family or friend	379(2.0)	217(2.3)	162(1.7)	p<.01	0.7(0.6-0.9)	0.8(0.7-1.0)
<b>Other Life Stressors</b>						
<b>Any life stressor</b>	9,743(51.9)	4,675(49.7)	5,068(54.2)	p<.01	1.2(1.1-1.3)	1.1(1.1-1.2)
Recent criminal legal problem	1,588(8.5)	586(6.2)	1,002(10.7)	p<.01	1.8(1.6-2.0)	1.7(1.5-1.9)
Other legal problem	748(4.0)	378(4.0)	370(4.0)		1.0(0.8-1.1)	1.0(0.9-1.2)
Physical health problem	4,179(22.3)	2,012(21.4)	2,167(23.2)	p<.01	1.1(1.0-1.2)	1.0(1.0-1.1)
Job/Financial problem <sup>††</sup>	2941(16.2)	1530(16.8)	1411(15.6)	p<.05	0.9(0.8-1.0)	0.9(0.8-1.0)
Eviction or loss of home	722(3.8)	317(3.4)	405(4.3)	p<.01	1.3(1.1-1.5)	1.4(1.2-1.6)
School problem <sup>§§</sup>	162(19.9)	70(17.8)	92(21.9)		1.3(0.9-1.8)	1.3(0.9-1.9)
Recent release from an institution <sup>¶¶</sup>	1,412(7.6)	941(10.2)	471(5.1)	p<.01	0.5(0.4-0.5)	0.5(0.4-0.5)
Jail/prison/detention facility	203(14.4)	82(8.7)	121(25.7)	p<.01	3.6(2.7-4.9)	4.5(3.2-6.4)
Hospital	517(36.6)	311(33.0)	206(43.7)	p<.01	1.6(1.3-2.0)	1.3(1.0-1.7)
Psychiatric hospital/institution	469(33.2)	439(46.7)	30(6.4)	p<.01	0.1(0.1-0.1)	0.1(0.1-0.1)
Other (includes alc/SA treatment facilities)	223(15.8)	109(11.6)	114(24.2)	p<.01	2.4(1.8-3.3)	2.5(1.8-3.3)
<b>Recent or Impending Crisis</b>						
Crisis within past or upcoming two weeks <sup>***</sup>	5,525(29.4)	2,444(26.0)	3,081(32.9)	p<.01	1.4(1.3-1.5)	1.4(1.3-1.5)
Intimate partner problem crisis	1968(35.6)	854(34.9)	1114(36.2)		1.1(0.9-1.2)	1.1(0.9-1.2)
Physical health problem crisis	739(13.4)	315(12.9)	424(13.8)		1.1(0.9-1.3)	1.0(0.8-1.2)
Criminal legal problem crisis	621(11.2)	203(8.3)	418(13.6)	p<.01	1.7(1.5-2.1)	1.6(1.3-1.9)
Family relationship problem crisis	430(7.8)	212(8.7)	218(7.1)	p<.05	0.8(0.7-1.0)	0.9(0.7-1.1)
Job problem crisis	354(6.4)	191(7.8)	163(5.3)	p<.01	0.7(0.5-0.8)	0.7(0.5-0.8)
<b>Suicide Event/History</b>						
Left a note	6,468(34.5)	3,182(33.8)	3,286(35.1)		1.1(1.0-1.1)	1.2(1.1-1.2)
Disclosed suicide intent	4,405(23.5)	2,306(24.5)	2,099(22.4)	p<.01	0.9(0.8-1.0)	0.9(0.8-0.9)
History of ideation	5,990(31.9)	3,838(40.8)	2,152(23.0)	p<.01	0.4(0.4-0.5)	0.4(0.4-0.5)
History of attempts	3,732(19.9)	2,770(29.4)	962(10.3)	p<.01	0.3(0.3-0.3)	0.3(0.3-0.3)

\*Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

<sup>†</sup> Decedent had been identified as having a current diagnosis of mental health problem in coroner/medical examiner or law enforcement reports.



§ Odds ratio reflects the risk among those without known mental health problem relative to those with known MHP.

¶ Logistic regression was used to estimate adjusted odds ratio with 95% CIs after controlling for age, sex, race and ethnicity. Known MHP was used as the reference group.

\*\* Includes decedents with one or more diagnosed current mental health problems, which are not mutually exclusive. Therefore sums of percentages for the diagnosed conditions exceed 100%. Denominator includes the number of decedents with one or more current diagnosed mental health problems.

†† Denominator is decedents aged 18 years of age and older.

§§ Denominator is decedents aged 10-18 years.

¶¶ Denominator of institution subgroup is decedents with recent release from an institution. Recent release from an institution is defined as having occurred within the past month.

\*\*\* Denominator of crisis subgroup is decedents with any crisis within past or upcoming two weeks. Crises depicted here represent the most commonly occurring categories.

---

April 10, 2018

**Table 2. Select Demographic and Descriptive Characteristics of Suicides among Decedents  $\geq 10$  years of age with and without Known Mental Health Problems--National Violent Death Reporting System, 27 states\*, 2015**

Characteristics	Total (n=20,446)	Mental Health Problem <sup>†</sup> (n=9,407)	No Known Mental Health Problem (n=11,039)	Chi- Square	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>¶</sup> (95% CI)
<b>Sex</b>						
Male	15,702(76.8)	6,469(68.8)	9,233(83.6)	p<.01	2.3(2.2-2.5)	
Female	4,744(23.2)	2,938(31.2)	1,806(16.4)	p<.01	0.4(0.4-0.5)	
<b>Age**</b>						
10-24	2,804(13.7)	1,211(12.9)	1,593(14.4)	p<.01	1.1(1.1-1.2)	
25-44	6,456(31.6)	3,036(32.3)	3,420(31.0)	p<.05	0.9(0.9-1.0)	
45-64	7,718(37.7)	3,820(40.6)	3,898(35.3)	p<.01	0.8(0.8-0.8)	
65+	3,468(17.0)	1,340(14.2)	2,128(19.3)	p<.01	1.4(1.3-1.5)	
<b>Race/ethnicity</b>						
White, non-Hispanic	17,102(83.6)	8,165(86.8)	8,937(81.0)	p<.01	0.6(0.6-0.7)	
Black, non-Hispanic	1,228(6.0)	411(4.4)	817(7.4)	p<.01	1.7(1.5-2.0)	
American Indian/Alaska Native, non-Hispa	378(1.8)	112(1.2)	266(2.4)	p<.01	2.0(1.6-2.6)	
Asian, non-Hispanic	576(2.8)	235(2.5)	341(3.1)	p<.05	1.2(1.1-1.5)	
Hispanic	1,096(5.4)	463(4.9)	633(5.7)	p<.05	1.2(1.0-1.3)	
Other	66(0.3)	21(0.2)	45(0.4)	p<.05	1.8(1.1-3.1)	
<b>Extended demographics</b>						
Ever served in military <sup>††</sup>	3,429(17.8)	1,354(15.3)	2,075(20.1)	p<.01	1.4(1.3-1.5)	1.1(1.0-1.1)
Homeless	240(1.2)	104(1.1)	136(1.3)		1.1(0.9-1.5)	1.2(0.9-1.5)
<b>Incident Type</b>						
Single suicide	20,063(98.2)	9,318(99.1)	10,745(97.4)	p<.01	0.3(0.3-0.4)	0.4(0.3-0.5)
Homicide followed by suicide	319(1.6)	64(0.7)	255(2.3)	p<.01	3.5(2.6-4.5)	2.9(2.2-3.8)
Multiple suicides	64(0.3)	25(0.3)	39(0.4)		1.3(0.8-2.2)	1.6(0.9-2.6)
<b>Method</b>						
Firearm	9,909(48.5)	3,821(40.6)	6,088(55.3)	p<.01	1.8(1.7-1.9)	1.6(1.5-1.7)
Hanging/Strangulation/Suffocation	5,907(28.9)	2,940(31.3)	2,967(26.9)	p<.01	0.8(0.8-0.9)	0.8(0.7-0.8)
Poisoning	3,003(14.7)	1,861(19.8)	1,142(10.4)	p<.01	0.5(0.4-0.5)	0.6(0.6-0.7)
Substance class causing death <sup>§§</sup>						



Other (e.g., over-the-counter)	1,021(34.0)	666(35.8)	355(31.1)	p<.01	0.8(0.7-0.9)	0.9(0.7-1.0)
Opioids	944(31.4)	608(32.7)	336(29.4)		0.9(0.7-1.0)	0.9(0.8-1.1)
Antidepressants	800(26.6)	644(34.6)	156(13.7)	p<.01	0.3(0.2-0.4)	0.3(0.3-0.4)
Benzodiazepines	624(20.8)	468(25.1)	156(13.7)	p<.01	0.5(0.4-0.6)	0.5(0.4-0.6)
Antipsychotics	219(7.3)	195(10.5)	24(2.1)	p<.01	0.2(0.1-0.3)	0.2(0.1-0.3)
Other	1,595(7.8)	780(8.3)	815(7.4)	p<.05	0.9(0.8-1.0)	0.9(0.8-1.0)
<b>Toxicology Results</b>						
Any toxicology testing	13,317(65.1)	6,658(70.8)	6,659(60.3)	p<.01	0.6(0.6-0.7)	0.7(0.6-0.7)
<b>Positive for ≥ 1 substance<sup>††</sup></b>	9,913(74.4)	5,192(78.0)	4,721(70.9)	p<.01	0.7(0.6-0.7)	0.8(0.7-0.8)
<b>Substance detected***</b>						
<b>Alcohol</b>						
Tested	10,950(53.6)	5,409(57.5)	5,541(50.2)	p<.01	0.7(0.7-0.8)	0.8(0.7-0.8)
Positive	4,442(40.6)	2,115(39.1)	2,327(42.0)	p<.01	1.1(1.0-1.2)	1.2(1.1-1.3)
<b>Opioids</b>						
Tested	8,554(41.8)	4,258(45.3)	4,296(38.9)	p<.01	0.8(0.7-0.8)	0.8(0.8-0.9)
Positive	2,279(26.6)	1,238(29.1)	1,041(24.2)	p<.01	0.8(0.7-0.9)	0.9(0.8-1.0)
<b>Benzodiazepines</b>						
Tested	8,124(39.7)	4,226(44.9)	3,898(35.3)	p<.01	0.7(0.6-0.7)	0.7(0.7-0.8)
Positive	2,464(30.3)	1,639(38.8)	825(21.2)	p<.01	0.4(0.4-0.5)	0.5(0.5-0.6)
<b>Cocaine</b>						
Tested	7,978(39.0)	3,866(41.1)	4,112(37.2)	p<.01	0.9(0.8-0.9)	0.9(0.9-1.0)
Positive	499(6.3)	216(5.6)	283(6.9)	p<.05	1.2(1.0-1.5)	1.2(1.0-1.5)
<b>Amphetamines</b>						
Tested	7,615(37.2)	3,696(39.3)	3,919(35.5)	p<.01	0.9(0.8-0.9)	0.9(0.8-0.9)
Positive	736(9.7)	376(10.2)	360(9.2)		0.9(0.8-1.0)	1.0(0.8-1.1)
<b>Marijuana</b>						
Tested	6,569(32.1)	3,127(33.2)	3,442(31.2)	p<.01	0.9(0.9-1.0)	0.9(0.9-1.0)
Positive	1,471(22.4)	710(22.7)	761(22.1)		1.0(0.9-1.1)	0.9(0.8-1.0)
<b>Antidepressants</b>						
Tested	5,425(26.5)	3,103(33.0)	2,322(21.0)	p<.01	0.5(0.5-0.6)	0.6(0.6-0.7)
Positive	2,214(40.8)	1,735(55.9)	479(20.6)	p<.01	0.2(0.2-0.2)	0.2(0.2-0.3)

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey,

<sup>†</sup> Decedent had been identified as having a current diagnosis of mental health problem in coroner/medical examiner or law enforcement reports.

<sup>§</sup> Odds ratio reflects the risk among those without known mental health problem relative to those with known MHP.

<sup>†</sup> Logistic regression was used to estimate adjusted odds ratio with 95% CIs after controlling for age, sex, race and ethnicity. Known MHP was used as the reference group.

<sup>\*\*</sup> Decedents were aged 10 years and older, as per standard in the suicide prevention literature.

<sup>††</sup> Denominator is decedents aged 18 years of age and older with reported military service status.

<sup>§§</sup> Denominator is decedents who died by poisoning, including overdose.

<sup>¶¶</sup> Denominator is decedents with any toxicology tested.

<sup>\*\*\*</sup> Denominator for each positive group is the number tested for the substance in that group.

---



**Table 3. Circumstances Preceding Suicide among Decedents  $\geq 10$  years of age with and without Known Mental Health Problems--National Violent Death Reporting System, 27 states\*, 2015**

Characteristics	Total	Mental Health Problem <sup>†</sup>	No Known Mental Health Problem	Chi-Square	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>¶</sup> (95% CI)
Suicide with known circumstances	18,764(91.8)	9,407(100)	9,357(84.8)	p<.01		
<b>Mental Health</b>						
Any Current Diagnosed Mental Health Problem**						
Depression/dysthymia		7,076(75.2)				
Anxiety disorder		1,579(16.8)				
Bipolar disorder		1,431(15.2)				
Schizophrenia		509(5.4)				
PTSD		424(4.5)				
ADD/ADHD		226(2.4)				
Unknown		760(8.1)				
Current depressed mood		3,962(42.1)	3,076(32.9)	p<.01	0.7(0.6-0.7)	0.7(0.6-0.7)
<b>Substance Problems</b>						
Any Current substance problem	5,319(28.3)	2,976(31.6)	2,343(25.0)	p<.01	0.7(0.7-0.8)	0.7(0.7-0.8)
Alcohol problem	3,268(17.4)	1,862(19.8)	1,406(15.0)	p<.01	0.7(0.7-0.8)	0.7(0.7-0.8)
Other substance problem	3,084(16.4)	1,768(18.8)	1,316(14.1)	p<.01	0.7(0.7-0.8)	0.7(0.7-0.8)
<b>Treatment</b>						
Current mental health/substance abuse treatment	5,141(27.4)	5,077(54.0)	64(0.7)	p<.01	0.01(0.01-0.01)	0.01(0.01-0.01)
Ever treated for mental health/substance problem	6,717(35.8)	6,323(67.2)	394(4.2)	p<.01	0.02(0.02-0.02)	0.02(0.02-0.03)
<b>Relationship Problems/Loss</b>						
Any relationship problem/loss	7,948(42.4)	3,726(39.6)	4,222(45.1)	p<.01	1.3(1.2-1.3)	1.3(1.2-1.4)
Intimate partner problem	5,098(27.2)	2,270(24.1)	2,828(30.2)	p<.01	1.4(1.3-1.5)	1.4(1.3-1.5)
Perpetrator of interpersonal violence past month	414(2.2)	131(1.4)	283(3.0)	p<.01	2.2(1.8-2.7)	2.0(1.6-2.4)
Victim of interpersonal violence within past month	84(0.4)	53(0.6)	31(0.3)	p<.05	0.6(0.4-0.9)	0.8(0.5-1.2)
Family relationship problem	1,671(8.9)	873(9.3)	798(8.5)		0.9(0.8-1.0)	1.0(0.9-1.1)
Other relationship problem (non-intimate)	403(2.1)	202(2.1)	201(2.1)		1.0(0.8-1.2)	1.1(0.9-1.3)
Argument or conflict (not specified)	2,914(15.5)	1,278(13.6)	1,636(17.5)	p<.01	1.3(1.2-1.5)	1.4(1.3-1.5)
Death of a loved one (any)	1,497(8.0)	826(8.8)	671(7.2)	p<.01	0.8(0.7-0.9)	0.9(0.8-0.9)
Non-suicide death	1,181(6.3)	647(6.9)	534(5.7)	p<.01	0.8(0.7-0.9)	0.9(0.8-1.0)

Suicide of family or friend	379(2.0)	217(2.3)	162(1.7)	p<.01	0.7(0.6-0.9)	0.8(0.7-1.0)
<b>Other Life Stressors</b>						
<b>Any life stressor</b>	9,743(51.9)	4,675(49.7)	5,068(54.2)	p<.01	1.2(1.1-1.3)	1.1(1.1-1.2)
Recent criminal legal problem	1,588(8.5)	586(6.2)	1,002(10.7)	p<.01	1.8(1.6-2.0)	1.7(1.5-1.9)
Other legal problem	748(4.0)	378(4.0)	370(4.0)		1.0(0.8-1.1)	1.0(0.9-1.2)
Physical health problem	4,179(22.3)	2,012(21.4)	2,167(23.2)	p<.01	1.1(1.0-1.2)	1.0(1.0-1.1)
Job/Financial problem <sup>††</sup>	2941(16.2)	1530(16.8)	1411(15.6)	p<.05	0.9(0.8-1.0)	0.9(0.8-1.0)
Eviction or loss of home	722(3.8)	317(3.4)	405(4.3)	p<.01	1.3(1.1-1.5)	1.4(1.2-1.6)
School problem <sup>§§</sup>	162(19.9)	70(17.8)	92(21.9)		1.3(0.9-1.8)	1.3(0.9-1.9)
Recent release from an institution <sup>†††</sup>	1,412(7.6)	941(10.2)	471(5.1)	p<.01	0.5(0.4-0.5)	0.5(0.4-0.5)
Jail/prison/detention facility	203(14.4)	82(8.7)	121(25.7)	p<.01	3.6(2.7-4.9)	4.5(3.2-6.4)
Hospital	517(36.6)	311(33.0)	206(43.7)	p<.01	1.6(1.3-2.0)	1.3(1.0-1.7)
Psychiatric hospital/institution	469(33.2)	439(46.7)	30(6.4)	p<.01	0.1(0.1-0.1)	0.1(0.1-0.1)
Other (includes alc/SA treatment facilities)	223(15.8)	109(11.6)	114(24.2)	p<.01	2.4(1.8-3.3)	2.5(1.8-3.3)
<b>Recent or Impending Crisis</b>						
Crisis within past or upcoming two weeks <sup>***</sup>	5,525(29.4)	2,444(26.0)	3,081(32.9)	p<.01	1.4(1.3-1.5)	1.4(1.3-1.5)
Intimate partner problem crisis	1968(35.6)	854(34.9)	1114(36.2)		1.1(0.9-1.2)	1.1(0.9-1.2)
Physical health problem crisis	739(13.4)	315(12.9)	424(13.8)		1.1(0.9-1.3)	1.0(0.8-1.2)
Criminal legal problem crisis	621(11.2)	203(8.3)	418(13.6)	p<.01	1.7(1.5-2.1)	1.6(1.3-1.9)
Family relationship problem crisis	430(7.8)	212(8.7)	218(7.1)	p<.05	0.8(0.7-1.0)	0.9(0.7-1.1)
Job problem crisis	354(6.4)	191(7.8)	163(5.3)	p<.01	0.7(0.5-0.8)	0.7(0.5-0.8)
<b>Suicide Event/History</b>						
Left a note	6,468(34.5)	3,182(33.8)	3,286(35.1)		1.1(1.0-1.1)	1.2(1.1-1.2)
Disclosed suicide intent	4,405(23.5)	2,306(24.5)	2,099(22.4)	p<.01	0.9(0.8-1.0)	0.9(0.8-0.9)
History of ideation	5,990(31.9)	3,838(40.8)	2,152(23.0)	p<.01	0.4(0.4-0.5)	0.4(0.4-0.5)
History of attempts	3,732(19.9)	2,770(29.4)	962(10.3)	p<.01	0.3(0.3-0.3)	0.3(0.3-0.3)

\*Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

<sup>†</sup> Decedent had been identified as having a current diagnosis of mental health problem in coroner/medical examiner or law enforcement reports.

<sup>§</sup> Odds ratio reflects the risk among those without known mental health problem relative to those with known MHP.

<sup>†</sup> Logistic regression was used to estimate adjusted odds ratio with 95% CIs after controlling for age, sex, race and ethnicity. Known MHP was used as the reference group.

<sup>\*\*</sup> Includes decedents with one or more diagnosed current mental health problems, which are not mutually exclusive. Therefore sums of percentages for the diagnosed conditions exceed 100%. Denominator includes the number of decedents with one or more current diagnosed mental health problems.

<sup>††</sup> Denominator is decedents aged 18 years of age and older.



§§ Denominator is decedents aged 10-18 years.

¶ Denominator of institution subgroup is decedents with recent release from an institution. Recent release from an institution is defined as having occurred within the past month.

\*\*\* Denominator of crisis subgroup is decedents with any crisis within past or upcoming two weeks. Crises depicted here represent the most commonly occurring categories.

---

**Table 2. Select Demographic and Descriptive Characteristics of Suicides among Decedents  $\geq 10$  years of age with and without Known Mental Health Problems--National Violent Death Reporting System, 27 states\*, 2015**

Characteristics	Total (n=20,446)	Mental Health Problem <sup>†</sup> (n=9,407)	No Known Mental Health Problem (n=11,039)	Chi- Square	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>¶</sup> (95% CI)
<b>Sex</b>						
Male	15,702(76.8)	6,469(68.8)	9,233(83.6)	p<.01	2.3(2.2-2.5)	
Female	4,744(23.2)	2,938(31.2)	1,806(16.4)	p<.01	0.4(0.4-0.5)	
<b>Age**</b>						
10-24	2,804(13.7)	1,211(12.9)	1,593(14.4)	p<.01	1.1(1.1-1.2)	
25-44	6,456(31.6)	3,036(32.3)	3,420(31.0)	p<.05	0.9(0.9-1.0)	
45-64	7,718(37.7)	3,820(40.6)	3,898(35.3)	p<.01	0.8(0.8-0.8)	
65+	3,468(17.0)	1,340(14.2)	2,128(19.3)	p<.01	1.4(1.3-1.5)	
<b>Race/ethnicity</b>						
White, non-Hispanic	17,102(83.6)	8,165(86.8)	8,937(81.0)	p<.01	0.6(0.6-0.7)	
Black, non-Hispanic	1,228(6.0)	411(4.4)	817(7.4)	p<.01	1.7(1.5-2.0)	
American Indian/Alaska Native, non-Hispa	378(1.8)	112(1.2)	266(2.4)	p<.01	2.0(1.6-2.6)	
Asian, non-Hispanic	576(2.8)	235(2.5)	341(3.1)	p<.05	1.2(1.1-1.5)	
Hispanic	1,096(5.4)	463(4.9)	633(5.7)	p<.05	1.2(1.0-1.3)	
Other	66(0.3)	21(0.2)	45(0.4)	p<.05	1.8(1.1-3.1)	
<b>Extended demographics</b>						
Ever served in military <sup>††</sup>	3,429(17.8)	1,354(15.3)	2,075(20.1)	p<.01	1.4(1.3-1.5)	1.1(1.0-1.1)
Homeless	240(1.2)	104(1.1)	136(1.3)		1.1(0.9-1.5)	1.2(0.9-1.5)
<b>Incident Type</b>						
Single suicide	20,063(98.2)	9,318(99.1)	10,745(97.4)	p<.01	0.3(0.3-0.4)	0.4(0.3-0.5)
Homicide followed by suicide	319(1.6)	64(0.7)	255(2.3)	p<.01	3.5(2.6-4.5)	2.9(2.2-3.8)
Multiple suicides	64(0.3)	25(0.3)	39(0.4)		1.3(0.8-2.2)	1.6(0.9-2.6)
<b>Method</b>						
Firearm	9,909(48.5)	3,821(40.6)	6,088(55.3)	p<.01	1.8(1.7-1.9)	1.6(1.5-1.7)
Hanging/Strangulation/Suffocation	5,907(28.9)	2,940(31.3)	2,967(26.9)	p<.01	0.8(0.8-0.9)	0.8(0.7-0.8)
Poisoning	3,003(14.7)	1,861(19.8)	1,142(10.4)	p<.01	0.5(0.4-0.5)	0.6(0.6-0.7)
Substance class causing death <sup>§§</sup>						



Other (e.g., over-the-counter)	1,021(34.0)	666(35.8)	355(31.1)	p<.01	0.8(0.7-0.9)	0.9(0.7-1.0)
Opioids	944(31.4)	608(32.7)	336(29.4)		0.9(0.7-1.0)	0.9(0.8-1.1)
Antidepressants	800(26.6)	644(34.6)	156(13.7)	p<.01	0.3(0.2-0.4)	0.3(0.3-0.4)
Benzodiazepines	624(20.8)	468(25.1)	156(13.7)	p<.01	0.5(0.4-0.6)	0.5(0.4-0.6)
Antipsychotics	219(7.3)	195(10.5)	24(2.1)	p<.01	0.2(0.1-0.3)	0.2(0.1-0.3)
Other	1,595(7.8)	780(8.3)	815(7.4)	p<.05	0.9(0.8-1.0)	0.9(0.8-1.0)
<b>Toxicology Results</b>						
Any toxicology testing	13,317(65.1)	6,658(70.8)	6,659(60.3)	p<.01	0.6(0.6-0.7)	0.7(0.6-0.7)
<b>Positive for ≥ 1 substance<sup>††</sup></b>	9,913(74.4)	5,192(78.0)	4,721(70.9)	p<.01	0.7(0.6-0.7)	0.8(0.7-0.8)
<b>Substance detected***</b>						
<b>Alcohol</b>						
Tested	10,950(53.6)	5,409(57.5)	5,541(50.2)	p<.01	0.7(0.7-0.8)	0.8(0.7-0.8)
Positive	4,442(40.6)	2,115(39.1)	2,327(42.0)	p<.01	1.1(1.0-1.2)	1.2(1.1-1.3)
<b>Opioids</b>						
Tested	8,554(41.8)	4,258(45.3)	4,296(38.9)	p<.01	0.8(0.7-0.8)	0.8(0.8-0.9)
Positive	2,279(26.6)	1,238(29.1)	1,041(24.2)	p<.01	0.8(0.7-0.9)	0.9(0.8-1.0)
<b>Benzodiazepines</b>						
Tested	8,124(39.7)	4,226(44.9)	3,898(35.3)	p<.01	0.7(0.6-0.7)	0.7(0.7-0.8)
Positive	2,464(30.3)	1,639(38.8)	825(21.2)	p<.01	0.4(0.4-0.5)	0.5(0.5-0.6)
<b>Cocaine</b>						
Tested	7,978(39.0)	3,866(41.1)	4,112(37.2)	p<.01	0.9(0.8-0.9)	0.9(0.9-1.0)
Positive	499(6.3)	216(5.6)	283(6.9)	p<.05	1.2(1.0-1.5)	1.2(1.0-1.5)
<b>Amphetamines</b>						
Tested	7,615(37.2)	3,696(39.3)	3,919(35.5)	p<.01	0.9(0.8-0.9)	0.9(0.8-0.9)
Positive	736(9.7)	376(10.2)	360(9.2)		0.9(0.8-1.0)	1.0(0.8-1.1)
<b>Marijuana</b>						
Tested	6,569(32.1)	3,127(33.2)	3,442(31.2)	p<.01	0.9(0.9-1.0)	0.9(0.9-1.0)
Positive	1,471(22.4)	710(22.7)	761(22.1)		1.0(0.9-1.1)	0.9(0.8-1.0)
<b>Antidepressants</b>						
Tested	5,425(26.5)	3,103(33.0)	2,322(21.0)	p<.01	0.5(0.5-0.6)	0.6(0.6-0.7)
Positive	2,214(40.8)	1,735(55.9)	479(20.6)	p<.01	0.2(0.2-0.2)	0.2(0.2-0.3)

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey,

<sup>†</sup> Decedent had been identified as having a current diagnosis of mental health problem in coroner/medical examiner or law enforcement reports.

<sup>§</sup> Odds ratio reflects the risk among those without known mental health problem relative to those with known mental health problems

<sup>†</sup> Logistic regression was used to estimate adjusted odds ratio with 95% CIs after controlling for age, sex, race and ethnicity. Known mental health problems was used as the

<sup>\*\*</sup> Decedents were aged 10 years and older, as per standard in the suicide prevention literature.

<sup>††</sup> Denominator is decedents aged 18 years of age and older with reported military service status.

<sup>§§</sup> Denominator is decedents who died by poisoning, including overdose.

<sup>¶¶</sup> Denominator is decedents with any toxicology tested.

<sup>\*\*\*</sup> Denominator for each positive group is the number tested for the substance in that group.

---



**Table 3. Circumstances Preceding Suicide among Decedents  $\geq 10$  years of age with and without Known Mental Health Problems--National Violent Death Reporting System, 27 states\*, 2015**

Characteristics	Total	Mental Health Problem <sup>†</sup>	No Known Mental Health Problem	Chi-Square	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>¶</sup> (95% CI)
Suicide with known circumstances	18,764(91.8)	9,407(100)	9,357(84.8)	p<.01		
<b>Mental Health/Substance Problems</b>						
Any Current Mental Health Diagnosis**						
Depression/dysthymia	7,076(75.2)	7,076(75.2)				
Anxiety disorder	1,579(16.8)	1,579(16.8)				
Bipolar disorder	1,431(15.2)	1,431(15.2)				
Schizophrenia	509(5.4)	509(5.4)				
PTSD	424(4.5)	424(4.5)				
ADD/ADHD	226(2.4)	226(2.4)				
Unknown	760(8.1)	760(8.1)				
Current depressed mood	7,038(37.5)	3,962(42.1)	3,076(32.9)	p<.01	0.7(0.6-0.7)	0.7(0.6-0.7)
<b>Substance Problems</b>						
<b>Any Current substance problem</b>	5,319(28.3)	2,976(31.6)	2,343(25.0)	p<.01	0.7(0.7-0.8)	0.7(0.7-0.8)
Alcohol problem	3,268(17.4)	1,862(19.8)	1,406(15.0)	p<.01	0.7(0.7-0.8)	0.7(0.7-0.8)
Other substance problem	3,084(16.4)	1,768(18.8)	1,316(14.1)	p<.01	0.7(0.7-0.8)	0.7(0.7-0.8)
<b>Treatment</b>						
Current mental health/substance abuse treatment	5,141(27.4)	5,077(54.0)	64(0.7)	p<.01	0.0(0.0-0.0)	0.0(0.0-0.0)
Ever treated for mental health/substance problem	6,717(35.8)	6,323(67.2)	394(4.2)	p<.01	0.0(0.0-0.0)	0.0(0.0-0.0)
<b>Relationship Problems/Loss</b>						
<b>Any relationship problem/loss</b>	7,948(42.4)	3,726(39.6)	4,222(45.1)	p<.01	1.3(1.2-1.3)	1.3(1.2-1.4)
Intimate partner problem	5,098(27.2)	2,270(24.1)	2,828(30.2)	p<.01	1.4(1.3-1.5)	1.4(1.3-1.5)
Perpetrator of interpersonal violence past month	414(2.2)	131(1.4)	283(3.0)	p<.01	2.2(1.8-2.7)	2.0(1.6-2.4)
Victim of interpersonal violence within past month	84(0.4)	53(0.6)	31(0.3)	p<.05	0.6(0.4-0.9)	0.8(0.5-1.2)
Family relationship problem	1,671(8.9)	873(9.3)	798(8.5)		0.9(0.8-1.0)	1.0(0.9-1.1)
Other relationship problem (non-intimate)	403(2.1)	202(2.1)	201(2.1)		1.0(0.8-1.2)	1.1(0.9-1.3)
Argument or conflict (not specified)	2,914(15.5)	1,278(13.6)	1,636(17.5)	p<.01	1.3(1.2-1.5)	1.4(1.3-1.5)
<b>Death of a loved one (any)</b>	1,497(8.0)	826(8.8)	671(7.2)	p<.01	0.8(0.7-0.9)	0.9(0.8-0.9)
Non-suicide death	1,181(6.3)	647(6.9)	534(5.7)	p<.01	0.8(0.7-0.9)	0.9(0.8-1.0)

Suicide of family or friend	379(2.0)	217(2.3)	162(1.7)	p<.01	0.7(0.6-0.9)	0.8(0.7-1.0)
<b>Other Life Stressors</b>						
<b>Any life stressor</b>	9,743(51.9)	4,675(49.7)	5,068(54.2)	p<.01	1.2(1.1-1.3)	1.1(1.1-1.2)
Recent criminal legal problem	1,588(8.5)	586(6.2)	1,002(10.7)	p<.01	1.8(1.6-2.0)	1.7(1.5-1.9)
Other legal problem	748(4.0)	378(4.0)	370(4.0)		1.0(0.8-1.1)	1.0(0.9-1.2)
Physical health problem	4,179(22.3)	2,012(21.4)	2,167(23.2)	p<.01	1.1(1.0-1.2)	1.0(1.0-1.1)
Job/Financial problem <sup>††</sup>	2941(16.2)	1530(16.8)	1411(15.6)	p<.05	0.9(0.8-1.0)	0.9(0.8-1.0)
Eviction or loss of home	722(3.8)	317(3.4)	405(4.3)	p<.01	1.3(1.1-1.5)	1.4(1.2-1.6)
School problem <sup>§§</sup>	162(19.9)	70(17.8)	92(21.9)		1.3(0.9-1.8)	1.3(0.9-1.9)
Recent release from an institution <sup>†††</sup>	1,412(7.6)	941(10.2)	471(5.1)	p<.01	0.5(0.4-0.5)	0.5(0.4-0.5)
Jail/prison/detention facility	203(14.4)	82(8.7)	121(25.7)	p<.01	3.6(2.7-4.9)	4.5(3.2-6.4)
Hospital	517(36.6)	311(33.0)	206(43.7)	p<.01	1.6(1.3-2.0)	1.3(1.0-1.7)
Psychiatric hospital/institution	469(33.2)	439(46.7)	30(6.4)	p<.01	0.1(0.1-0.1)	0.1(0.1-0.1)
Other (includes alc/SA treatment facilities)	223(15.8)	109(11.6)	114(24.2)	p<.01	2.4(1.8-3.3)	2.5(1.8-3.3)
<b>Recent or Impending Crisis</b>						
Crisis within past or upcoming two weeks <sup>***</sup>	5,525(29.4)	2,444(26.0)	3,081(32.9)	p<.01	1.4(1.3-1.5)	1.4(1.3-1.5)
Intimate partner problem crisis	1968(35.6)	854(34.9)	1114(36.2)		1.1(0.9-1.2)	1.1(0.9-1.2)
Physical health problem crisis	739(13.4)	315(12.9)	424(13.8)		1.1(0.9-1.3)	1.0(0.8-1.2)
Criminal legal problem crisis	621(11.2)	203(8.3)	418(13.6)	p<.01	1.7(1.5-2.1)	1.6(1.3-1.9)
Family relationship problem crisis	430(7.8)	212(8.7)	218(7.1)	p<.05	0.8(0.7-1.0)	0.9(0.7-1.1)
Job problem crisis	354(6.4)	191(7.8)	163(5.3)	p<.01	0.7(0.5-0.8)	0.7(0.5-0.8)
<b>Suicide Event/History</b>						
Left a note	6,468(34.5)	3,182(33.8)	3,286(35.1)		1.1(1.0-1.1)	1.2(1.1-1.2)
Disclosed suicide intent	4,405(23.5)	2,306(24.5)	2,099(22.4)	p<.01	0.9(0.8-1.0)	0.9(0.8-0.9)
History of ideation	5,990(31.9)	3,838(40.8)	2,152(23.0)	p<.01	0.4(0.4-0.5)	0.4(0.4-0.5)
History of attempts	3,732(19.9)	2,770(29.4)	962(10.3)	p<.01	0.3(0.3-0.3)	0.3(0.3-0.3)

\*Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

<sup>†</sup> Decedent had been identified as having a current diagnosis of mental health problem in coroner/medical examiner or law enforcement reports.

<sup>§</sup> Odds ratio reflects the risk among those without known mental health problem relative to those with known mental health problem

<sup>†</sup> Logistic regression was used to estimate adjusted odds ratio with 95% CIs after controlling for age, sex, race and ethnicity. Known mental health problem was used as the referent

<sup>\*\*</sup> Includes decedents with one or more diagnosed current mental health problems, which are not mutually exclusive. Therefore sums of percentages for the diagnosed conditions exceed 100%. Denominator includes the number of decedents with one or more current diagnosed mental health problems.

<sup>††</sup> Denominator is decedents aged 18 years of age and older.



§§ Denominator is decedents aged 10-18 years.

¶ Denominator of institution subgroup is decedents with recent release from an institution. Recent release from an institution is defined as having occurred within the past month.

\*\*\* Denominator of crisis subgroup is decedents with any crisis within past or upcoming two weeks. Crises depicted here represent the most commonly occurring categories.

---

**Table 2. Select Demographic and Descriptive Characteristics of Suicides among Decedents  $\geq 10$  years of age with and without Known Mental Health Problems--National Violent Death Reporting System, 27 states\*, 2015**

Characteristics	Total (n=20,446)	Mental Health Problem <sup>†</sup> (n=9,407)	No Known Mental Health Problem (n=11,039)	Chi- Square	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>¶</sup> (95% CI)
<b>Sex</b>						
Male	15,702(76.8)	6,469(68.8)	9,233(83.6)	p<.01	2.3(2.2-2.5)	
Female	4,744(23.2)	2,938(31.2)	1,806(16.4)	p<.01	0.4(0.4-0.5)	
<b>Age**</b>						
10-24	2,804(13.7)	1,211(12.9)	1,593(14.4)	p<.01	1.1(1.1-1.2)	
25-44	6,456(31.6)	3,036(32.3)	3,420(31.0)	p<.05	0.9(0.9-1.0)	
45-64	7,718(37.7)	3,820(40.6)	3,898(35.3)	p<.01	0.8(0.8-0.8)	
65+	3,468(17.0)	1,340(14.2)	2,128(19.3)	p<.01	1.4(1.3-1.5)	
<b>Race/ethnicity</b>						
White, non-Hispanic	17,102(83.6)	8,165(86.8)	8,937(81.0)	p<.01	0.6(0.6-0.7)	
Black, non-Hispanic	1,228(6.0)	411(4.4)	817(7.4)	p<.01	1.7(1.5-2.0)	
American Indian/Alaska Native, non-Hispa	378(1.8)	112(1.2)	266(2.4)	p<.01	2.0(1.6-2.6)	
Asian, non-Hispanic	576(2.8)	235(2.5)	341(3.1)	p<.05	1.2(1.1-1.5)	
Hispanic	1,096(5.4)	463(4.9)	633(5.7)	p<.05	1.2(1.0-1.3)	
Other	66(0.3)	21(0.2)	45(0.4)	p<.05	1.8(1.1-3.1)	
<b>Extended demographics</b>						
Ever served in military <sup>††</sup>	3,429(17.8)	1,354(15.3)	2,075(20.1)	p<.01	1.4(1.3-1.5)	1.1(1.0-1.1)
Homeless	240(1.2)	104(1.1)	136(1.3)		1.1(0.9-1.5)	1.2(0.9-1.5)
<b>Incident Type</b>						
Single suicide	20,063(98.2)	9,318(99.1)	10,745(97.4)	p<.01	0.3(0.3-0.4)	0.4(0.3-0.5)
Homicide followed by suicide	319(1.6)	64(0.7)	255(2.3)	p<.01	3.5(2.6-4.5)	2.9(2.2-3.8)
Multiple suicides	64(0.3)	25(0.3)	39(0.4)		1.3(0.8-2.2)	1.6(0.9-2.6)
<b>Method</b>						
Firearm	9,909(48.5)	3,821(40.6)	6,088(55.3)	p<.01	1.8(1.7-1.9)	1.6(1.5-1.7)
Hanging/Strangulation/Suffocation	5,907(28.9)	2,940(31.3)	2,967(26.9)	p<.01	0.8(0.8-0.9)	0.8(0.7-0.8)
Poisoning	3,003(14.7)	1,861(19.8)	1,142(10.4)	p<.01	0.5(0.4-0.5)	0.6(0.6-0.7)
Substance class causing death <sup>§§</sup>						



Other (e.g., over-the-counter)	1,021(34.0)	666(35.8)	355(31.1)	p<.01	0.8(0.7-0.9)	0.9(0.7-1.0)
Opioids	944(31.4)	608(32.7)	336(29.4)		0.9(0.7-1.0)	0.9(0.8-1.1)
Antidepressants	800(26.6)	644(34.6)	156(13.7)	p<.01	0.3(0.2-0.4)	0.3(0.3-0.4)
Benzodiazepines	624(20.8)	468(25.1)	156(13.7)	p<.01	0.5(0.4-0.6)	0.5(0.4-0.6)
Antipsychotics	219(7.3)	195(10.5)	24(2.1)	p<.01	0.2(0.1-0.3)	0.2(0.1-0.3)
Other	1,595(7.8)	780(8.3)	815(7.4)	p<.05	0.9(0.8-1.0)	0.9(0.8-1.0)
<b>Toxicology Results</b>						
Any toxicology testing	13,317(65.1)	6,658(70.8)	6,659(60.3)	p<.01	0.6(0.6-0.7)	0.7(0.6-0.7)
<b>Positive for ≥ 1 substance<sup>††</sup></b>	9,913(74.4)	5,192(78.0)	4,721(70.9)	p<.01	0.7(0.6-0.7)	0.8(0.7-0.8)
<b>Substance detected***</b>						
<b>Alcohol</b>						
Tested	10,950(53.6)	5,409(57.5)	5,541(50.2)	p<.01	0.7(0.7-0.8)	0.8(0.7-0.8)
Positive	4,442(40.6)	2,115(39.1)	2,327(42.0)	p<.01	1.1(1.0-1.2)	1.2(1.1-1.3)
<b>Opioids</b>						
Tested	8,554(41.8)	4,258(45.3)	4,296(38.9)	p<.01	0.8(0.7-0.8)	0.8(0.8-0.9)
Positive	2,279(26.6)	1,238(29.1)	1,041(24.2)	p<.01	0.8(0.7-0.9)	0.9(0.8-1.0)
<b>Benzodiazepines</b>						
Tested	8,124(39.7)	4,226(44.9)	3,898(35.3)	p<.01	0.7(0.6-0.7)	0.7(0.7-0.8)
Positive	2,464(30.3)	1,639(38.8)	825(21.2)	p<.01	0.4(0.4-0.5)	0.5(0.5-0.6)
<b>Cocaine</b>						
Tested	7,978(39.0)	3,866(41.1)	4,112(37.2)	p<.01	0.9(0.8-0.9)	0.9(0.9-1.0)
Positive	499(6.3)	216(5.6)	283(6.9)	p<.05	1.2(1.0-1.5)	1.2(1.0-1.5)
<b>Amphetamines</b>						
Tested	7,615(37.2)	3,696(39.3)	3,919(35.5)	p<.01	0.9(0.8-0.9)	0.9(0.8-0.9)
Positive	736(9.7)	376(10.2)	360(9.2)		0.9(0.8-1.0)	1.0(0.8-1.1)
<b>Marijuana</b>						
Tested	6,569(32.1)	3,127(33.2)	3,442(31.2)	p<.01	0.9(0.9-1.0)	0.9(0.9-1.0)
Positive	1,471(22.4)	710(22.7)	761(22.1)		1.0(0.9-1.1)	0.9(0.8-1.0)
<b>Antidepressants</b>						
Tested	5,425(26.5)	3,103(33.0)	2,322(21.0)	p<.01	0.5(0.5-0.6)	0.6(0.6-0.7)
Positive	2,214(40.8)	1,735(55.9)	479(20.6)	p<.01	0.2(0.2-0.2)	0.2(0.2-0.3)

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey,

<sup>†</sup> Decedent had been identified as having a current diagnosis of mental health problem in coroner/medical examiner or law enforcement reports.

<sup>§</sup> Odds ratio reflects the risk among those without known mental health problem relative to those with known MHP.

<sup>†</sup> Logistic regression was used to estimate adjusted odds ratio with 95% CIs after controlling for age, sex, race and ethnicity. Known MHP was used as the reference group.

<sup>\*\*</sup> Decedents were aged 10 years and older, as per standard in the suicide prevention literature.

<sup>††</sup> Denominator is decedents aged 18 years of age and older with reported military service status.

<sup>§§</sup> Denominator is decedents who died by poisoning, including overdose.

<sup>¶¶</sup> Denominator is decedents with any toxicology tested.

<sup>\*\*\*</sup> Denominator for each positive group is the number tested for the substance in that group.

---



**Table 3. Circumstances Preceding Suicide among Decedents  $\geq 10$  years of age with and without Known Mental Health Problems--National Violent Death Reporting System, 27 states\*, 2015**

Characteristics	Total	Mental Health Problem <sup>†</sup>	No Known Mental Health Problem	Chi-Square	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>¶</sup> (95% CI)
Suicide with known circumstances	18,764(91.8)	9,407(100)	9,357(84.8)	p<.01		
<b>Mental Health/Substance Problems</b>						
Any Current Mental Health Diagnosis**						
Depression/dysthymia	7,076(75.2)	7,076(75.2)				
Anxiety disorder	1,579(16.8)	1,579(16.8)				
Bipolar disorder	1,431(15.2)	1,431(15.2)				
Schizophrenia	509(5.4)	509(5.4)				
PTSD	424(4.5)	424(4.5)				
ADD/ADHD	226(2.4)	226(2.4)				
Unknown	760(8.1)	760(8.1)				
Current depressed mood	7,038(37.5)	3,962(42.1)	3,076(32.9)	p<.01	0.7(0.6-0.7)	0.7(0.6-0.7)
<b>Substance Problems</b>						
<b>Any Current substance problem</b>	5,319(28.3)	2,976(31.6)	2,343(25.0)	p<.01	0.7(0.7-0.8)	0.7(0.7-0.8)
Alcohol problem	3,268(17.4)	1,862(19.8)	1,406(15.0)	p<.01	0.7(0.7-0.8)	0.7(0.7-0.8)
Other substance problem	3,084(16.4)	1,768(18.8)	1,316(14.1)	p<.01	0.7(0.7-0.8)	0.7(0.7-0.8)
<b>Treatment</b>						
Current mental health/substance abuse treatment	5,141(27.4)	5,077(54.0)	64(0.7)	p<.01	0.01(0.01-0.01)	0.01(0.01-0.01)
Ever treated for mental health/substance problem	6,717(35.8)	6,323(67.2)	394(4.2)	p<.01	0.02(0.02-0.02)	0.02(0.02-0.03)
<b>Relationship Problems/Loss</b>						
<b>Any relationship problem/loss</b>	7,948(42.4)	3,726(39.6)	4,222(45.1)	p<.01	1.3(1.2-1.3)	1.3(1.2-1.4)
Intimate partner problem	5,098(27.2)	2,270(24.1)	2,828(30.2)	p<.01	1.4(1.3-1.5)	1.4(1.3-1.5)
Perpetrator of interpersonal violence past month	414(2.2)	131(1.4)	283(3.0)	p<.01	2.2(1.8-2.7)	2.0(1.6-2.4)
Victim of interpersonal violence within past month	84(0.4)	53(0.6)	31(0.3)	p<.05	0.6(0.4-0.9)	0.8(0.5-1.2)
Family relationship problem	1,671(8.9)	873(9.3)	798(8.5)		0.9(0.8-1.0)	1.0(0.9-1.1)
Other relationship problem (non-intimate)	403(2.1)	202(2.1)	201(2.1)		1.0(0.8-1.2)	1.1(0.9-1.3)
Argument or conflict (not specified)	2,914(15.5)	1,278(13.6)	1,636(17.5)	p<.01	1.3(1.2-1.5)	1.4(1.3-1.5)
<b>Death of a loved one (any)</b>	1,497(8.0)	826(8.8)	671(7.2)	p<.01	0.8(0.7-0.9)	0.9(0.8-0.9)
Non-suicide death	1,181(6.3)	647(6.9)	534(5.7)	p<.01	0.8(0.7-0.9)	0.9(0.8-1.0)

Suicide of family or friend	379(2.0)	217(2.3)	162(1.7)	p<.01	0.7(0.6-0.9)	0.8(0.7-1.0)
<b>Other Life Stressors</b>						
<b>Any life stressor</b>	9,743(51.9)	4,675(49.7)	5,068(54.2)	p<.01	1.2(1.1-1.3)	1.1(1.1-1.2)
Recent criminal legal problem	1,588(8.5)	586(6.2)	1,002(10.7)	p<.01	1.8(1.6-2.0)	1.7(1.5-1.9)
Other legal problem	748(4.0)	378(4.0)	370(4.0)		1.0(0.8-1.1)	1.0(0.9-1.2)
Physical health problem	4,179(22.3)	2,012(21.4)	2,167(23.2)	p<.01	1.1(1.0-1.2)	1.0(1.0-1.1)
Job/Financial problem <sup>††</sup>	2941(16.2)	1530(16.8)	1411(15.6)	p<.05	0.9(0.8-1.0)	0.9(0.8-1.0)
Eviction or loss of home	722(3.8)	317(3.4)	405(4.3)	p<.01	1.3(1.1-1.5)	1.4(1.2-1.6)
School problem <sup>§§</sup>	162(19.9)	70(17.8)	92(21.9)		1.3(0.9-1.8)	1.3(0.9-1.9)
Recent release from an institution <sup>†††</sup>	1,412(7.6)	941(10.2)	471(5.1)	p<.01	0.5(0.4-0.5)	0.5(0.4-0.5)
Jail/prison/detention facility	203(14.4)	82(8.7)	121(25.7)	p<.01	3.6(2.7-4.9)	4.5(3.2-6.4)
Hospital	517(36.6)	311(33.0)	206(43.7)	p<.01	1.6(1.3-2.0)	1.3(1.0-1.7)
Psychiatric hospital/institution	469(33.2)	439(46.7)	30(6.4)	p<.01	0.1(0.1-0.1)	0.1(0.1-0.1)
Other (includes alc/SA treatment facilities)	223(15.8)	109(11.6)	114(24.2)	p<.01	2.4(1.8-3.3)	2.5(1.8-3.3)
<b>Recent or Impending Crisis</b>						
Crisis within past or upcoming two weeks <sup>***</sup>	5,525(29.4)	2,444(26.0)	3,081(32.9)	p<.01	1.4(1.3-1.5)	1.4(1.3-1.5)
Intimate partner problem crisis	1968(35.6)	854(34.9)	1114(36.2)		1.1(0.9-1.2)	1.1(0.9-1.2)
Physical health problem crisis	739(13.4)	315(12.9)	424(13.8)		1.1(0.9-1.3)	1.0(0.8-1.2)
Criminal legal problem crisis	621(11.2)	203(8.3)	418(13.6)	p<.01	1.7(1.5-2.1)	1.6(1.3-1.9)
Family relationship problem crisis	430(7.8)	212(8.7)	218(7.1)	p<.05	0.8(0.7-1.0)	0.9(0.7-1.1)
Job problem crisis	354(6.4)	191(7.8)	163(5.3)	p<.01	0.7(0.5-0.8)	0.7(0.5-0.8)
<b>Suicide Event/History</b>						
Left a note	6,468(34.5)	3,182(33.8)	3,286(35.1)		1.1(1.0-1.1)	1.2(1.1-1.2)
Disclosed suicide intent	4,405(23.5)	2,306(24.5)	2,099(22.4)	p<.01	0.9(0.8-1.0)	0.9(0.8-0.9)
History of ideation	5,990(31.9)	3,838(40.8)	2,152(23.0)	p<.01	0.4(0.4-0.5)	0.4(0.4-0.5)
History of attempts	3,732(19.9)	2,770(29.4)	962(10.3)	p<.01	0.3(0.3-0.3)	0.3(0.3-0.3)

\*Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

<sup>†</sup> Decedent had been identified as having a current diagnosis of mental health problem in coroner/medical examiner or law enforcement reports.

<sup>§</sup> Odds ratio reflects the risk among those without known mental health problem relative to those with known MHP.

<sup>†</sup> Logistic regression was used to estimate adjusted odds ratio with 95% CIs after controlling for age, sex, race and ethnicity. Known MHP was used as the reference group.

<sup>\*\*</sup> Includes decedents with one or more diagnosed current mental health problems, which are not mutually exclusive. Therefore sums of percentages for the diagnosed conditions exceed 100%. Denominator includes the number of decedents with one or more current diagnosed mental health problems.

<sup>††</sup> Denominator is decedents aged 18 years of age and older.



§§ Denominator is decedents aged 10-18 years.

¶ Denominator of institution subgroup is decedents with recent release from an institution. Recent release from an institution is defined as having occurred within the past month.

\*\*\* Denominator of crisis subgroup is decedents with any crisis within past or upcoming two weeks. Crises depicted here represent the most commonly occurring categories.

---

**Table 2. Select Demographic and Descriptive Characteristics of Suicides among Decedents  $\geq 10$  years of age with and without Known Mental Health Problems--National Violent Death Reporting System, 27 states\*, 2015**

Characteristics	Total (n=20,446)	Mental Health Problem <sup>†</sup> (n=9,407)	No Known Mental Health Problem (n=11,039)	Chi- Square	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>¶</sup> (95% CI)
<b>Sex</b>						
Male	15,702(76.8)	6,469(68.8)	9,233(83.6)	p<.01	2.3(2.2-2.5)	
Female	4,744(23.2)	2,938(31.2)	1,806(16.4)	p<.01	0.4(0.4-0.5)	
<b>Age**</b>						
10-24	2,804(13.7)	1,211(12.9)	1,593(14.4)	p<.01	1.1(1.1-1.2)	
25-44	6,456(31.6)	3,036(32.3)	3,420(31.0)	p<.05	0.9(0.9-1.0)	
45-64	7,718(37.7)	3,820(40.6)	3,898(35.3)	p<.01	0.8(0.8-0.8)	
65+	3,468(17.0)	1,340(14.2)	2,128(19.3)	p<.01	1.4(1.3-1.5)	
<b>Race/ethnicity</b>						
White, non-Hispanic	17,102(83.6)	8,165(86.8)	8,937(81.0)	p<.01	0.6(0.6-0.7)	
Black, non-Hispanic	1,228(6.0)	411(4.4)	817(7.4)	p<.01	1.7(1.5-2.0)	
American Indian/Alaska Native, non-Hispa	378(1.8)	112(1.2)	266(2.4)	p<.01	2.0(1.6-2.6)	
Asian, non-Hispanic	576(2.8)	235(2.5)	341(3.1)	p<.05	1.2(1.1-1.5)	
Hispanic	1,096(5.4)	463(4.9)	633(5.7)	p<.05	1.2(1.0-1.3)	
Other	66(0.3)	21(0.2)	45(0.4)	p<.05	1.8(1.1-3.1)	
<b>Extended demographics</b>						
Ever served in military <sup>††</sup>	3,429(17.8)	1,354(15.3)	2,075(20.1)	p<.01	1.4(1.3-1.5)	1.1(1.0-1.1)
Homeless	240(1.2)	104(1.1)	136(1.3)		1.1(0.9-1.5)	1.2(0.9-1.5)
<b>Incident Type</b>						
Single suicide	20,063(98.2)	9,318(99.1)	10,745(97.4)	p<.01	0.3(0.3-0.4)	0.4(0.3-0.5)
Homicide followed by suicide	319(1.6)	64(0.7)	255(2.3)	p<.01	3.5(2.6-4.5)	2.9(2.2-3.8)
Multiple suicides	64(0.3)	25(0.3)	39(0.4)		1.3(0.8-2.2)	1.6(0.9-2.6)
<b>Method</b>						
Firearm	9,909(48.5)	3,821(40.6)	6,088(55.3)	p<.01	1.8(1.7-1.9)	1.6(1.5-1.7)
Hanging/Strangulation/Suffocation	5,907(28.9)	2,940(31.3)	2,967(26.9)	p<.01	0.8(0.8-0.9)	0.8(0.7-0.8)
Poisoning	3,003(14.7)	1,861(19.8)	1,142(10.4)	p<.01	0.5(0.4-0.5)	0.6(0.6-0.7)
Substance class causing death <sup>§§</sup>						



Other (e.g., over-the-counter)	1,021(34.0)	666(35.8)	355(31.1)	p<.01	0.8(0.7-0.9)	0.9(0.7-1.0)
Opioids	944(31.4)	608(32.7)	336(29.4)		0.9(0.7-1.0)	0.9(0.8-1.1)
Antidepressants	800(26.6)	644(34.6)	156(13.7)	p<.01	0.3(0.2-0.4)	0.3(0.3-0.4)
Benzodiazepines	624(20.8)	468(25.1)	156(13.7)	p<.01	0.5(0.4-0.6)	0.5(0.4-0.6)
Antipsychotics	219(7.3)	195(10.5)	24(2.1)	p<.01	0.2(0.1-0.3)	0.2(0.1-0.3)
Other	1,595(7.8)	780(8.3)	815(7.4)	p<.05	0.9(0.8-1.0)	0.9(0.8-1.0)
<b>Toxicology Results</b>						
Any toxicology testing	13,317(65.1)	6,658(70.8)	6,659(60.3)	p<.01	0.6(0.6-0.7)	0.7(0.6-0.7)
<b>Positive for ≥ 1 substance<sup>††</sup></b>	9,913(74.4)	5,192(78.0)	4,721(70.9)	p<.01	0.7(0.6-0.7)	0.8(0.7-0.8)
<b>Substance detected***</b>						
<b>Alcohol</b>						
Tested	10,950(53.6)	5,409(57.5)	5,541(50.2)	p<.01	0.7(0.7-0.8)	0.8(0.7-0.8)
Positive	4,442(40.6)	2,115(39.1)	2,327(42.0)	p<.01	1.1(1.0-1.2)	1.2(1.1-1.3)
<b>Opioids</b>						
Tested	8,554(41.8)	4,258(45.3)	4,296(38.9)	p<.01	0.8(0.7-0.8)	0.8(0.8-0.9)
Positive	2,279(26.6)	1,238(29.1)	1,041(24.2)	p<.01	0.8(0.7-0.9)	0.9(0.8-.99)
<b>Benzodiazepines</b>						
Tested	8,124(39.7)	4,226(44.9)	3,898(35.3)	p<.01	0.7(0.6-0.7)	0.7(0.7-0.8)
Positive	2,464(30.3)	1,639(38.8)	825(21.2)	p<.01	0.4(0.4-0.5)	0.5(0.5-0.6)
<b>Cocaine</b>						
Tested	7,978(39.0)	3,866(41.1)	4,112(37.2)	p<.01	0.9(0.8-0.9)	0.9(0.9-1.0)
Positive	499(6.3)	216(5.6)	283(6.9)	p<.05	1.2(1.0-1.5)	1.2(1.0-1.5)
<b>Amphetamines</b>						
Tested	7,615(37.2)	3,696(39.3)	3,919(35.5)	p<.01	0.9(0.8-0.9)	0.9(0.8-0.9)
Positive	736(9.7)	376(10.2)	360(9.2)		0.9(0.8-1.0)	1.0(0.8-1.1)
<b>Marijuana</b>						
Tested	6,569(32.1)	3,127(33.2)	3,442(31.2)	p<.01	0.9(0.9-1.0)	0.9(0.9-1.0)
Positive	1,471(22.4)	710(22.7)	761(22.1)		1.0(0.9-1.1)	0.9(0.8-1.0)
<b>Antidepressants</b>						
Tested	5,425(26.5)	3,103(33.0)	2,322(21.0)	p<.01	0.5(0.5-0.6)	0.6(0.6-0.7)
Positive	2,214(40.8)	1,735(55.9)	479(20.6)	p<.01	0.2(0.2-0.2)	0.2(0.2-0.3)

\* Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey,

<sup>†</sup> Decedent had been identified as having a current diagnosis of mental health problem in coroner/medical examiner or law enforcement reports.

<sup>§</sup> Odds ratio reflects the risk among those without known mental health problem relative to those with known MHP.

<sup>†</sup> Logistic regression was used to estimate adjusted odds ratio with 95% CIs after controlling for age, sex, race and ethnicity. Known MHP was used as the reference group.

<sup>\*\*</sup> Decedents were aged 10 years and older, as per standard in the suicide prevention literature.

<sup>††</sup> Denominator is decedents aged 18 years of age and older with reported military service status.

<sup>§§</sup> Denominator is decedents who died by poisoning, including overdose.

<sup>¶¶</sup> Denominator is decedents with any toxicology tested.

<sup>\*\*\*</sup> Denominator for each positive group is the number tested for the substance in that group.

---



**Table 3. Circumstances Preceding Suicide among Decedents  $\geq 10$  years of age with and without Known Mental Health Problems--National Violent Death Reporting System, 27 states\*, 2015**

Characteristics	Total	Mental Health Problem <sup>†</sup>	No Known Mental Health Problem	Chi-Square	OR <sup>§</sup> (95% CI)	Adjusted OR <sup>¶</sup> (95% CI)
Suicide with known circumstances	18,764(91.8)	9,407(100)	9,357(84.8)	p<.01		
<b>Mental Health</b>						
Any Current Diagnosed Mental Health Problem**						
Depression/dysthymia		7,076(75.2)				
Anxiety disorder		1,579(16.8)				
Bipolar disorder		1,431(15.2)				
Schizophrenia		509(5.4)				
PTSD		424(4.5)				
ADD/ADHD		226(2.4)				
Unknown		760(8.1)				
Current depressed mood		3,962(42.1)	3,076(32.9)	p<.01	0.7(0.6-0.7)	0.7(0.6-0.7)
<b>Substance Problems</b>						
Any Current substance problem	5,319(28.3)	2,976(31.6)	2,343(25.0)	p<.01	0.7(0.7-0.8)	0.7(0.7-0.8)
Alcohol problem	3,268(17.4)	1,862(19.8)	1,406(15.0)	p<.01	0.7(0.7-0.8)	0.7(0.7-0.8)
Other substance problem	3,084(16.4)	1,768(18.8)	1,316(14.1)	p<.01	0.7(0.7-0.8)	0.7(0.7-0.8)
<b>Treatment</b>						
Current mental health/substance abuse treatment	5,141(27.4)	5,077(54.0)	64(0.7)	p<.01	0.01(0.01-0.01)	0.01(0.01-0.01)
Ever treated for mental health/substance problem	6,717(35.8)	6,323(67.2)	394(4.2)	p<.01	0.02(0.02-0.02)	0.02(0.02-0.03)
<b>Relationship Problems/Loss</b>						
Any relationship problem/loss	7,948(42.4)	3,726(39.6)	4,222(45.1)	p<.01	1.3(1.2-1.3)	1.3(1.2-1.4)
Intimate partner problem	5,098(27.2)	2,270(24.1)	2,828(30.2)	p<.01	1.4(1.3-1.5)	1.4(1.3-1.5)
Perpetrator of interpersonal violence past month	414(2.2)	131(1.4)	283(3.0)	p<.01	2.2(1.8-2.7)	2.0(1.6-2.4)
Victim of interpersonal violence within past month	84(0.4)	53(0.6)	31(0.3)	p<.05	0.6(0.4-0.9)	0.8(0.5-1.2)
Family relationship problem	1,671(8.9)	873(9.3)	798(8.5)		0.9(0.8-1.0)	1.0(0.9-1.1)
Other relationship problem (non-intimate)	403(2.1)	202(2.1)	201(2.1)		1.0(0.8-1.2)	1.1(0.9-1.3)
Argument or conflict (not specified)	2,914(15.5)	1,278(13.6)	1,636(17.5)	p<.01	1.3(1.2-1.5)	1.4(1.3-1.5)
Death of a loved one (any)	1,497(8.0)	826(8.8)	671(7.2)	p<.01	0.8(0.7-0.9)	0.9(0.8-0.9)
Non-suicide death	1,181(6.3)	647(6.9)	534(5.7)	p<.01	0.8(0.7-0.9)	0.9(0.8-1.0)

Suicide of family or friend	379(2.0)	217(2.3)	162(1.7)	p<.01	0.7(0.6-0.9)	0.8(0.7-1.0)
<b>Other Life Stressors</b>						
<b>Any life stressor</b>	9,743(51.9)	4,675(49.7)	5,068(54.2)	p<.01	1.2(1.1-1.3)	1.1(1.1-1.2)
Recent criminal legal problem	1,588(8.5)	586(6.2)	1,002(10.7)	p<.01	1.8(1.6-2.0)	1.7(1.5-1.9)
Other legal problem	748(4.0)	378(4.0)	370(4.0)		1.0(0.8-1.1)	1.0(0.9-1.2)
Physical health problem	4,179(22.3)	2,012(21.4)	2,167(23.2)	p<.01	1.1(1.0-1.2)	1.0(1.0-1.1)
Job/Financial problem <sup>††</sup>	2941(16.2)	1530(16.8)	1411(15.6)	p<.05	0.9(0.8-1.0)	0.9(0.8-1.0)
Eviction or loss of home	722(3.8)	317(3.4)	405(4.3)	p<.01	1.3(1.1-1.5)	1.4(1.2-1.6)
School problem <sup>§§</sup>	162(19.9)	70(17.8)	92(21.9)		1.3(0.9-1.8)	1.3(0.9-1.9)
Recent release from an institution <sup>†††</sup>	1,412(7.6)	941(10.2)	471(5.1)	p<.01	0.5(0.4-0.5)	0.5(0.4-0.5)
Jail/prison/detention facility	203(14.4)	82(8.7)	121(25.7)	p<.01	3.6(2.7-4.9)	4.5(3.2-6.4)
Hospital	517(36.6)	311(33.0)	206(43.7)	p<.01	1.6(1.3-2.0)	1.3(1.0-1.7)
Psychiatric hospital/institution	469(33.2)	439(46.7)	30(6.4)	p<.01	0.1(0.1-0.1)	0.1(0.1-0.1)
Other (includes alc/SA treatment facilities)	223(15.8)	109(11.6)	114(24.2)	p<.01	2.4(1.8-3.3)	2.5(1.8-3.3)
<b>Recent or Impending Crisis</b>						
Crisis within past or upcoming two weeks <sup>***</sup>	5,525(29.4)	2,444(26.0)	3,081(32.9)	p<.01	1.4(1.3-1.5)	1.4(1.3-1.5)
Intimate partner problem crisis	1968(35.6)	854(34.9)	1114(36.2)		1.1(0.9-1.2)	1.1(0.9-1.2)
Physical health problem crisis	739(13.4)	315(12.9)	424(13.8)		1.1(0.9-1.3)	1.0(0.8-1.2)
Criminal legal problem crisis	621(11.2)	203(8.3)	418(13.6)	p<.01	1.7(1.5-2.1)	1.6(1.3-1.9)
Family relationship problem crisis	430(7.8)	212(8.7)	218(7.1)	p<.05	0.8(0.7-1.0)	0.9(0.7-1.1)
Job problem crisis	354(6.4)	191(7.8)	163(5.3)	p<.01	0.7(0.5-0.8)	0.7(0.5-0.8)
<b>Suicide Event/History</b>						
Left a note	6,468(34.5)	3,182(33.8)	3,286(35.1)		1.1(1.0-1.1)	1.2(1.1-1.2)
Disclosed suicide intent	4,405(23.5)	2,306(24.5)	2,099(22.4)	p<.01	0.9(0.8-1.0)	0.9(0.8-0.9)
History of ideation	5,990(31.9)	3,838(40.8)	2,152(23.0)	p<.01	0.4(0.4-0.5)	0.4(0.4-0.5)
History of attempts	3,732(19.9)	2,770(29.4)	962(10.3)	p<.01	0.3(0.3-0.3)	0.3(0.3-0.3)

\*Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin.

<sup>†</sup> Decedent had been identified as having a current diagnosis of mental health problem in coroner/medical examiner or law enforcement reports.

<sup>§</sup> Odds ratio reflects the risk among those without known mental health problem relative to those with known MHP.

<sup>†</sup> Logistic regression was used to estimate adjusted odds ratio with 95% CIs after controlling for age, sex, race and ethnicity. Known MHP was used as the reference group.

<sup>\*\*</sup> Includes decedents with one or more diagnosed current mental health problems, which are not mutually exclusive. Therefore sums of percentages for the diagnosed conditions exceed 100%. Denominator includes the number of decedents with one or more current diagnosed mental health problems.

<sup>††</sup> Denominator is decedents aged 18 years of age and older.



§§ Denominator is decedents aged 10-18 years.

¶ Denominator of institution subgroup is decedents with recent release from an institution. Recent release from an institution is defined as having occurred within the past month.

\*\*\* Denominator of crisis subgroup is decedents with any crisis within past or upcoming two weeks. Crises depicted here represent the most commonly occurring categories.

---

1. All drafts of a document, held by Deborah Stone, that became a MMWR report entitled "Vital Signs: Trends in State Suicide Rates – United States, 1999 – 2016 and Circumstances Contributing to Suicide – 27 States, 2015"
2. All drafts of a document, held by Deborah Stone, that became a CDC publication entitled "Preventing Suicide: A Technical Package of Policy, Programs, and Practices"



**Title...**

**A Technical Package to Prevent Suicide**

**Prepared by:**

**Division of Violence Prevention  
National Center for Injury Prevention and Control (NCIPC)  
Centers for Disease Control and Prevention**

**2016**

**[Title] is a publication of the National Center for Injury Prevention and Control of the Centers for Disease Control and Prevention.**

Centers for Disease Control and Prevention  
Thomas R. Frieden, MD, MPH, Director

National Center for Injury Prevention and Control  
Debra E. Houry, MD, MPH, Director

Division of Violence Prevention  
James A. Mercy, PhD, Director

*Suggested Citation:* [authors] *A Technical Package to Prevent....* Atlanta, GA: National Center for Injury Prevention and Control, Centers for Disease Control and Prevention, 2016.



## Contents

## External Reviewers

[to be inserted later]



## Acknowledgments

[to be inserted later]

## Overview

This technical package represents a select group of strategies based on the best available evidence to help communities and states sharpen their focus on prevention activities with the greatest potential to prevent suicide. Broadly, the strategies represented include those with a focus on preventing suicide from happening in the first place as well as approaches to lessen the immediate and long-term effects of suicidal behavior for individuals, families, communities, and society. Specifically, the strategies include strengthening economic supports; strengthening access to mental health care; establishing protective environments; promoting connectedness to protect against suicide; teaching coping and problem-solving skills; identifying and supporting people at-risk; and intervening to lessen harms and prevent future risk.

This package supports the National Strategy for Suicide prevention, Goal 1, “Integrate and coordinate suicide prevention activities across multiple sectors and settings.” (p.29) It also supports the National Action Alliance for Suicide Prevention’s priority (2016) “To create and disseminate a framework for comprehensive community-based suicide prevention.”

Commitment, cooperation, and leadership from numerous sectors, including public health, education, justice, health care, social services, business/labor, and government can bring about the successful implementation of this package.

### What is a Technical Package?

A technical package is a compilation of a core set of strategies to achieve and sustain substantial reductions in a specific risk factor or outcome (Frieden, 2014). Technical packages help communities and states prioritize prevention activities based on the best available evidence. This technical package has three components. The first component is the **strategy** or the preventive direction or actions to achieve the goal of preventing suicide. The second component is the **approach**. The approach includes the specific ways to advance the strategy. This can be accomplished through *programs, policies, and practices*. The approaches included come primarily from studies based in the United States. The **evidence** for each of the approaches in preventing suicide or its associated risk factors is included as the third component. This package is intended as a resource to guide and inform prevention decision-making in communities and states.

### Preventing Suicide is a Priority

Suicide, as defined by the CDC, is part of a broader class of behavior called *self-directed violence*. Self-directed violence refers to behavior directed at oneself that deliberately results in injury or the *potential* for injury (Crosby, Ortega, & Melanson, 2011). Self-directed violence may be *suicidal* or *non-suicidal* in nature. For the purposes of this document, we refer only to behavior where suicide is intended.



- **Suicide** is a death caused by self-directed injurious behavior with any intent to die as a result of the behavior.
- **Suicide attempt** is defined as a *non-fatal* self-directed and potentially injurious behavior with any intent to die as a result of the behavior. A suicide attempt may or may not result in injury.

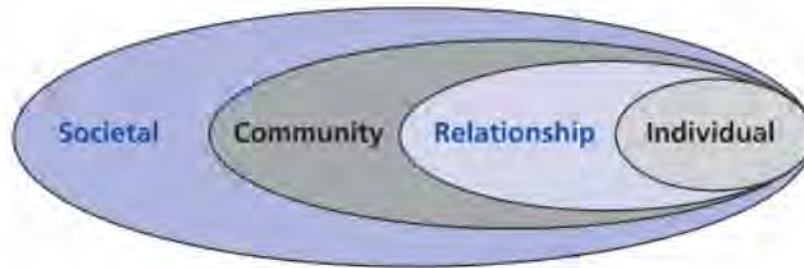
### **Suicide is highly prevalent.**

Suicidal behavior presents a major challenge to public health in the United States and worldwide. It contributes to premature death, morbidity, lost productivity, and health care costs (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014). In 2014 in the U.S., the most recent death data available, suicide was responsible for 42,773 deaths, which is approximately one suicide every 12 minutes (Centers for Disease Control and Prevention, 2005). In 2014, suicide ranked as the tenth leading cause of death and has been among the top twelve leading causes of death since 1975 in the U.S (Centers for Disease Control and Prevention, 2005). Overall suicide rates have increased from 1999 to 2014 (24% increase) (Curtin, Warner, & Hedegaard, 2016). Suicide is a problem throughout the life span; it is the second leading cause of death among those aged 10–19 years, also second among persons in their 20s and 30s; it is the fourth leading cause among persons in their 40s and seventh among persons in their 50s (Centers for Disease Control and Prevention, 2005).

Suicides reflect only a portion of the number of persons affected by suicidal thoughts and behaviors (Crosby, Han, Ortega, Parks, & Gfroerer, 2011). Substantially more persons are hospitalized as a result of nonfatal suicidal behaviors than are fatally injured, and an even greater number are either treated in ambulatory settings or not treated at all (Crosby, Han, et al., 2011). For example, during 2014, among adults aged  $\geq 18$  years, for every one suicide there were 9 adults treated in hospital emergency departments for self-inflicted injuries, 27 who reported making a suicide attempt, and over 227 who reported seriously considering suicide (Ferdon et al., In press). Suicides, attempts, and ideation take an immense emotional, physical, and economic toll on individuals, families and communities. By one estimate, for every death by suicide six people are directly impacted (i.e. survivors). Based on this figure it is estimated that there are over 13 million survivors in the U.S. and unfortunately, survivorship itself is a risk factor for suicide (Crosby & Sacks, 2002).

### **Suicide is associated with several risk and protective factors.**

Suicide, like other human behaviors, is complex with no single determining cause. It occurs in response to multiple biological, psychological, interpersonal, environmental and societal influences that interact with one another and act cumulatively to increase one's vulnerability to think about or engage in suicidal behaviors. The social-ecological model is a useful framework for viewing and understanding suicidal risk factors that have been identified in the literature (Dahlber & Krug, 2002):



Risk Factors for Suicide (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014)

- ❑ **Individual:** History of depression and other mental illnesses, alcohol and drug abuse, previous suicide attempt, previous victimization, acute and chronic stressors (e.g. financial problems), genetic and biological determinants, hopelessness
- ❑ **Relationship:** High conflict or violent relationships, sense of isolation and lack of social support, family history of suicide, financial and work stress
- ❑ **Community:** Inadequate community connectedness, barriers to health care-- lack of access to providers or medications
- ❑ **Societal:** Availability of lethal means of suicide, unsafe media portrayals of suicide, stigma associated with help-seeking

An individual having or experiencing one or a number of risk factors does not always result in suicide; for example, the vast majority of individuals who are depressed do not die by suicide. It is also important to note that the risk factors described above is not an exhaustive list. These and many other risk factors exist and can be arranged differently or contribute to multiple areas within the social-ecological model. Furthermore, the relevance of each risk factor can vary by age, race, gender, sexual orientation, residential geography, and socio-cultural and economic status (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014)

Protective factors, or those influences that guard against the risk for suicide, can also be found across the different levels of the social-ecological model. Protective factors identified in the literature include: effective coping and problem solving skills, moral objections to suicide, strong and supportive relationships with partners, peers, and family, connectedness to school, community and other social institutions and the availability of physical and mental health care (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014). These protective factors can either counter a specific risk factor or guard against a number of risks associated with suicide.

**Suicide is connected to other forms of violence.**



Suicide is connected to other forms of violence in a number of ways. First, suicide and other forms of violence often share some of the same root causes. They can all take place under one roof, or in a given community and can happen at the same time or at different stages of life (Butchart, Phinney, Check, & Villaveces, 2004; Klevens, Simon, & Chen, 2012). For example, in neighborhoods where there is low cohesion, or where residents don't support and trust each other, people are at higher risk for suicide (Desai, Dausey, & Rosenheck, 2005) as well as perpetration of child maltreatment (Coulton, Crampton, Irwin, Spilsbury, & Korbin, 2007; Freisthler, Merritt, & LaScala, 2006), teen dating violence (Capaldi, Knoble, Shortt, & Kim, 2012), intimate partner violence (Pinchevsky & Wright, 2012), and youth violence (Sampson, Morenoff, & Gannon-Rowley, 2002). Lack of economic opportunities and unemployment are associated with suicide (Luo, Florence, Quispe-Agnoli, Ouyang, & Crosby, 2011; Reeves et al., 2012), as well as perpetration of child maltreatment (D. Runyan, Wattam, Ikeda, Hassan, & Ramiro, 2002), intimate partner violence (Heise & Garcia-Moreno, 2002; Pinchevsky & Wright, 2012), sexual violence (Centers for Disease Control and Prevention, 2016c) and youth violence (Wilson, 2011). Also, while most people who are victims of violence do not act violently or die by suicide, people who experience or are exposed to suicide are at a higher risk for both being a victim of other forms of violence and for inflicting harm on others. For example, children who experience physical abuse or neglect early in their lives are at greater risk for suicide (Briere, Madni, & Godbout, 2015), and also at greater risk for committing violence against peers (particularly for boys) (Logan, Leeb, & Barker, 2009), bullying (Duke, Pettingell, McMorris, & Borowsky, 2010), teen dating violence (Duke et al., 2010), and committing child abuse, elder abuse, intimate partner violence (American Psychological Association, 1996), and sexual violence (Jewkes, 2012), later in life. There are also a number of protective factors that pose an opportunity to protect individuals and communities from suicide and other forms of violence, and buffer the effects of shared risk factors. For example, connectedness increases people's and communities' resilience to suicide and other forms of violence, including connectedness to one's community (Basile, Hamburger, Swahn, & Choi, 2013; Borowsky, Hogan, & Ireland, 1997; Centers for Disease Control and Prevention, 2016b; Coulton et al., 2007; Kleiman, Riskind, Schaefer, & Weingarden, 2012; Pinchevsky & Wright, 2012; Widome, Sieving, Harpin, & Hearst, 2008), school (Basile, Espelage, Rivers, McMahon, & Simon, 2009; Capaldi et al., 2012; Carter, McGee, Taylor, & Williams, 2007; DeGue et al., 2013; Hong, Kral, Espelage, & Allen-Meares, 2012; Losel & Farrington, 2012), family (Capaldi et al., 2012; Centers for Disease Control and Prevention, 2016a; Elgar, Craig, Boyce, Morgan, & Vella-Zarb, 2009; Maimon, Browning, & Brooks-Gunn, 2010; Resnick, Ireland, & Borowsky, 2004), caring adults (Capaldi et al., 2012; Losel & Farrington, 2012; Maimon et al., 2010), and pro-social peers (Capaldi et al., 2012; Losel & Farrington, 2012).

### **The health and economic consequences of suicide are substantial.**

Suicide has far-reaching consequences for individuals, families, and communities. Research indicates that the health consequences of violence, even self-directed, are much more comprehensive than merely injury and death. Suicide attempt survivors may suffer from health consequences ranging from anger, guilt, and mental health problems to traumatic brain injury and physical impairment, depending

on the means and severity of the attempt (Chapman & Dixon-Gordon, 2007). Further, for each person who dies by suicide, it is estimated that there are an estimated 18 people (called survivors) (Cerel, 2015) who experience a major life disruption, such as complicated grief (Mitchell, Kim, Prigerson, & Mortimer-Stephens, 2004), stigma, depression, anxiety, post-traumatic stress disorder, and increased risk of suicidal ideation and suicide (Cvinar, 2005; Runeson & Asberg, 2003).

The economic toll of suicide is immense as well. The total lifetime costs associated with nonfatal injuries and deaths caused by self-directed violence in 2013 were approximately \$93.5 billion after adjusting for under-reporting of suicide (Shepard, Gurewich, Lwin, Reed, & Silverman, 2016). The overwhelming burden of these costs results from lost productivity over the life course, with the average cost per suicide being over \$1.3 million (Shepard et al., 2016).

### **Suicide can be prevented.**

Despite the myths surrounding suicide, like most public health problems, suicide is preventable. And while progress will continue to be made into the future, evidence for numerous programs, practices, and policies currently exists, and many programs are ready to be implemented now. Just as suicide is not caused by a single factor, research suggests that suicide will not be prevented by any single intervention taking place in any single setting (Silverman & Maris, 1995; U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). Rather, suicide prevention is best achieved by a focus across the individual-, relationship-, family-, community, and societal-levels and across all sectors, private and public (e.g., business, public health, physical and behavioral healthcare, justice, education, labor)(National Action Alliance for Suicide Prevention, 2014; World Health Organization, 2014). According to CDC Director, Tom Frieden, successful public health programs also require political commitment, funding, communication, and performance monitoring (Frieden, 2014).

### **Assessing the Evidence**

This technical package includes programs, practices, and policies with evidence of impact on suicide or risk or protective factors for suicide. To be considered for inclusion in the technical package, the program, practice, or policy selected had to meet at least one of these criteria: a) meta-analyses or systematic reviews showing impact on suicide; b) evidence from at least one rigorous (e.g., randomized controlled trial [RCT] or quasi-experimental design) evaluation study that found significant preventive effects on suicide; c) meta-analyses or systematic reviews showing impact on risk or protective factors for suicide, or d) evidence from at least one rigorous (e.g., RCT or quasi-experimental design) evaluation study that found significant impacts on risk or protective factors for suicide. Finally, consideration was also given to the likelihood of achieving beneficial effects on multiple forms of violence; no evidence of harmful effects on specific outcomes or with particular subgroups; and feasibility of implementation in a U.S. context if the program, policy, or practice has been evaluated in another country.



Within this technical package, some approaches do not yet have research evidence demonstrating impact on rates of suicide but instead are supported by evidence indicating impacts on risk or protective factors for suicide (e.g., help-seeking, stigma reduction, depression, connectedness). In terms of the strength of the evidence, programs that have demonstrated effects on suicidal behavior (e.g., reductions in deaths, attempts) provide a higher-level of evidence, but the evidence base is not that strong in all areas. For instance, there has been less evaluation of community engagement and family programs on suicidal behavior. Thus, approaches in this package that have effects on risk or protective factors reflect the developmental nature of the evidence base and the use of the best available evidence at a given time.

It is also important to note that there is often significant heterogeneity among the programs, policies, or practices that fall within one approach or strategy area in terms of the nature and quality of the available evidence. Not all programs, policies, or practices that utilize the same approach (e.g., gatekeeper training) are equally effective, and even those that are effective may not work across all populations. Tailoring programs and more evaluation may be necessary to address different population groups. The examples provided are not intended to be a comprehensive list of evidence-based programs, policies, or practices for each approach, but rather illustrate models that have been shown to impact suicide or have beneficial effects on risk or protective factors for suicide. In practice, the effectiveness of the programs, policies and practices identified in this package will be strongly dependent on the quality of their implementation and the communities in which they are implemented. Implementation guidance to assist practitioners, organizations and communities will be developed separately.

### Context and Cross-Cutting Themes

The strategies and approaches that have been included in this technical package represent different levels of the social ecology, with efforts intended to impact the community and societal levels, as well individual and relationship levels. The strategies and approaches are intended to work in combination and reinforce each other to prevent suicide (see box below). The strategies are arranged in order such that those strategies hypothesized to have the greatest potential for broad public health impact on suicide are included first, followed by those that might impact more select populations (e.g., persons who have already made a suicide attempt).

Preventing Suicide	
Strategy	Approach
Strengthen economic supports	<ul style="list-style-type: none"> <li>Strengthen financial security</li> <li>Housing stabilization policies</li> </ul>
Strengthen access to mental health care	<ul style="list-style-type: none"> <li>Coverage of mental health conditions in health</li> </ul>

	insurance policies
Establish protective environments	<ul style="list-style-type: none"> <li>• Means restriction</li> <li>• Organizational policies and culture</li> <li>• Community-based policies to reduce excessive alcohol use</li> </ul>
Promote connectedness to protect against suicide	<ul style="list-style-type: none"> <li>• Peer norm approaches</li> <li>• Community engagement activities</li> </ul>
Teach coping and problem-solving skills	<ul style="list-style-type: none"> <li>• Social-emotional learning</li> <li>• Parenting skill and family relationship approaches</li> </ul>
Identify and support people at risk	<ul style="list-style-type: none"> <li>• Gatekeeper training</li> <li>• Screening combined with care management</li> <li>• Crisis intervention</li> </ul>
Intervene to lessen harms and prevent future risk	<ul style="list-style-type: none"> <li>• Treatment for people at-risk of suicide</li> <li>• Treatment to prevent re-attempts</li> <li>• Postvention</li> <li>• Safe messaging following a suicide</li> </ul>

The example programs, policies, and practices have been implemented within particular contexts. The social and cultural context of communities is critically important to take into account when selecting strategies and approaches. Practitioners in the field may be in the best position to assess the needs and strengths of their communities and work with community members to make decisions about the combination of approaches included here that are best suited to their context.

[Add text for other issues to potentially cover in this section. You may want to take a look at the other packages in this regard]

This package includes strategies where public health agencies are well positioned to bring leadership and resources to implementation efforts. It also includes strategies where public health can serve as an important collaborator (e.g., strategies addressing community and societal level risks), but where leadership and commitment from other sectors such as business/labor or health care is critical to implement a particular policy or program (e.g., workplace policies; screening combined with care management). The role of various sectors in the implementation of a strategy or approach in preventing suicide is described further in the section on *Sector Involvement*.

In the sections that follow, the strategies and approaches with the best available evidence for preventing suicide are described.



## Strengthen Economic Supports

### Rationale

Research consistently links difficult economic conditions, unemployment, and home foreclosures to increased rates of suicide (Fowler, Gladden, Vagi, Barnes, & Frazier, 2015; Luo et al., 2011).

Strengthening financial security may prevent suicide by reducing stress and negative economic outcomes associated with unemployment or underemployment, such as home foreclosures and evictions, which are also associated with suicide risk. Thus, policies that have the potential to improve the socioeconomic conditions of individuals experiencing economic hardship may reduce the risk of suicide.

### Approaches

Economic and housing supports for individuals and families can be strengthened by improving policies through enhancing financial security and stabilizing housing assistance options during times of economic need.

- **Strengthen household financial security.** Research indicates that economic crises are related to suicide rates. Findings from the U.S. show that suicide rates increase during economic recessions marked by high unemployment rates, job losses, and economic instability and decrease during economic expansions and periods marked by low unemployment rates, particularly for working-age individuals 25 to 64 years old (Fowler et al., 2015; Luo et al., 2011). Policies that support financial security during difficult economic times have been shown to mitigate the risk of economic crises on suicide rates.
  - *Unemployment benefit programs* provide income protection during periods of unemployment in an effort to prevent or lessen the economic hardship for those experiencing job loss and enduring unemployment. These benefits may buffer suicide risk during economic crises by increasing financial security and reducing emotional distress among the unemployed. Greater financial assistance through unemployment benefits has been shown to mitigate the risk of unemployment on suicide.
- **Housing stabilization policies** that aim to strengthen housing stability and security may help to buffer the impact of foreclosures and evictions on suicide, as recent research has drawn an association between housing instability and suicidal behavior. Programs that provide affordable housing and other options for homebuyers such as loan modification programs may be used in conjunction with move-out planning and financial counseling services to minimize the impact of foreclosures and evictions on suicide.

- *The National Neighborhood Stabilization Program* was designed to help neighborhoods suffering from high rates of foreclosure and abandonment by slowing the deterioration of the neighborhoods and providing affordable housing options for low, moderate, and middle-income homebuyers. This program also offers financial assistance to eligible individuals for the purchase of a new home.

### Potential Outcomes

- Reduced suicide rates
- Lower foreclosure rates
- Lower eviction rates

### Evidence

To date, much research in this area has focused on the association between economic depressions or recessions and suicide rates; however, some studies have demonstrated the impact of public programs on these associations.

- **Strengthen household financial security.** An examination of variations in U.S. *unemployment benefit programs* across states demonstrated that the impact of unemployment on suicide was offset in those states that provided unemployment benefits greater than the national average across all states (Cylus, Glymour, & Avendano, 2014). Another U.S. study of the link between unemployment and suicide risk using monthly data on suicides, length of unemployment, and job losses found that duration, as opposed to merely the loss of a job, predicted suicide risk (Classen & Dunn, 2012). Together, these results suggest that to help prevent suicide, not only should state unemployment benefit programs be **generous** in their financial allocations, but also in their duration.
- **Housing stabilization policies.** Although the *National Neighborhood Stabilization Program* has not been rigorously evaluated for its impact on suicide outcomes, it addresses foreclosure and eviction, which are risk factors for suicide. A longitudinal analysis of annual data on suicides and foreclosures demonstrated that as the proportion of foreclosed properties increased in U.S. states, so did the state suicide rate, particularly among working-aged adults (Houle & Light, 2014). Another study of data from 16 U.S. states participating in the National Violent Death Reporting System found that suicides precipitated by home foreclosures and evictions increased more than 100% from 2005 (before the housing crisis began) to 2010 (after it had peaked; Fowler et al. (2015)). Most of these suicides occurred prior to the actual loss of the decedent's home. These findings suggest that integrating suicide prevention resources, messaging, and referrals into financial, foreclosure, and move-out planning and counseling services may help to prevent suicide.

**Comment [A]:** Tom had a concern about this term so we've tried to explain it above. Hopefully it's a bit clearer. The interpretation from the study isn't the easiest.



## Strengthen Access to Mental Health Care

### Rationale

Mental illness is a risk factor for suicide. Studies suggest that up to 90% of people who die by suicide may have had a mental illness (Cavanagh, Carson, Sharpe, & Lawrie, 2003). Research on state-level suicide rates have been found to be correlated with general mental health measures such as depression (Arsenault-Lapierre, Kim, & Turecki, 2004). While most people with mental health problems do not attempt or die by suicide (Olfson, Gerhard, Huang, Crystal, & Stroup, 2015) (and most people who attempt suicide do not die by suicide (Suominen et al., 2004)), assuring access to quality mental health care is critical to suicide prevention.

### Approaches

A major approach to strengthening access to mental health care is to have health insurance policies that include coverage for such services.

- **Coverage of mental health conditions in health insurance policies.** Health insurance policies that allow people with mental health problems to access mental health treatment in the same way that they access health care for physical health concerns can increase use of mental health services, help normalize treatment seeking in the population, reduce symptoms of mental illnesses like depression and bipolar disorder, and in turn, reduce rates of suicide and suicide attempts.

### Potential Outcomes

- Increased access to mental health services
- Decreased symptoms of mental illnesses
- Decreased rates of suicide attempts
- Decreased rates of suicide

### Evidence

Research suggests that policies supporting health insurance coverage of mental healthcare are associated with decreased suicide rates.

- **Coverage of mental health conditions in health insurance policies.** Using data from the National Survey of Drug Use and Health, Harris, Carpenter, and Bao (2006) found that 12 months after states enacted *mental health parity laws*, self-reported use of mental healthcare services significantly increased. Subsequent research by Lang (2013), suggests that mental health parity laws are associated with an approximate 5% reduction in suicide rates. This reduction (in 29 states) equated to the prevention of 592 suicides per year and a cost savings of \$1.3-3.1 million per suicide prevented (Lang, 2013).

## Establish Protective Environments

### Rationale

Suicide prevention efforts that focus on *both* the individual *and* his/her environment increase the likelihood of lives saved. Establishing protective environments helps ensure that all of the places where individuals live, work, and play are supportive. Limiting access to lethal means, be it at home or in nature, and particularly when an individual may be most vulnerable, can literally make the difference between life and death. Likewise, creating a work environment conducive to prevention and focused on employee well-being supports the large majority of the population where they spend much of their day. Finally, policies that reduce the availability of alcohol, a potent suicide risk factor, serve to further support individuals and protect the environment in which they live.

### Approaches

The current evidence suggests three approaches with promise for creating environments that protect against suicide.

- **Means Restriction.** Modifying the environment to decrease access to lethal means is an important public health strategy for preventing suicide. Acute suicidal crises are often brief and impulsive. Previous research indicates that the interval between thinking about suicide and attempting can be as short as 5-10 minutes (Deisenhammer et al., 2009; Simon et al., 2001). Getting past the impulse by making it more difficult to access lethal means can be lifesaving. Highly lethal means such as firearms, hanging/suffocation, or jumping from heights provide little opportunity for rescue and have high fatality rates (e.g., about 85% of people who use a firearm in an attempt die from their injury). Research also indicates that most people tend not to substitute a different method when a highly lethal method is unavailable or difficult to access (Hawton, 2007; Yip et al., 2012). Removing or restricting access to lethal means changes the context of the potential suicide and whether the outcome will be fatal or non-fatal (Yip et al., 2012).
  - *Intervening at Suicide Hotspots.* These interventions are focused on preventing suicides at locations which offer direct means for suicide or a secluded place that prevents intervention. Suicide hotspots include tall structures (e.g., bridges and cliffs), railway tracks, and isolated locations that are popular destinations for suicide (for example, parks). Interventions include barriers to prevent jumping and signs and telephones to encourage suicidal individuals to seek help (Cox et al., 2013).
  - *Safe Storage Practices* for medications, firearms, and other household products can reduce the risk for suicide by preventing impulsive action and separating individuals from easy access to lethal means. Safe storage practices include education and



counseling around storing firearms locked in a secure place (e.g., in a gun safe or lock box), preferably unloaded and separate from the ammunition. Keeping medicines in a locked cabinet or secure location can also prevent their misuse by children and adolescents (Rowhani-Rahbar, Simonetti, & Rivara, 2016; C. W. Runyan et al., 2016).

- **Organizational policies and culture** that focus on prosocial behavior, skill building, changing social norms, referral and access to helping services (e.g. mental health, substance abuse treatment, financial counseling), and that have leadership support from the top down can positively impact organizational climate and morale and help prevent suicide and its related risk factors (e.g. depression, social isolation).
  - *Together for Life* is a workplace program of the Montreal Police Force implemented to address suicide among officers. Policy and program components of *Together for Life* were designed to foster an organizational culture that promoted mutual support and solidarity among members of the Force, help for problems related to suicide, training of supervisors, managers and all units to improve competencies in identifying suicidal risk and in using existing resources, and an education campaign to improve awareness and help-seeking (Mishara & Martin, 2012).
  - The *United States Air Force Suicide Prevention Program (AFSPP)* serves as an example of an organizational policy inclusive of 11 policy and education initiatives that was designed to change the culture of the Air Force surrounding suicide. The program uses leaders as role models and agents of change, establishes expectations for behavior related to awareness of suicide risk, develops population skills and knowledge (i.e., education and training), and investigates every suicide (i.e., outcomes measurement). The program represents a fundamental shift from viewing suicide and mental illness solely as medical problem and instead sees them as larger service-wide problems impacting the whole community (K. L. Knox, Litts, Talcott, Feig, & Caine, 2003).
- **Community-based policies to reduce excessive alcohol use.** Acute alcohol use has been found to be associated with more than one-third of suicides and approximately 40% of suicide attempts (Cherpitel, Borges, & Wilcox, 2004). While various community policies exist to reduce excessive alcohol use (e.g., zoning limits related to alcohol outlet locations and density, taxes on alcohol, and bans on the sale of alcohol for individuals under the legal drinking age), previous research indicates that policies related to outlet locations and density are more strongly associated with suicide, making these particular policies an important approach to preventing suicide.

## Potential Outcomes

- Increase in safe storage of lethal means
- Reduction in suicide attempts
- Reduction in suicide deaths
- Reduction in alcohol-related suicide deaths

## Evidence

The evidence for the effectiveness of means restriction and other ways to establish protective environments is some of the strongest in the field (Zalsman et al., 2016).

- **Means restriction.** A meta-analysis of *suicide hotspot interventions* implemented in combination or in isolation in the U.S. and abroad found that they reduced suicide (Cox et al., 2013; Pirkis et al., 2015). For example, the suicide rate from jumping from the Jacques-Cartier bridge in Canada decreased significantly from 0.324 to 0.079 per 100,000 after the installation of a bridge barrier, or from about 10 suicide deaths to 2.6 per year (Perron, Burrows, Fournier, Perron, & Ouellet, 2013). Importantly, the reduction in suicides from the bridge was sustained when all bridges and nearby jumping sites were considered, suggesting little to no displacement of suicides to other jumping sites (Perron et al., 2013). In contrast, a study of the removal of safety barriers from the Grafton Bridge in Auckland, New Zealand demonstrated the negative impact of removing suicide hotspot interventions on preventing suicide (Beautrais, Gibb, Fergusson, Horwood, & Larkin, 2009). The removal of the Grafton Bridge barriers resulted in an immediate, substantial, and statistically significant increase in suicide by jumping from the bridge. Both the suicide numbers and rate saw a fivefold increase after the removal of the bridge barriers (Beautrais, 2001; Beautrais et al., 2009).

Another form of means restriction involves implementation of *safe storage practices*. In a case-control study of firearm-related events identified by medical examiner and coroner offices from 37 counties in Washington, Oregon, and Missouri, and 5 trauma centers, Grossman et al. (2005) found that *safe storage practices* (i.e., storing firearms unloaded, separate from ammunition, in a locked place and/or secured with a safety device) were protective for suicide attempts among adolescents. A recent systematic review of clinic and community-based education and counseling around safe storage of firearms found that the provision of safety devices significantly increases safe firearm storage practices compared to counseling alone or providing economic incentives to acquire safety devices (Rowhani-Rahbar et al., 2016). The *Emergency Department Counseling on Access to Lethal Means (ED CALM)* program trained psychiatric emergency clinicians in a large children's hospital to provide lethal means counseling and safe storage boxes to parents of patients under age 18 receiving care for suicidal behavior. In a pre-post study, (C. W. Runyan et al., 2016) found that among the parents contacted at follow-up, 76% reported all medications in the home were locked up as compared to fewer than 10% at the time of the initial emergency department visit. Among



parents who indicated the presence of guns in the home at the time of the child's initial emergency department visit, all reported guns were currently locked, compared to 67% reporting this at the time of the initial visit (C. W. Runyan et al., 2016).

- **Organizational policies and culture.** After implementation of the *Together for Life* program, police suicides were tracked over 12 years and compared to rates in the control city of Quebec. Pre-post assessments of learning, interviews, and focus groups were also included. The suicide rate in the intervention group decreased significantly by 78.9% to 6.42 per 100,000 per year compared to 29.0 per 100,000 in the control city (Mishara & Martin, 2012).

Additionally, using a time-series design to examine the impact of the AFSP program on various violence-related outcomes, researchers found that the program was associated with a 33% relative risk reduction in suicide (K. L. Knox et al., 2003). The program was also associated with relative risk reductions in related outcomes including moderate and severe family violence (30% and 54%, respectively), homicide (51%), and accidental death (18%) (K. L. Knox et al., 2003). A longitudinal assessment of the program over the period 1981 to 2008 (16 years before the 1997 launch of the program and 11 years post-launch) found significantly lower rates of suicide after the program was launched than before (K. L. Knox et al., 2010). These effects were sustained over time, except in 2004, which the authors found was associated with less rigorous implementation in that year than in the other years (K. L. Knox et al., 2010).

- **Community-based policies to reduce excessive alcohol use.** Several studies on alcohol outlet density suggest that *measures to reduce alcohol outlet density* can potentially reduce alcohol-involved suicides. Research studies in the United States have found that greater alcohol availability is positively associated with alcohol-involved suicides (Escobedo & Ortiz, 2002; Giesbrecht et al., 2015). For example, Giesbrecht et al. (2015) found that both on and off-premises alcohol outlets (i.e., restaurants where alcohol is served and stores where alcohol is available for purchase to go) were positively associated with alcohol-related suicides in 14 U.S. states, particularly among men (AOR 1.08, CI=1.03-1.13) and American Indian/Alaska Natives (AOR= 1.36; CI= 1/10-1.69). Additionally, a longitudinal analysis of alcohol outlet density, suicide mortality, and hospitalizations for suicide attempts over 6 years in 581 California zip codes indicated that the density of bars, specifically, is related to suicide and suicide attempts, particularly in rural areas (Johnson, Gruenewald, & Remer, 2009).

## Promote Connectedness to Protect Against Suicide

### Rationale

The quantity and quality of our social connection with others has been linked with suicide dating as far back to Durkheim, who first posited that weak social bonds are among the chief causes for suicidality (Durkheim, 1951). Connectedness is the degree to which an individual or group of individuals are socially close, interrelated, or share resources with others (Centers for Disease Control and Prevention, 2009), and social connections can be formed within and between multiple levels of the social ecology (Dahlber & Krug, 2002) for instance between individuals (e.g. peers, neighbors, co-workers), families, schools, neighborhoods, workplace, faith communities, cultural groups, and society as a whole. Related to connectedness, social capital refers to a sense of trust in one's community and neighborhood, social integration, and also the availability and participation in social organizations (Beyer, Layde, Hamberger, & Laud, 2015; Muennig, Cohen, Palmer, & Zhu, 2013). Many ecological cross-sectional and longitudinal studies have examined the impact of aspects of social capital on depression symptoms, depressive disorder, mental health more generally, and suicide. While the evidence is still being built the pattern is towards an inverse association between social capital measured by social trust, community/neighborhood engagement, and improved mental health. Connectedness and social capital together can serve to protect against suicidal behaviors by decreasing isolation, encouraging adaptive coping behaviors, increasing belongingness, personal value and worth all of which helps individuals to build resilience in the face of adversity. Connectedness can also provide individuals with better access to formal supports and resources, mobilize communities to meet the needs of its members and provide collective primary prevention activities to the community as a whole (Centers for Disease Control and Prevention, 2009)

### Approaches

Promoting connectedness among individuals and within communities through modeling peer norms and enhancing community engagement can protect against suicide.

- **Peer norm approaches** seek to normalize help-seeking, encourage reaching out and talking to trusted adults, and promote supporting peers through building connectedness. These approaches are typically delivered in school settings but can also be implemented in community settings.
  - *Sources of Strength* is a suicide prevention program for adolescents (ages 13-17) and young adults (ages 18-25) that uses peer social networks to enhance protective factors and change unhealthy norms and behavior. The program trains young people to serve as peer leaders and connects them with adult advisors at school and in the community.



Peer leaders are taught to use their leadership qualities and social influence to promote strength-based messages intended to change peer group norms around coping practices and problem behaviors (e.g., self-harm, substance use, and unhealthy sexual practices). The goal of the program is to reduce the acceptability of suicide as a response to distress, increase the acceptability of seeking help, improve communication between youth and adults, and to develop healthy coping attitudes and behaviors among youth (Wyman, 2014).

- **Community engagement activities.** Community engagement is an aspect of social capital and involves residents participating in a range of activities, including religious activities, community clean-up and greening activities, and physical exercise. These activities provide opportunities for residents to become more involved in the community and to connect with other community members, organizations, and resources, resulting in enhanced overall physical health, reduced stress, and decreased depressive symptoms, thereby reducing risk of suicide.
  - *Greening vacant urban spaces.* Many cities across the nation have experienced urban abandonment over time or in response to the Great Recession (2007-2009). Some of these communities have sought to engage community members in the cleaning and greening of vacant lots. These activities bring community residents together to clean and beautify vacant areas – sometimes building playgrounds and walking areas and other times merely cleaning up litter and mowing the lawns of abandoned homes. Such activities foster community engagement, prosocial norms, and social cohesion, protective factors for suicide (Branas et al., 2011).

### Potential Outcomes

- Reduction in maladaptive coping attitudes and behaviors
- Increase in healthy coping attitudes and behaviors
- Increase in referrals for youth in distressed
- Increase help-seeking behaviors
- Positive perception of adult support

### Evidence

Current evidence provides some support indicating that peer norm approaches and community engagement can reduce risk factors associated with suicidal behaviors.

- **Peer norm approaches.** Evaluations show that programs such as *Sources of Strength* can improve school norms and beliefs about suicide that are created and disseminated by student peers. In a randomized controlled trial of *Sources of Strength* conducted with 18 high-schools

(6 metropolitan, 12 rural), Wyman et al. (2010) found that the program improved peer leaders' adaptive norms regarding suicide, their connectedness to adults, and school engagement. Peer leaders were also more likely than controls to refer a suicidal friend to an adult. Among students, the intervention increased perceptions of adult support for suicidal youths and the acceptability of seeking help. Perception of adult support increased most in students with a history of suicidal ideation. Finally, trained peer leaders also reported a greater decrease in maladaptive coping attitudes compared with untrained leaders (Wyman et al., 2010).

- **Community engagement activities.** One vacant lot greening initiative was undertaken in Philadelphia between 1999 and 2008. Local residents and community members worked together to green 4,436 lots in 4 areas of Philadelphia, PA, resulting in significant reductions in community residents' self-reported stress levels and engagement in more physical exercise than residents in control vacant lot areas. Other benefits included reductions in firearm assaults and vandalism (Branas et al., 2011).



## Teach Coping and Problem-Solving Skills

### Rationale

Building life skills prepare individuals to successfully tackle every day challenges and adapt to stress and adversity. Life skills encompasses many concepts, but most often include coping and problem-solving skills, conflict resolution, and critical thinking. Life skills are important in shielding individuals from suicidal behaviors (World Health Organization, 2014). Suicide prevention programs that focus on life and social skills training are drawn from social cognitive theories (Bandura, 1986), surmising that individuals who engage in suicidal behavior is attributed to either direct learning, modeling, and environmental and individual (e.g. hopelessness) characteristics. The literature linking life skills and suicide is robust--- The inability to employ adequate coping strategies to cope with immediate stressors or identify and find solutions for problems have been characterized among suicide attempters (Pollock & Williams, 2004). Treatments that include bolstering problem skills (Goldsmith, Pellmar, Kleinman, & Bunney, 2002) and include problem-solving techniques (Ghahramanlou-Holloway, Bhar, Brown, Olsen, & Beck, 2012; Townsend et al., 2001) appear to reduce suicidal ideation and attempts more effectively. Prevention programs focused on teaching these skills target youth, parents and families and have been used with both universal and at-risk populations. While many do not target suicidal behaviors directly, these programs strive to train youth and parents important life skills to offset the underlying vulnerabilities that contribute to engaging in high risk behaviors early in life.

### Approaches

Current evidence provides support for the following two approaches:

- **Social emotional learning programs** focus on developing and strengthening communication and problem-solving skills, emotion regulation, conflict resolution, help seeking and coping skills. These approaches address a range of risk and protective factors for suicidal behavior. They provide children and youth with skills to resolve problems in relationships, school, and with peers, and help youth to address other negative influences (e.g., substance use) associated with suicide. These approaches are typically delivered to all students in a particular grade or school, although some programs also focus on groups of students considered to be at high-risk for suicide. Opportunities to practice and reinforce skills are an important part of programs that work (Herman, Borden, Reinke, & Webster-Stratton, 2011).
  - *The Youth Aware of Mental Health Program (YAM)* teaches youth about the risk and protective factors associated with suicide (including knowledge about depression and anxiety), and helps enhance their problem-solving skills for dealing with adverse life events, stress, school and other problems. The program includes 3 hours of role-play sessions with interactive workshops combined with a booklet that students take home, educational

posters displayed in classroom, and interactive lectures about mental health at the beginning and end of the program (Wasserman et al., 2014).

- *Signs of Suicide (SOS)* is a school-based prevention program for students ages 13-17. The program includes guided classroom discussions about suicide and depression. As part of the program, students are screened for depression and suicide risk and referred for professional help as indicated. The program is designed to increase knowledge about suicide and risk factors associated with suicidal behavior as well as improve and normalize help-seeking behavior (Schilling, Aseltine, & James, 2016).
- *The Good Behavior Game (GBG)* is a classroom-based program for elementary school children ages 6-10. The program uses a team-based behavior management strategy that promotes good behavior by setting clear expectations for good behavior and consequences for maladaptive behavior. The goal of the GBG is to create an integrated classroom social system that is supportive of all children being able to learn with little aggressive or disruptive behavior (Wilcox et al., 2008).
- **Parenting skill and family relationship programs** are designed to strengthen parenting skills, enhance positive parent-child interactions, and improve children's behavioral and emotional skills and abilities. Several parenting and family relationship programs have been shown in rigorous evaluations to improve resilience and reduce risk factors for various behaviors, including ones closely related to suicide, such as depression, internalizing behaviors, and substance abuse (M. S. Knox, Burkhart, & Hunter, 2010).
  - *The Incredible Years* is a comprehensive group training program for parents, teachers and children is designed to prevent and treat behavioral and emotional problems in children ages 2-12. The program includes 9- 20 sessions (depending on the age of the child) offered in community based settings (e.g., religious, recreation centers, mental health treatment centers, hospital medical centers). Its goal is to reduce conduct and substance abuse problems, two important suicide risk factors in youth, by improving protective factors such as responsive and positive parent-teacher-child interactions and relationships, emotion self-regulation and social competence (all protective factors for suicide) (Herman et al., 2011).
  - *Strengthening Families 10-14 years* is a program that involves sessions between parents, youth, and family with the goal of improving parents' skills for disciplining, managing emotions and conflict, and communicating with their children; promoting youths' interpersonal and problem-solving skills; and creating family activities to build cohesion



and positive parent-child interactions. The premise of the program is that developing of these skills for both parents and children will reduce internalizing behavior and adolescent substance abuse, two important risk factors for suicide (Spoth, Gyll, & Day, 2002).

### Potential Outcomes

- Reduction in suicide attempts and suicide ideation
- Enhanced knowledge of risk and protective factors associated with suicide
- Reduction in suicide risk behaviors (i.e., depression, anxiety, conduct problems, substance abuse)
- Improve and normalize help-seeking behavior
- Enhance social competence and emotional regulation skills
- Enhance problem-solving and conflict management skills

### Evidence

There are a several programs with evidence that supports teaching social, emotional and parenting skills to reduce suicidal behaviors and associated risk factors.

- **Social emotional learning programs.** In a cluster-randomized controlled trial of *YAM* conducted across 10 European Union countries and 168 schools, students participating in the *YAM* program were significantly less likely to have an incident suicide attempt (OR 0.45, 95%CI 0.24–0.85;  $p=0.014$ ) and severe suicidal ideation (0.50, 0.27-0.92;  $p=0.025$ ) at the 12-month follow-up compared to the control group. Additionally, related to severe suicide ideation, in the *YAM* group absolute risk fell by 0.50% and RR fell by 49.6% (Wasserman et al., 2014).

Additionally, in a randomized controlled trial, *SOS* was shown to reduce self-reported suicide attempts at 3-months post intervention among participating students compared to control students. The *SOS* program also increased students' knowledge of how to get help for themselves or friends for depression and/or suicidal thoughts, and favorable attitudes toward help-seeking. *SOS* participants with a lifetime history of suicide attempt were also less likely to report planning a suicide in the 3 months following the program compared to lower-risk participants (Schilling et al., 2016).

Finally, in an outcome evaluation of the *GBG*, first graders assigned to *GBG* reported half the adjusted odds of suicidal ideation and suicide attempts. The beneficial effect of the program was consistent for suicidal ideation regardless of whether baseline covariates were included. The *GBG* effect on attempts was less robust in some adjusted models including caregiver mental health. In the second cohort of *GBG* students, neither suicidal ideation nor

suicide attempts were significantly different between *GBG* and the control interventions (Wilcox et al., 2008). This finding likely arose due to the lack of implementation fidelity and pointed to the need for *GBG* to be delivered with precision, consistency, and teacher support. *GBG* was also found to be associated with reduced risk of later substance abuse, a risk factor for suicide (Kellam et al., 2008).

- **Parenting skill and family relationship programs.** Parenting and family skills training approaches have shown promising impacts in preventing key risk factors associated with suicide. Several studies have demonstrated the effect of *The Incredible Years* program on reducing internalizing symptoms, such as anxiety and depression, and child conduct problems (C. H. Webster-Stratton, Reid, & Beauchaine, 2011; Webster-Stratton, Jamila Reid, & Stoolmiller, 2008). The program is also associated with improved problem-solving and conflict management; these skills were maintained at 1-year follow-up (Reid, Webster-Stratton, & Hammond, 2003; C. Webster-Stratton & Hammond, 1997; C. Webster-Stratton, Reid, & Hammond, 2001). The program demonstrated greater benefits as the dosage of the intervention increased (Herman et al., 2011).

Additionally, *Strengthening Families* has been shown to decrease externalizing behaviors, alcohol use, and drug use among youth participants and reductions in depression, alcohol use, and drug use among participating families (Spoth et al., 2002).



## Identify and Support People At-Risk

### Rationale

In order to be successful in decreasing suicidal behavior, attention must be paid to those who are at-risk or vulnerable. These persons experience risk and occurrence of suicidal behavior at higher than average rates. This group requires particular focus on proactive case finding and retention and access to services. These vulnerable or disadvantaged populations include, but are not limited to, individuals living in lower socio-economic status or with a mental health problem; individuals who are institutionalized, have been victims of violence, or are homeless; and members of certain ethnic minority groups. Finding effective ways of identifying at-risk or vulnerable groups, customizing services to make them accessible and maintaining care are still key challenges. For example, simply improving services does not guarantee that those services will be used by those most in need of them, nor will it necessarily increase the number of people who follow treatments that are recommended. People who are disadvantaged face social and economic issues that may adversely affect their ability to respond to the treatments or advice that are offered.

### Approaches

This document outlines three approaches that focus on identifying and supporting those who are at-risk.

- **Gatekeeper training** is typically implemented in schools and within health care settings and is designed to train teachers, coaches, providers and others in the community to identify people who may be at risk of suicide and to respond effectively, including facilitating treatment seeking and support services.
  - *Mental Health First Aid (MHFA)*, designed for the lay public, consists of three weekly sessions of three hours each. The content covers helping people in mental health crises and/or in the early stages of mental health problems. The crisis situations covered included suicidal thoughts and behavior, acute stress reaction, panic attacks and acute psychotic behavior. The mental health problems discussed included depressive, anxiety and psychotic disorders. The co-morbidity with substance use disorders is also covered. Participants learn the symptoms of these disorders, possible risk factors, where and how to get help and evidence-based effective help (Kitchener & Jorm, 2004).
- **Screening combined with care management and overall continuity of care** has been used in primary care and behavioral health care to assure that people who may be at high-risk of suicide don't 'slip through the cracks'. These approaches typically employ screening for

depression and/or suicide combined with collaborative treatment planning between patients and their providers and patient follow-up. Programs such as these have demonstrated beneficial effects on depression, suicide ideation, and suicide mortality.

- *Henry Ford Perfect Depression Care (Pre-cursor to Zero Suicide)*. The overall goal of the Henry Ford Perfect Depression Care program was to eliminate suicide. More broadly, the aim of the program was to completely redesign depression care delivery to achieve breakthrough improvement in quality and safety. The redesign focused on six aims: effectiveness, safety, patient centeredness, timeliness, efficiency, and equity among patients. The program developed concrete measures to assess progress on each of these aims. The program began with screening and assessment of each patient for suicide risk with coordinated continuous follow-up care system wide (C. E. Coffey, 2006).
- **Crisis intervention.** These approaches provide support and referral services, typically by connecting a person in crisis (or a friend or family member of someone at-risk) to trained volunteers and/or professional staff via telephone hotline, online chat, or text messaging. Crisis intervention approaches are intended to impact key risk factors for suicide, including feelings of depression, hopelessness, and subsequent mental health care utilization. Like means restriction, crisis interventions can put space or time between an individual who may be considering suicide and harmful behavior.
  - *National Suicide Prevention Lifeline (NSPL)*. This is a nationwide hotline that operates 24/7 and is accessible by phone or a web-based chat function. Trained counselors are on-hand to listen, offer free and confidential emotional support, and provide referrals for mental health services in the local area (Gould, Cross, Pisani, Munfakh, & Kleinman, 2013).
  - *Applied Suicide Intervention Skills Training (ASIST)*. This a training program for hotline counselors, emergency workers, clergy, caregivers and others in the community. The ASIST model has three phases of caregiving: connecting, understanding and assisting. The training helps participants identify people who are having thoughts of suicide and to recognize their invitation for help (connecting); to listen to the caller's reasons for dying and living (understanding); and how to conduct a safety assessment, develop a safety plan for the person at risk, and connect the person at risk to community resources (assisting). The ASIST training program has been field tested in a variety of settings (Gould et al., 2013).



### Potential Outcomes

- Reduction in suicide attempts
- Reduction in suicide deaths
- Increased identification of individuals at-risk for suicidal behavior
- Increased at-risk individuals in treatment
- Increased community members trained to identify at-risk individuals
- Increased referrals for health care

### Evidence

There is evidence that community gatekeeper programs are successful in reducing suicides and suicide attempts but the efforts must be maintained (Substance Abuse and Mental Health Services Administration, Center for Mental Health Services. Report to Congress: Garret Lee Smith Suicide Prevention Program. US Department of Health and Human Services: Rockville, MD, 2014). However, there is limited evidence for effectiveness screening programs, but at the same time, standard principles for public health screening make them promising (Pena & Caine, 2006). The number of studies evaluating crisis intervention services is limited, but a few studies do indicate that those who use the hotline services have decreased suicidal thoughts and behavior.

Comment [A]: Need to add ref

- **Gatekeeper training.** In a randomized controlled trial of 300 participants of *Mental Health First Aid (MHFA)*, the intervention group reported greater confidence in providing help to others, greater likelihood of advising people to seek professional help, improved concordance with health professionals about treatments, and decreased stigmatizing attitudes. Additionally, the intervention resulted in improved mental health of the participants themselves. All results were statistically significant at  $p < .05$ . (Kitchener & Jorm, 2004). Additional research rigorously evaluating *MHFA* for its impact on the first aid recipients themselves and suicidal behavior is needed (Kitchener & Jorm, 2006).
- **Screening combined with care management and overall continuity of care.** An examination of the impact of the *Henry Ford Perfect Depression Care (Pre-cursor to Zero Suicide)* program found that there was a dramatic and statistically significant decrease in the rate of suicide between the baseline years prior to the intervention (1999 and 2000) to the intervention years (2002-2009). During this time period, the suicide rate fell 82% (C. E. Coffey, 2006; C. E. Coffey, Coffey, & Ahmedani, 2013). Further, suicide rates also declined among HMO members who participated in targeted suicide prevention efforts and received mental health specialty services. However, for those HMO members who accessed only general medical services as opposed to specialty mental health services, the suicide rate increased (M. Coffey, Coffey, & Ahmedani, 2015).

- **Crisis intervention.**

*National Suicide Prevention Lifeline (NSPL).* In an evaluation of the effectiveness of the National Suicide Prevention Lifeline (NSPL) to prevent suicide, 1,085 suicidal individuals who called the hotline completed a standard risk assessment for suicide, and 380 of those completed a follow-up assessment between 1 and 52 days after the initial assessment. Researchers found that over half of the initial sample were seriously considering suicide when they called, and they had a plan for their suicide. At the same time, researchers found that participants experienced significant decreases in suicidality over the course of the telephone session, and their levels of hopelessness and psychological pain continued to decrease after their initial call (Gould, Kalafat, Harrismunfakh, & Kleinman, 2007).

*Applied Suicide Intervention Skills Training (ASIST).* The ASIST training program has been field tested in a variety of settings. In a national randomized controlled trial, Gould et al. (2013) assessed the impact of the ASIST training across the NSPL network of hotlines over the period 2008-2009. Using data from 1,410 suicidal individuals who called 17 Lifeline centers, researchers found that compared to callers who spoke to counselors that received the usual care training, individuals who spoke with counselors trained in ASIST were significantly more likely to feel less depressed, less suicidal, less overwhelmed, and more hopeful by the end of their call to the hotline. Counselors trained in ASIST were also more skilled at keeping callers on the phone longer and establishing a connection with them. However, training in ASIST did not result in more comprehensive suicide risk assessments than usual care training (Gould et al., 2013).



## Intervene to Lessen Harms and Prevent Future Risk

### Rationale

Individuals who have experienced mental health challenges, suicidal ideation, and have had non-fatal suicide attempts or have engaged in non-suicidal self-injury are at increased risk of subsequent suicide-related morbidity and mortality. Risk of suicidality can also increase among those who have lost a friend, family member, co-worker, or other acquaintance to suicide. Exposure to sensationalized or uninformed reporting regarding suicide-related deaths may heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to suicide contagion.

### Approaches

A broad array of approaches to lesson harms and reduce future risk of suicidality among those at increased risk include the provision of mental health care and improved continuity of care, improving linkage to care through active post-discharge planning and follow-up that decreases barriers to ongoing therapeutic support, increasing connectedness to supportive others, addressing bereavement, and framing communications to emphasize resilience, decrease negative affect, and to prevent contagion.

- **Treatment for people at-risk of suicide** typically includes various forms of psychotherapy delivered by licensed providers to help individuals with mental health problems and other risk factors for suicide with problem-solving, impulsivity and emotion regulation.
  - *Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)* aims to prevent suicide among older primary care patients by reducing suicide ideation and depression in primary care settings. IMPACT facilitates the development of a therapeutic alliance, a personalized treatment plan that includes patient preferences, as well as proactive follow-up (biweekly during an acute phase and monthly during continuation phase) by a depression care manager (Hunkeler et al., 2006).
  - *Collaborative Assessment and Management of Suicidality (CAMS)* is a therapeutic framework for suicide-specific assessment and treatment of patient's suicide risk. It is a flexible approach that can be used across treatment settings and clinician theoretical orientations. The clinician and patient work together in an interactive assessment process. The patient is highly engaged in the development of their own treatment plan. Every session of CAMS is collaborative and involves the patient's input about what is and is not working. Ultimately, this process is designed to enhance the therapeutic alliance and increase treatment motivation in the suicidal patient (Jobes, 2012).

- *Dialectical Behavioral Therapy* is a multicomponent therapy for individuals at high risk for suicide who may struggle with impulsivity and emotional regulation. The components of DBT include individual therapy, group skills training, between-session telephone coaching and a therapist consultation team.
- *Attachment-Based Family Therapy (ABFT)* is a program for adolescents ages 12-18 that is designed to treat clinically diagnosed major depressive disorder, eliminate suicidal ideation, and reduce dispositional anxiety (Diamond et al., 2010).
- **Treatment to prevent re-attempts.** These follow-up contact approaches use diverse modalities (e.g., home visits, mail, telephone, e-mail) to engage recent suicide attempt survivors to prevent reattempts. These approaches typically focus on coping and other emotional regulation skills and may include case management home visits to increase adherence to and continuity of care, one-on-one interpersonal therapy and/or group therapy. Approaches that engage and connect attempters to peers and providers are especially important because many attempters do not present to aftercare; 12%-25% reattempt within a year, and 3%-9% of attempt survivors die by suicide within 1 to 5 years of their initial attempt (Inagaki et al., 2015)
  - *Emergency Department Brief Intervention with Follow-up Visits* - A one-hour discharge information session that addressed suicidal behavior, distress, risk and protective factors, alternatives to suicidal behavior, and referral options was combined with nine follow-up contacts over 18-months (at 1, 2, 4, 7, 11 weeks and 4, 6, 12, 18 months). Follow-up contacts were either conducted by phone or home visits according to a specific time line for up to 18-months.
  - *Active follow-up contact approaches* such as postcards, letters, and telephone calls, are intended to increase a patient's sense of connectedness with health care providers and decrease isolation. These approaches include expression of caring and support and typically invite patients to reconnect with their provider. Contacts are made periodically (e.g., monthly or every few months in the first 12 months post-discharge with some programs continuing contact for 2 or more years).
  - *Cognitive Behavior Therapy for Suicide Prevention (CBT-SP)* uses a risk reduction, relapse prevention approach that includes an analysis of proximal risk factors and stressors (e.g., relationship problems, school or work-related difficulties) leading up to and following the suicidal event; safety plan development; skill building; and psychoeducation. *CBT-SP* also has family skill modules focused on family support and communication patterns as well as improving the family's problem solving skills.



- **Postvention** approaches are implemented after a suicide has taken place and may include debriefing of survivors (those who have lost a friend, peer, family member, co-worker to suicide), counseling, and/or bereavement support groups. The programs have not typically tested their impact on suicide or suicidal behavior but may reduce risk of guilt, feelings of depression, and complicated grief (Szumilas & Kutcher, 2011). Additionally, research suggests that active postvention approaches in which outreach to suicide survivors occurs at the scene of a suicide is associated with intake into treatment sooner, greater attendance at support group meetings, and attendance at more meetings compared to passive postvention (no outreach) (Cerel & Campbell, 2008).
  - *StandBy Response Service* is a suicide bereavement support service. The service provides clients with face-to-face outreach and telephone support provided by a professional crisis response team. A site coordinator then develops a customized case management plan, referring clients to other existing community services matched to their needs (Visser, Comans, & Scuffham, 2014).
- **Safe messaging following a suicide.** The manner in which information on a recent suicide is communicated to the public (e.g. school assemblies, mass media, social media) can heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to suicide contagion.
  - *Media guidelines.* Guidelines for reporting on suicides can help assure that stories on suicide are communicated in a safe and effective way. Reports that are both inclusive of suicide prevention messages, stories of hope and resilience, risk and protective factors, and links to helping resources (e.g., hotline) and that avoid sensationalizing events or reducing suicide to one cause can help reduce the likelihood of suicide contagion (Niederkrotenthaler & Sonneck, 2007).

### Potential Outcomes

- Reduction in mental health-related sequelae
- Increase connectedness
- Improved coping skills
- Improved messaging following suicide
- Reduction in re-attempts

## Evidence

The evidence addressing strategies to lesson harm and prevent future risk of suicide includes the evaluation of effects of specific approaches on risk and protective factors as well as suicide-related mortality. However, because the evaluation of suicide-related mortality is a statistically rare event, evaluation of mortality outcomes requires large sample sizes and extended follow-up. Therefore, much of the evidence in this area primarily focuses on risk and protective factors.

- **Treatment for people at-risk of suicide.**

**Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)** has been shown to significantly improve quality of life, and to reduce functional impairment, depression and suicidal ideation over 24-months of follow-up (Hunkeler et al., 2006; Unutzer et al., 2006) relative to patients who received care as usual.

**Collaborative Assessment and Management of Suicidality (CAMS)** has been tested and supported in 6 correlational studies (Jobes, 2012), in a variety of inpatient and outpatient settings and in one RCT with several additional RCTs under way. CAMS has been associated with significant improvements in suicidal ideation, overall symptom distress, and feelings of hopelessness at 12 month follow-up among a community-based sample of suicidal outpatients. (Comtois et al., 2011).

**Dialectical Behavioral Therapy.** In a randomized controlled trial of women with recent suicidal or self-injurious behavior, those receiving DBT were half as likely to make a suicide attempt at two-year follow-up than women receiving community treatment (23% vs 46%), required less hospitalization for suicide ideation, and had lower medical risk across all suicide attempts and self-injurious acts combined (Linehan et al., 2006).

**Attachment-Based Family Therapy (ABFT).** A randomized controlled trial of ABFT (Diamond et al., 2010) found that suicidal adolescents assigned to ABFT experienced significantly greater improvement in suicidal ideation over 24 weeks of follow-up than did adolescents assigned to enhanced usual care (-4.37 vs. -2.34;  $p = .001$ ;  $d=0.97$ ). Additionally, a higher percentage of ABFT participants reported no suicidal ideation in the week prior to assessment at 12 weeks than did adolescents receiving enhanced usual care (69.2% vs. 34.6%;  $p = .01$ ;  $OR= 4.25$ ) and at 24 weeks (82.1% vs. 46.2%;  $p = .006$ ;  $OR=5.37$ ) (Diamond et al., 2010).

- **Treatment to prevent re-attempts.**



**Emergency Department Brief Intervention with Follow-up Visits.** A randomized controlled trial that enrolled suicide attempters from eight hospital emergency departments in five culturally different sites found that a brief intervention combined with 9 follow-up visits over 18-months was associated with significantly fewer deaths from suicide relative to a treatment-as-usual group (0.2% versus 2.2%, respectively;  $\chi^2 = 13.83$ ,  $P < 0.001$ ) (Fleischmann et al., 2008).

**Active follow-up contact approaches** intended to prevent reattempts among patients that have been hospitalized and subsequently discharged for suicide attempts have been found in a meta-analysis conducted by Inagaki et al. (2015) to reduce reattempts by approximately 17% for up to 12 months post-discharge, however, the long-term effects of these approaches on reattempts has not yet been demonstrated. Also, because the number of trials and associated sample sizes included in this meta-analysis were small, it was not possible to determine the effect of active contact and follow-up approaches on death by suicide. In a randomized controlled trial of postcrisis suicide prevention long-term follow-up contact approach, Motto and Bostrom (2001) found that patients who refused ongoing care but who were randomized to be contacted by letter four times per year had a lower rate of suicide over two years of follow-up than did patients in the control group who received no further contact. Other studies have also shown post-crisis letters and coping cards to be protective against suicide ideation and attempts (Hassanian-Moghaddam, Sarjami, Kolahi, & Carter, 2011; Wang et al., 2016).

**Postvention.** In a study by Visser et al. (2014), *StandBy* clients were significantly less likely to be at high risk for suicidality than a suicide bereaved comparison group who had not had contact with the *StandBy* program (48% and 64% respectively,  $p = 0.005$ ).

**Safe messaging following a suicide.** The most compelling evidence supporting the effect of *media guidelines* on reduction in suicides comes from Austria. After a sharp increase in suicides on the Viennese subway, media guidelines were introduced and an interrupted time series design was used to evaluate the national impact of the guidelines on subsequent suicides. Changes in the quality and quantity of media reporting resulted in a reduction of 81 suicides annually (95% confidence interval: -149 to -13;  $t = -2.32$ ,  $df = 54$ ,  $p < 0.024$ ) in the Viennese subway system (Niederkrötenenthaler & Sonneck, 2007)

## Sector Involvement

Public health can play an important and unique role in addressing suicide. Public health agencies, which typically place prevention at the forefront of efforts and work to create broad population-level impact, can bring critical leadership and resources to bear on this problem. For example, these agencies can serve as a convener, bringing together partners and stakeholders to plan, prioritize, and coordinate suicide prevention efforts. Public health agencies are also well positioned to collect and disseminate data, implement preventive measures, evaluate programs, and track progress. Although public health can play a leadership role in preventing suicide, the strategies and approaches outlined in this technical package cannot be accomplished by the public health sector alone.

Other sectors vital to implementing this package include, but are not limited to, education, government (local, state, and federal), social services, health services, business/labor, justice, housing, media, and organizations that comprise the civil society sector such as faith-based organizations, youth-serving organizations, foundations, and other non-governmental organizations. Collectively, these sectors can make a difference in preventing suicide by impacting the various contexts and underlying risks that contribute to suicide.

The strategies and approaches described in this technical package are summarized in Appendix A along with the relevant sectors that are well positioned to lead implementation efforts.

[I can write the text specific to the strategies and approaches. I've done this for the other TPs and am happy to do the same here. This is the section where we distinguish the strategies where public health is best positioned to lead from those where leadership is necessary from other sectors and how public health can assist, etc.]

Regardless of strategy, action by many sectors will be necessary for the successful implementation of this package. In this regard, all sectors can play an important and influential role in creating safe and protective environments where individuals who are at high risk of suicide can easily access the mental healthcare and services they need.



## Monitoring and Evaluation

Monitoring and evaluation are necessary components of the public health approach to prevention. It is important to have timely and reliable data to monitor the extent of the problem and to evaluate the impact of prevention efforts. Data are necessary for program implementation; planning, implementation, and assessment all rely on accurate measurement of the problem.

Surveillance data helps researchers and practitioners track changes in the burden of suicide.

Surveillance systems exist at the federal, state, and local levels. It is important to assess the availability of surveillance data and data systems across these levels to identify and address gaps in the systems. CDC's National Vital Statistics System and the National Violent Death Reporting System (NVDRS) are examples of surveillance systems that provide data on deaths from suicide. NVDRS, for example, is a state-based surveillance system that combines data from death certificates, law enforcement reports, and coroner or medical examiner reports to provide detailed information on the circumstances of violent deaths, including suicide, which can assist communities in guiding prevention approaches (Blair, Fowler, Jack, & Crosby, 2016). The National Electronic Injury Surveillance System-All Injury Program (NEISS-AIP) provides nationally representative data about all types and causes of nonfatal injuries treated in U.S. hospital emergency departments, and can be used to assess national rates of, and trends in, self-harm injuries by cause (e.g., falls, poisoning, etc.), age, race/ethnicity, sex, disposition (where the injured person goes when released from the Emergency Department (<http://www.cdc.gov/injury/wisqars/nonfatal.html>)).

In addition to information on deaths and nonfatal injuries, there are also surveillance systems that provide national, state, and some local estimates of suicidal behavior. The Youth Risk Behavior Surveillance System (YRBSS) collects information from a nationally representative sample of 9-12 grade students and is a key resource in monitoring health-risk behaviors among youth, including whether youth have seriously considered attempting suicide, attempted suicide, made a plan, or required treatment by a doctor or nurse for a suicide attempt that resulted in an injury, poisoning, or overdose (Brener et al., 2013). The YRBSS data are obtained from a national school-based survey conducted by CDC as well as school-based state, territorial, tribal, and large urban school district survey conducted by education and health agencies. The National Survey on Drug Use and Health (NSDUH) is an annual nationwide survey of individuals aged 12 years and older that provides national and state-level estimates of drug use and mental health-related issues, including suicide ideation and suicide attempts (<https://nsduhweb.rti.org/respweb/homepage.cfm>).

It is also important at all levels (local, state, and federal) to address gaps in responses, track progress of prevention efforts and evaluate the impact of those efforts, including the impact of this technical package. Evaluation data, produced through program implementation and monitoring, is essential to provide information on what does and does not work to reduce rates of suicide and its associated risk

and protective factors. Theories of change and logic models that identify short, intermediate, and long-term outcomes are an important part of program evaluation.

The evidence-base for suicide prevention has advanced greatly over the last few decades. However, additional research is needed to understand the impact of prevention programs on preventing suicide, as opposed to merely examining the effectiveness of programs to impact risk factors associated with suicide. More research is also needed to examine the effectiveness of upstream and community-level strategies to prevent suicide at the population level. Lastly, it will be important for researchers to test the effectiveness of combinations of the strategies and approaches included in this package. Most existing evaluations focus on approaches implemented in isolation. However, there is potential to understand the synergistic effects within a comprehensive prevention approach. Additional research is needed to understand the extent to which combinations of strategies and approaches result in greater reductions in suicide than individual programs, practices, or policies.

## **Conclusion**



## References

(See last 7 pages after Appendix—EndNote put them there because it thought the Appendix/table was part of the regular text; Didn't want to cut and paste table for fear it'd get de-formatted)

## Appendix A: Summary of Strategies and Approaches to Prevent Suicide

Strategy	Approach/Program, Practice or Policy	Best Available Evidence			Lead Sectors <sup>1</sup>
		Suicide	Suicide Attempts or Ideation	Other Risk/Protective Factors for Suicide	
Strengthen economic supports	Strengthen financial security				
	Unemployment benefit programs	X			Government (local, state, Federal)
	Housing stabilization policies				
	The National Neighborhood Stabilization Program			X	Government (local, state, Federal)
Strengthen access to mental health care	Coverage of mental health conditions in health insurance policies				
	Mental Health Parity Laws	X		X	Healthcare  Government (local, state, Federal)
Establish protective environments	Means restriction				
	Intervening at hot spots	X			Government (local, state, Federal)
	Safe storage practices		X (attempts)	X (Safe storage of firearms and medication)	Government (local, state, Federal)
	Organizational policies and culture				

**Comment [A]:** I'll help you complete the lead sector column. For the other columns, you just need to insert a check-mark based on the evidence you describe in the narrative for a particular program or policy. For example, if the evidence shows impact on suicide, then put a check-mark in that column. If the study also found effects on risk or protective factors, then put a check-mark in that column as well.



		Best Available Evidence			
	<i>Together for Life</i>	X			Business/Labor
	<i>US Air Force Suicide Prevention Program</i>	X		X (family violence)	Government (local, state, Federal)  Business/Labor
	Community-based policies to reduce excessive alcohol use				
	<i>Alcohol outlet density</i>	X		X	Government (local, state, Federal)
Promote connectedness to protect against suicide	Peer norm approaches				
	<i>Sources of Strength</i>			X	Public Health Social Services
	Community-engagement activities				
	<i>Greening vacant urban spaces</i>			X	Public Health
Teach coping and problem-solving skills	Social emotional learning				
	<i>Youth Aware of Mental Health Program</i>		X		Public Health Social Services
	<i>Signs of Suicide</i>		X	X	
	<i>Good Behavior Game</i>		X	X	
	Parenting skill and family relationship approaches				
	<i>The Incredible Years</i>			X	Public Health Social Services

		Best Available Evidence			
	Strengthening Families 10-14			X	
Identify and support people at-risk	Gatekeeper training				
	Mental Health First Aid			X	Public Health Healthcare Social Services
	Screening combined with care management				
	Henry Ford Perfect Depression Care (Pre-cursor to Zero Suicide)	X		X	Healthcare
	Crisis Intervention				
	National Suicide Prevention Lifeline		X	X	Public Health Social Services
	Applied Suicide Intervention Skills Training		X	X	
Intervene to lessen harms and prevent future risk	Treatment for people at risk of suicide				
	Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)		X	X	Healthcare Social Services
	Collaborative Assessment and Management of Suicidality (CAMS)		X	X	
	Dialectical Behavioral Therapy		X	X	
	Attachment-Based Family Therapy		X		
	Treatment to prevent re-attempts				



		Best Available Evidence			
	<i>ED Brief Intervention with Follow-up Visits</i>	X			Healthcare
	<i>Active follow-up contact approaches</i>	X	X		
	<i>CBT for Suicide Prevention</i>				
	Postvention				
	<i>StandBy Response Service</i>		X		Healthcare
	Safe messaging following a suicide				
	<i>Media Guidelines</i>	X			Public Health

<sup>1</sup>This column refers to the lead sectors well positioned to bring leadership and resources to implementation efforts. For each strategy, there are many other sectors such as non-governmental organizations that are instrumental to prevention planning and implementing the specific programmatic activities.

## REFERENCES

- American Psychological Association. (1996). *Violence and the family: Report of the American Psychological Association presidential task force on violence and the family*: APA.
- Arsenault-Lapierre, G., Kim, C., & Turecki, G. (2004). Psychiatric diagnoses in 3275 suicides: a meta-analysis. *BMC Psychiatry*, 4, 37. doi: 10.1186/1471-244X-4-37
- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*: Prentice-Hall, Inc.
- Basile, K. C., Espelage, D. L., Rivers, I., McMahon, P. M., & Simon, T. R. (2009). The theoretical and empirical links between bullying behavior and male sexual violence perpetration. *Aggression and violent behavior*, 14(5), 336-347.
- Basile, K. C., Hamburger, M. E., Swahn, M. H., & Choi, C. (2013). Sexual violence perpetration by adolescents in dating versus same-sex peer relationships: differences in associated risk and protective factors. *Western Journal of Emergency Medicine*, 14(4), 329.
- Beautrais, A. L. (2001). Effectiveness of barriers at suicide jumping sites: A case study. *Aust NZ J Psychiat*, 35. doi: 10.1080/0004867010060501
- Beautrais, A. L., Gibb, S. J., Fergusson, D. M., Horwood, L. J., & Larkin, G. L. (2009). Removing bridge barriers stimulates suicides: An unfortunate natural experiment. *Aust NZ J Psychiat*, 43. doi: 10.1080/00048670902873714
- Beyer, K. M., Layde, P. M., Hamberger, L. K., & Laud, P. W. (2015). Does neighborhood environment differentiate intimate partner femicides from other femicides? *Violence Against Women*, 21(1), 49-64. doi: 10.1177/1077801214564075
- Blair, J. M., Fowler, K. A., Jack, S. P., & Crosby, A. E. (2016). The National Violent Death Reporting System: overview and future directions. *Inj Prev*, 22 Suppl 1, i6-i11. doi: 10.1136/injuryprev-2015-041819
- Borowsky, I. W., Hogan, M., & Ireland, M. (1997). Adolescent sexual aggression: risk and protective factors. *Pediatrics*, 100(6), E7.
- Branas, C. C., Cheney, R. A., MacDonald, J. M., Tam, V. W., Jackson, T. D., & Ten Have, T. R. (2011). A difference-in-differences analysis of health, safety, and greening vacant urban space. *Am J Epidemiol*, 174(11), 1296-1306. doi: 10.1093/aje/kwr273
- Briere, J., Madni, L. A., & Godbout, N. (2015). Recent Suicidality in the General Population: Multivariate Association With Childhood Maltreatment and Adult Victimization. *J Interpers Violence*. doi: 10.1177/0886260515584339
- Butchart, A., Phinney, A., Check, P., & Villaveces, A. (2004). *Preventing Violence: A Guide to Implementing the Recommendations of the World Report on Violence and Health*. Geneva, Switzerland: World Health Organization.
- Capaldi, D. M., Knoble, N. B., Shortt, J. W., & Kim, H. K. (2012). A Systematic Review of Risk Factors for Intimate Partner Violence. *Partner Abuse*, 3(2), 231-280. doi: 10.1891/1946-6560.3.2.231
- Carter, M., McGee, R., Taylor, B., & Williams, S. (2007). Health outcomes in adolescence: associations with family, friends and school engagement. *J Adolesc*, 30(1), 51-62. doi: 10.1016/j.adolescence.2005.04.002
- Cavanagh, J. T., Carson, A. J., Sharpe, M., & Lawrie, S. M. (2003). Psychological autopsy studies of suicide: a systematic review. *Psychol Med*, 33(3), 395-405.
- Centers for Disease Control and Prevention. (2005). Web-Based Injury Statistics Query and Reporting System (WISQARS). Retrieved June 3, 2016 Available at: <http://www.cdc.gov/injury/wisqars/index.html>
- Centers for Disease Control and Prevention. (2009). Strategic direction for the prevention of suicidal behavior: Promoting individual, family, and community connectedness to prevent suicidal behavior. from Available at: [http://www.cdc.gov/ViolencePrevention/pdf/Suicide\\_Strategic\\_Direction\\_Full\\_version-a.pdf](http://www.cdc.gov/ViolencePrevention/pdf/Suicide_Strategic_Direction_Full_version-a.pdf)
- Centers for Disease Control and Prevention. (2016a). Child Maltreatment: Risk and Protective Factors. from Available at: <http://www.cdc.gov/violenceprevention/childmaltreatment/riskprotectivefactors.html>



- Centers for Disease Control and Prevention. (2016b). Elder Maltreatment: Risk and Protective Factors. from Available at: <http://www.cdc.gov/ViolencePrevention/eldermaltreatment/riskprotectivefactors.html>.
- Centers for Disease Control and Prevention. (2016c). Sexual Violence: Risk and Protective Factors. from Available at: <http://www.cdc.gov/ViolencePrevention/sexualviolence/riskprotectivefactors.html>
- Cerel, J. (2015). *We are all connected in suicidology: The continuum of "survivorship."* Paper presented at the Plenary presentation at the 48th annual conference of the American Association of Suicidology Atlanta, GA.
- Cerel, J., & Campbell, F. R. (2008). Suicide survivors seeking mental health services: a preliminary examination of the role of an active postvention model. *Suicide Life Threat Behav*, 38(1), 30-34. doi: 10.1521/suli.2008.38.1.30
- Chapman, A. L., & Dixon-Gordon, K. L. (2007). Emotional antecedents and consequences of deliberate self-harm and suicide attempts. *Suicide Life Threat Behav*, 37(5), 543-552. doi: 10.1521/suli.2007.37.5.543
- Cheripitel, C. J., Borges, G. L. G., & Wilcox, H. C. (2004). Acute alcohol use and suicidal behavior: A review of the literature. *Alcoholism: Clinical and Experimental Research*, 28(5 SUPPL.), 18S-28S.
- Classen, T. J., & Dunn, R. A. (2012). The effect of job loss and unemployment duration on suicide risk in the United States: a new look using mass-layoffs and unemployment duration. *Health Econ*, 21(3), 338-350. doi: 10.1002/hec.1719
- Coffey, C. E. (2006). Pursuing perfect depression care. *Psychiatr Serv*, 57(10), 1524-1526. doi: 10.1176/ps.2006.57.10.1524
- Coffey, C. E., Coffey, M. J., & Ahmedani, B. K. (2013). An update on perfect depression care. *Psychiatr Serv*, 64(4), 396. doi: 10.1176/appi.PS.640422
- Coffey, M., Coffey, C., & Ahmedani, B. K. (2015). Suicide in a health maintenance organization population. *JAMA Psychiatry*, 72(3), 294-296. doi: 10.1001/jamapsychiatry.2014.2440
- Comtois, K. A., Jobes, D. A., S. O'Connor, S., Atkins, D. C., Janis, K., E. Chesson, C., . . . Yuodelis-Flores, C. (2011). Collaborative assessment and management of suicidality (CAMS): feasibility trial for next-day appointment services. *Depress Anxiety*, 28(11), 963-972. doi: 10.1002/da.20895
- Coulton, C. J., Crampton, D. S., Irwin, M., Spilsbury, J. C., & Korbin, J. E. (2007). How neighborhoods influence child maltreatment: a review of the literature and alternative pathways. *Child Abuse Negl*, 31(11-12), 1117-1142. doi: 10.1016/j.chiabu.2007.03.023
- Cox, G. R., Owens, C., Robinson, J., Nicholas, A., Lockley, A., Williamson, M., . . . Pirkis, J. (2013). Interventions to reduce suicides at suicide hotspots: a systematic review. *BMC Public Health*, 13(1), 1-12. doi: 10.1186/1471-2458-13-214
- Crosby, A. E., Han, B., Ortega, L., Parks, S. E., & Gfroerer, J. (2011). Suicidal Thoughts and Behaviors Among Adults Aged ≥18 Years — United States, 2008–2009. *MMWR*, 60(No. SS-13), 1-22.
- Crosby, A. E., Ortega, L., & Melanson, C. (2011). Self-directed Violence Surveillance: Uniform Definitions and Recommended Data Elements, Version 1.0. Atlanta, GA: Centers for Disease Control and Prevention, National Center for Injury Prevention and Control.
- Crosby, A. E., & Sacks, J. J. (2002). Exposure to suicide: incidence and association with suicidal ideation and behavior: United States, 1994. *Suicide Life Threat Behav*, 32(3), 321-328.
- Curtin, S. C., Warner, M., & Hedegaard, H. (2016). *Increase in suicide in the United States, 1999-2014*. ( ). Hyattsville, MD: National Center for Health Statistics Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/25116188>.
- Cvinar, J. G. (2005). Do suicide survivors suffer social stigma: A review of the literature. *Perspectives in psychiatric care*, 41(1), 14-21.
- Cylus, J., Glymour, M. M., & Avendano, M. (2014). Do generous unemployment benefit programs reduce suicide rates? A state fixed-effect analysis covering 1968-2008. *Am J Epidemiol*, 180(1), 45-52. doi: 10.1093/aje/kwu106

- Dahlber, L. L., & Krug, E. G. (2002). Violence-a global public health problem. In E. Krug, L. L. Dahlberg, J. A. Mercy, A. B. Zwi, & R. Lozano (Eds.), *World Report on Violence and Health* (pp. 1-56). Geneva, Switzerland: World Health Organization.
- DeGue, S., Massetti, G. M., Holt, M. K., Tharp, A. T., Valle, L. A., Matjasko, J. L., & Lippy, C. (2013). Identifying links between sexual violence and youth violence perpetration: New opportunities for sexual violence prevention. *Psychology of violence*, 3(2), 140.
- Deisenhammer, E. A., Ing, C. M., Strauss, R., Kemmler, G., Hinterhuber, H., & Weiss, E. M. (2009). The duration of the suicidal process: how much time is left for intervention between consideration and accomplishment of a suicide attempt? *J Clin Psychiatry*, 70(1), 19-24.
- Desai, R. A., Dausey, D. J., & Rosenheck, R. A. (2005). Mental health service delivery and suicide risk: the role of individual patient and facility factors. *Am J Psychiatry*, 162(2), 311-318. doi: 10.1176/appi.ajp.162.2.311
- Diamond, G. S., Wintersteen, M. B., Brown, G. K., Diamond, G. M., Gallop, R., Shelef, K., & Levy, S. (2010). Attachment-based family therapy for adolescents with suicidal ideation: a randomized controlled trial. *J Am Acad Child Adolesc Psychiatry*, 49(2), 122-131.
- Duke, N. N., Pettingell, S. L., McMorris, B. J., & Borowsky, I. W. (2010). Adolescent violence perpetration: associations with multiple types of adverse childhood experiences. *Pediatrics*, 125(4), e778-786. doi: 10.1542/peds.2009-0597
- Durkheim, E. (1951). *Suicide: A study in sociology* (JA Spaulding & G. Simpson, trans.). Glencoe, IL: Free Press. (Original work published 1897).
- Elgar, F. J., Craig, W., Boyce, W., Morgan, A., & Vella-Zarb, R. (2009). Income inequality and school bullying: multilevel study of adolescents in 37 countries. *J Adolesc Health*, 45(4), 351-359. doi: 10.1016/j.jadohealth.2009.04.004
- Escobedo, L. G., & Ortiz, M. (2002). The relationship between liquor outlet density and injury and violence in New Mexico. *Accid Anal Prev*, 34(5), 689-694.
- Ferdon, C., Crosby, A. E., Caine, E. D., Hindman J., Reed, G. A., & Iskander, J. (In press). CDC Public Health Grand Rounds: Preventing Suicide through a Comprehensive Public Health Approach. *MMWR*.
- Fleischmann, A., Bertolote, J. M., Wasserman, D., De Leo, D., Bolhari, J., Botega, N. J., . . . Thanh, H. T. (2008). Effectiveness of brief intervention and contact for suicide attempters: a randomized controlled trial in five countries. *Bulletin of the World Health Organization*, 86(9), 703-709. doi: S0042-96862008000900014 [pii]
- Fowler, K. A., Gladden, R. M., Vagi, K. J., Barnes, J., & Frazier, L. (2015). Increase in suicides associated with home eviction and foreclosure during the US housing crisis: findings from 16 National Violent Death Reporting System States, 2005-2010. *Am J Public Health*, 105(2), 311-316. doi: 10.2105/AJPH.2014.301945
- Freisthler, B., Merritt, D. H., & LaScala, E. A. (2006). Understanding the ecology of child maltreatment: a review of the literature and directions for future research. *Child Maltreat*, 11(3), 263-280. doi: 10.1177/1077559506289524
- Frieden, T. R. (2014). Six components necessary for effective public health program implementation. *Am J Public Health*, 104(1), 17-22. doi: 10.2105/AJPH.2013.301608
- Ghahramanlou-Holloway, M., Bhar, S., Brown, G., Olsen, C., & Beck, A. T. (2012). Changes in problem-solving appraisal after cognitive therapy for the prevention of suicide. *Psychological Medicine*, 42(06), 1185-1193.
- Giesbrecht, N., Huguette, N., Ogden, L., Kaplan, M. S., McFarland, B. H., Caetano, R., . . . Nolte, K. B. (2015). Acute alcohol use among suicide decedents in 14 US states: impacts of off-premise and on-premise alcohol outlet density. *Addiction*, 110(2), 300-307. doi: 10.1111/add.12762
- Goldsmith, S. K., Pellmar, T. C., Kleinman, A. M., & Bunney, W. E. (2002). *Reducing suicide: A national imperative*: National Academies Press.



- Gould, M. S., Cross, W., Pisani, A. R., Munfakh, J. L., & Kleinman, M. (2013). Impact of Applied Suicide Intervention Skills Training on the National Suicide Prevention Lifeline. *Suicide Life Threat Behav*, 43(6), 676-691. doi: 10.1111/sltb.12049
- Gould, M. S., Kalafat, J., Harrismunfakh, J. L., & Kleinman, M. (2007). An evaluation of crisis hotline outcomes. Part 2: Suicidal callers. *Suicide Life Threat Behav*, 37(3), 338-352. doi: 10.1521/suli.2007.37.3.338
- Grossman, D. C., Mueller, B. A., Riedy, C., Dowd, M. D., Villaveces, A., Prodzinski, J., . . . Harruff, R. (2005). Gun storage practices and risk of youth suicide and unintentional firearm injuries. *JAMA*, 293(6), 707-714. doi: 10.1001/jama.293.6.707
- Harris, K. M., Carpenter, C., & Bao, Y. (2006). The effects of state parity laws on the use of mental health care. *Med Care*, 44(6), 499-505. doi: 10.1097/01.mlr.0000215813.16211.00
- Hassanian-Moghaddam, H., Sarjami, S., Kolahi, A. A., & Carter, G. L. (2011). Postcards in Persia: randomised controlled trial to reduce suicidal behaviours 12 months after hospital-treated self-poisoning. *British Journal of Psychiatry*, 198(4), 309-316.
- Hawton, K. (2007). Restricting access to methods of suicide: Rationale and evaluation of this approach to suicide prevention. *Crisis*, 28. doi: 10.1027/0227-5910.28.s1.4
- Heise, L., & Garcia-Moreno, C. (2002). Violence by Intimate Partners. In E. Krug, L. L. Dahlberg, J. A. Mercy, A. B. Zwi, & R. Lozano (Eds.), *World Report on Violence and Health* (pp. 87-121). Geneva, Switzerland: World Health Organization.
- Herman, K. C., Borden, L. A., Reinke, W. M., & Webster-Stratton, C. (2011). The Impact of the Incredible Years Parent, Child, and Teacher Training Programs on Children's Co-Occurring Internalizing Symptoms. *Sch Psychol Q*, 26(3), 189-201. doi: 10.1037/a0025228
- Hong, J. S., Kral, M. J., Espelage, D. L., & Allen-Meares, P. (2012). The social ecology of adolescent-initiated parent abuse: a review of the literature. *Child Psychiatry Hum Dev*, 43(3), 431-454. doi: 10.1007/s10578-011-0273-y
- Houle, J. N., & Light, M. T. (2014). The home foreclosure crisis and rising suicide rates, 2005 to 2010. *Am J Public Health*, 104(6), 1073-1079. doi: 10.2105/AJPH.2013.301774
- Hunkeler, E. M., Katon, W., Tang, L., Williams, J. W., Jr., Kroenke, K., Lin, E. H., . . . Unutzer, J. (2006). Long term outcomes from the IMPACT randomised trial for depressed elderly patients in primary care. *BMJ*, 332(7536), 259-263. doi: 10.1136/bmj.38683.710255.BE
- Inagaki, M., Kawashima, Y., Kawanishi, C., Yonemoto, N., Sugimoto, T., Furuno, T., . . . Yamada, M. (2015). Interventions to prevent repeat suicidal behavior in patients admitted to an emergency department for a suicide attempt: a meta-analysis. *J Affect Disord*, 175, 66-78. doi: 10.1016/j.jad.2014.12.048
- Jewkes, R. (2012). Rape perpetration: A review. *Pretoria Sexual Violence Research Initiative*.
- Jobes, D. A. (2012). The Collaborative Assessment and Management of Suicidality (CAMS): an evolving evidence-based clinical approach to suicidal risk. *Suicide Life Threat Behav*, 42(6), 640-653. doi: 10.1111/j.1943-278X.2012.00119.x
- Johnson, F. W., Gruenewald, P. J., & Remer, L. G. (2009). Suicide and alcohol: do outlets play a role? *Alcohol Clin Exp Res*, 33(12), 2124-2133. doi: 10.1111/j.1530-0277.2009.01052.x
- Kellam, S. G., Brown, C. H., Poduska, J. M., Ialongo, N. S., Wang, W., Toyinbo, P., . . . Wilcox, H. C. (2008). Effects of a universal classroom behavior management program in first and second grades on young adult behavioral, psychiatric, and social outcomes. *Drug Alcohol Depend*, 95 Suppl 1, S5-S28. doi: 10.1016/j.drugalcdep.2008.01.004
- Kitchener, B. A., & Jorm, A. F. (2004). Mental health first aid training in a workplace setting: a randomized controlled trial [ISRCTN13249129]. *BMC Psychiatry*, 4, 23. doi: 10.1186/1471-244X-4-23
- Kitchener, B. A., & Jorm, A. F. (2006). Mental health first aid training: review of evaluation studies. *Aust N Z J Psychiatry*, 40(1), 6-8. doi: 10.1111/j.1440-1614.2006.01735.x

- Kleiman, E. M., Riskind, J. H., Schaefer, K. E., & Weingarden, H. (2012). The moderating role of social support on the relationship between impulsivity and suicide risk. *Crisis*, 33(5), 273-279. doi: 10.1027/0227-5910/a000136
- Klevens, J., Simon, T. R., & Chen, J. (2012). Are the perpetrators of violence one and the same? Exploring the co-occurrence of perpetration of physical aggression in the United States. *J Interpers Violence*, 27(10), 1987-2002. doi: 10.1177/0886260511431441
- Knox, K. L., Litts, D. A., Talcott, G. W., Feig, J. C., & Caine, E. D. (2003). Risk of suicide and related adverse outcomes after exposure to a suicide prevention programme in the US Air Force: cohort study. *BMJ*, 327(7428), 1376.
- Knox, K. L., Pflanz, S., Talcott, G. W., Campise, R. L., Lavigne, J. E., Bajorska, A., . . . Caine, E. D. (2010). The US Air Force suicide prevention program: implications for public health policy. *Am J Public Health*, 100(12), 2457-2463. doi: 10.2105/ajph.2009.159871
- Knox, M. S., Burkhart, K., & Hunter, K. E. (2010). ACT against violence parents raising safe kids program: Effects on maltreatment-related parenting behaviors and beliefs. *Journal of Family Issues*.
- Lang, M. (2013). The impact of mental health insurance laws on state suicide rates. *Health Econ*, 22(1), 73-88. doi: 10.1002/hec.1816
- Linehan, M. M., Comtois, K. A., Murray, A. M., Brown, M. Z., Gallop, R. J., Heard, H. L., . . . Lindenboim, N. (2006). Two-year randomized controlled trial and follow-up of dialectical behavior therapy vs therapy by experts for suicidal behaviors and borderline personality disorder. *Arch Gen Psychiatry*, 63(7), 757-766. doi: 10.1001/archpsyc.63.7.757
- Logan, J. E., Leeb, R. T., & Barker, L. E. (2009). Gender-specific mental and behavioral outcomes among physically abused high-risk seventh-grade youths. *Public Health Reports*, 234-245.
- Losel, F., & Farrington, D. P. (2012). Direct protective and buffering protective factors in the development of youth violence. *Am J Prev Med*, 43(2 Suppl 1), S8-S23. doi: 10.1016/j.amepre.2012.04.029
- Luo, F., Florence, C. S., Quispe-Agnoli, M., Ouyang, L., & Crosby, A. E. (2011). Impact of business cycles on US suicide rates, 1928-2007. *Am J Public Health*, 101(6), 1139-1146. doi: 10.2105/ajph.2010.300010
- Maimon, D., Browning, C. R., & Brooks-Gunn, J. (2010). Collective efficacy, family attachment, and urban adolescent suicide attempts. *J Health Soc Behav*, 51(3), 307-324. doi: 10.1177/0022146510377878
- Mishara, B. L., & Martin, N. (2012). Effects of a comprehensive police suicide prevention program. *Crisis: Journal of Crisis Intervention & Suicide*, 33(3), 162-168.
- Mitchell, A. M., Kim, Y., Prigerson, H. G., & Mortimer-Stephens, M. (2004). Complicated grief in survivors of suicide. *Crisis*, 25(1), 12-18. doi: 10.1027/0227-5910.25.1.12
- Motto, J. A., & Bostrom, A. G. (2001). A randomized controlled trial of postcrisis suicide prevention. *Psychiatr Serv*, 52(6), 828-833.
- Muennig, P., Cohen, A. K., Palmer, A., & Zhu, W. (2013). The relationship between five different measures of structural social capital, medical examination outcomes, and mortality. *Soc Sci Med*, 85, 18-26. doi: 10.1016/j.socscimed.2013.02.007
- National Action Alliance for Suicide Prevention. (2014). Research Prioritization Task Force.(2014). *A prioritized research agenda for suicide prevention: An action plan to save lives*.
- National Action Alliance for Suicide Prevention. (2016). Action Alliance Priorities. Retrieved July 12, 2016, from <http://actionallianceforsuicideprevention.org/priorities>
- Niederkrotenthaler, T., & Sonneck, G. (2007). Assessing the impact of media guidelines for reporting on suicides in Austria: Interrupted time series analysis. *Aust N Z J Psychiatry*, 41. doi: 10.1080/00048670701266680
- Olfson, M., Gerhard, T., Huang, C., Crystal, S., & Stroup, T. S. (2015). Premature Mortality Among Adults With Schizophrenia in the United States. *JAMA Psychiatry*, 72(12), 1172-1181. doi: 10.1001/jamapsychiatry.2015.1737
- Pena, J. B., & Caine, E. D. (2006). Screening as an approach for adolescent suicide prevention. *Suicide Life Threat Behav*, 36(6), 614-637. doi: 10.1521/suli.2006.36.6.614



- Perron, S., Burrows, S., Fournier, M., Perron, P. A., & Ouellet, F. (2013). Installation of a bridge barrier as a suicide prevention strategy in Montreal, Quebec, Canada. *Am J Public Health, 103*(7), 1235-1239. doi: 10.2105/ajph.2012.301089
- Pinchevsky, G. M., & Wright, E. M. (2012). The impact of neighborhoods on intimate partner violence and victimization. *Trauma Violence Abuse, 13*(2), 112-132. doi: 10.1177/1524838012445641
- Pirkis, J., Too, L. S., Spittal, M. J., Krysinska, K., Robinson, J., & Cheung, Y. T. D. (2015). Interventions to reduce suicides at suicide hotspots: a systematic review and meta-analysis. *The Lancet Psychiatry, 2*(11), 994-1001. doi: [http://dx.doi.org/10.1016/S2215-0366\(15\)00266-7](http://dx.doi.org/10.1016/S2215-0366(15)00266-7)
- Pollock, L. R., & Williams, J. M. (2004). Problem-solving in suicide attempters. *Psychol Med, 34*(1), 163-167.
- Reeves, A., Stuckler, D., McKee, M., Gunnell, D., Chang, S. S., & Basu, S. (2012). Increase in state suicide rates in the USA during economic recession. *Lancet, 380*(9856), 1813-1814. doi: 10.1016/S0140-6736(12)61910-2
- Reid, M. J., Webster-Stratton, C., & Hammond, M. (2003). Follow-up of children who received the Incredible Years intervention for oppositional-defiant disorder: Maintenance and prediction of 2-year outcome. *Behavior Therapy, 34*(4), 471-491.
- Resnick, M. D., Ireland, M., & Borowsky, I. (2004). Youth violence perpetration: what protects? What predicts? Findings from the National Longitudinal Study of Adolescent Health. *J Adolesc Health, 35*(5), 424 e421-410. doi: 10.1016/j.jadohealth.2004.01.011
- Rowhani-Rahbar, A., Simonetti, J. A., & Rivara, F. P. (2016). Effectiveness of Interventions to Promote Safe Firearm Storage. *Epidemiol Rev, 38*(1), 111-124. doi: 10.1093/epirev/mxv006
- Runeson, B., & Asberg, M. (2003). Family history of suicide among suicide victims. *Am J Psychiatry, 160*(8), 1525-1526. doi: 10.1176/appi.ajp.160.8.1525
- Runyan, C. W., Becker, A., Brandspigel, S., Barber, C., Trudeau, A., & Novins, D. (2016). Lethal Means Counseling for Parents of Youth Seeking Emergency Care for Suicidality. *West J Emerg Med, 17*(1), 8-14. doi: 10.5811/westjem.2015.11.28590
- Runyan, D., Wattam, C., Ikeda, R., Hassan, F., & Ramiro, L. (2002). Child abuse and neglect by parents and other caregivers. In E. Krug, L. L. Dahlberg, J. A. Mercy, A. B. Zwi, & R. Lozano (Eds.), *World Report on Violence and Health* (pp. 59-86). Geneva, Switzerland: World Health Organization.
- Sampson, R. J., Morenoff, J. D., & Gannon-Rowley, T. (2002). Assessing "Neighborhood Effects": Social Processes and New Directions in Research. *Annual Review of Sociology, 28*, 443-478.
- Schilling, E. A., Aseltine, R. H., Jr., & James, A. (2016). The SOS Suicide Prevention Program: Further Evidence of Efficacy and Effectiveness. *Prev Sci, 17*(2), 157-166. doi: 10.1007/s11121-015-0594-3
- Shepard, D. S., Gurewich, D., Lwin, A. K., Reed, G. A., Jr., & Silverman, M. M. (2016). Suicide and Suicidal Attempts in the United States: Costs and Policy Implications. *Suicide Life Threat Behav, 46*(3), 352-362. doi: 10.1111/sltb.12225
- Silverman, M. M., & Maris, R. W. (1995). The prevention of suicidal behaviors: An overview. *Suicide and life-threatening behavior, 25*(1), 10-21.
- Simon, O. R., Swann, A. C., Powell, K. E., Potter, L. B., Kresnow, M. J., & O'Carroll, P. W. (2001). Characteristics of impulsive suicide attempts and attempters. *Suicide Life Threat Behav, 32*(1 Suppl), 49-59.
- Spoth, R. L., Gyll, M., & Day, S. X. (2002). Universal family-focused interventions in alcohol-use disorder prevention: cost-effectiveness and cost-benefit analyses of two interventions. *J Stud Alcohol, 63*(2), 219-228.
- Suominen, K., Isometsä, E., Suokas, J., Haukka, J., Achte, K., & Lönnqvist, J. (2004). Completed Suicide After a Suicide Attempt: A 37-Year Follow-Up Study. *American Journal of Psychiatry, 161*(3), 562-563. doi: 10.1176/appi.ajp.161.3.562
- Szumilas, M., & Kutcher, S. (2011). Post-suicide intervention programs: a systematic review. *Can J Public Health, 102*(1), 18-29.

- Townsend, E., Hawton, K., Altman, D. G., Arensman, E., Gunnell, D., Hazell, P., . . . Van Heeringen, K. (2001). The efficacy of problem-solving treatments after deliberate self-harm: meta-analysis of randomized controlled trials with respect to depression, hopelessness and improvement in problems. *Psychological Medicine*, 31(6), 979-988.
- U.S. Office of the Surgeon General, & National Action Alliance for Suicide Prevention. (2012). *2012 National Strategy for Suicide Prevention: Goals and Objectives for Action*. Washington, D.C.: HHS.
- Unutzer, J., Tang, L., Oishi, S., Katon, W., Williams, J. W., Jr., Hunkeler, E., . . . Langston, C. (2006). Reducing suicidal ideation in depressed older primary care patients. *J Am Geriatr Soc*, 54(10), 1550-1556.
- Visser, V. S., Comans, T. A., & Scuffham, P. A. (2014). Evaluation Of The Effectiveness Of A Community-Based Crisis Intervention Program For People Bereaved By Suicide. *Journal of Community Psychology*, 42(1), 19-28. doi: 10.1002/jcop.21586
- Wang, Y. C., Hsieh, L. Y., Wang, M. Y., Chou, C. H., Huang, M. W., & Ko, H. C. (2016). Coping Card Usage can Further Reduce Suicide Reattempt in Suicide Attempter Case Management Within 3-Month Intervention. *Suicide Life Threat Behav*, 46(1), 106-120. doi: 10.1111/sltb.12177
- Wasserman, D., Hoven, C. W., Wasserman, C., Wall, M., Eisenberg, R., Hadlaczky, G., . . . Carli, V. (2014). School-based suicide prevention programmes: The SEYLE cluster-randomised, controlled trial. *The Lancet*, 385(9977), 1536-1544. doi: 10.1016/S0140-6736(14)61213-7
- Webster-Stratton, C., & Hammond, M. (1997). Treating children with early-onset conduct problems: a comparison of child and parent training interventions. *J Consult Clin Psychol*, 65(1), 93-109.
- Webster-Stratton, C., Reid, M. J., & Hammond, M. (2001). Preventing conduct problems, promoting social competence: a parent and teacher training partnership in head start. *J Clin Child Psychol*, 30(3), 283-302. doi: 10.1207/S15374424JCCP3003\_2
- Webster-Stratton, C. H., Reid, M. J., & Beauchaine, T. (2011). Combining parent and child training for young children with ADHD. *Journal of Clinical Child & Adolescent Psychology*, 40(2), 191-203.
- Webster-Stratton, C., Jamila Reid, M., & Stoolmiller, M. (2008). Preventing conduct problems and improving school readiness: evaluation of the incredible years teacher and child training programs in high-risk schools. *Journal of child psychology and psychiatry*, 49(5), 471-488.
- Widome, R., Sieving, R. E., Harpin, S. A., & Hearst, M. O. (2008). Measuring neighborhood connection and the association with violence in young adolescents. *J Adolesc Health*, 43(5), 482-489. doi: 10.1016/j.jadohealth.2008.04.013
- Wilcox, H. C., Kellam, S. G., Brown, C. H., Poduska, J. M., Ialongo, N. S., Wang, W., & Anthony, J. C. (2008). The impact of two universal randomized first- and second-grade classroom interventions on young adult suicide ideation and attempts. *Drug Alcohol Depend*, 95 Suppl 1, S60-73.
- Wilson, W. J. (2011). *When work disappears: The world of the new urban poor*: Vintage.
- World Health Organization. (2014). *Suicide Prevention: A Global Imperative*. Geneva, Switzerland: WHO Press.
- Wyman, P. A. (2014). Developmental approach to prevent adolescent suicides: research pathways to effective upstream preventive interventions. *Am J Prev Med*, 47(3 Suppl 2), S251-256. doi: 10.1016/j.amepre.2014.05.039
- Wyman, P. A., Brown, C. H., LoMurray, M., Schmeelk-Cone, K., Petrova, M., Yu, Q., . . . Wang, W. (2010). An outcome evaluation of the Sources of Strength suicide prevention program delivered by adolescent peer leaders in high schools. *Am J Public Health*, 100(9), 1653-1661. doi:
- Yip, P., Caine, E., Yousuf, S., Chang, S.-S., Wu, K., & Chen, Y.-Y. (2012). Means restriction for suicide prevention. *Lancet*, 379. doi: 10.1016/s0140-6736(12)60521-2



**Title...**

**A Technical Package to Prevent Suicide**

**Prepared by:**

**Division of Violence Prevention  
National Center for Injury Prevention and Control (NCIPC)  
Centers for Disease Control and Prevention**

**2016**

**[Title] is a publication of the National Center for Injury Prevention and Control of the Centers for Disease Control and Prevention.**

Centers for Disease Control and Prevention  
Thomas R. Frieden, MD, MPH, Director

National Center for Injury Prevention and Control  
Debra E. Houry, MD, MPH, Director

Division of Violence Prevention  
James A. Mercy, PhD, Director

*Suggested Citation:* [authors] *A Technical Package to Prevent....* Atlanta, GA: National Center for Injury Prevention and Control, Centers for Disease Control and Prevention, 2016.



## Contents

## External Reviewers

[to be inserted later]



## Acknowledgments

[to be inserted later]

## Overview

This technical package represents a select group of strategies based on the best available evidence to help communities and states sharpen their focus on prevention activities with the greatest potential to prevent suicide. Broadly, the strategies represented include those with a focus on preventing suicide from happening in the first place as well as approaches to lessen the immediate and long-term effects of suicidal behavior for individuals, families, communities, and society. Specifically, the strategies include strengthening economic supports; strengthening access to mental health care; establishing protective environments; promoting connectedness to protect against suicide; teaching coping and problem-solving skills; identifying and supporting people at-risk; and intervening to lessen harms and prevent future risk.

This package supports the National Strategy for Suicide prevention, Goal 1, “Integrate and coordinate suicide prevention activities across multiple sectors and settings.” (p.29) It also supports the National Action Alliance for Suicide Prevention’s priority (2016) “To create and disseminate a framework for comprehensive community-based suicide prevention.”

Commitment, cooperation, and leadership from numerous sectors, including public health, education, justice, health care, social services, business/labor, and government can bring about the successful implementation of this package.

### What is a Technical Package?

A technical package is a compilation of a core set of strategies to achieve and sustain substantial reductions in a specific risk factor or outcome (Frieden, 2014). Technical packages help communities and states prioritize prevention activities based on the best available evidence. This technical package has three components. The first component is the **strategy** or the preventive direction or actions to achieve the goal of preventing suicide. The second component is the **approach**. The approach includes the specific ways to advance the strategy. This can be accomplished through *programs, policies, and practices*. The approaches included come primarily from studies based in the United States. The **evidence** for each of the approaches in preventing suicide or its associated risk factors is included as the third component. This package is intended as a resource to guide and inform prevention decision-making in communities and states.

### Preventing Suicide is a Priority

Suicide, as defined by the Centers for Disease Control and Prevention (CDC), is part of a broader class of behavior called *self-directed violence*. Self-directed violence refers to behavior directed at oneself that deliberately results in injury or the *potential* for injury (Crosby, Ortega, & Melanson, 2011). Self-directed violence may be *suicidal* or *non-suicidal* in nature. For the purposes of this document, we refer only to behavior where suicide is intended.



- **Suicide** is a death caused by self-directed injurious behavior with any intent to die as a result of the behavior.
- **Suicide attempt** is defined as a *non-fatal* self-directed and potentially injurious behavior with any intent to die as a result of the behavior. A suicide attempt may or may not result in injury.

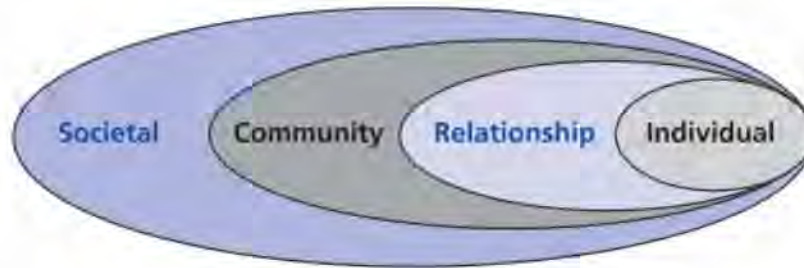
### **Suicide is highly prevalent.**

Suicide presents a major challenge to public health in the United States and worldwide. It contributes to premature death, morbidity, lost productivity, and health care costs (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014). In 2014 in the U.S., the most recent death data available, suicide was responsible for 42,773 deaths, which is approximately one suicide every 12 minutes (Centers for Disease Control and Prevention, 2016d). In 2014, suicide ranked as the tenth leading cause of death and has been among the top twelve leading causes of death since 1975 in the U.S (Centers for Disease Control and Prevention, 2016d). Overall suicide rates have increased 24% from 1999 to 2014 (Curtin, Warner, & Hedegaard, 2016). Suicide is a problem throughout the life span; it is the second leading cause of death among those aged 10–19 years, also second among persons in their 20s and 30s; it is the fourth leading cause among persons in their 40s and seventh among persons in their 50s (Centers for Disease Control and Prevention, 2016d).

Suicides reflect only a portion of the problem (Crosby, Han, Ortega, Parks, & Gfroerer, 2011). Substantially more people are hospitalized as a result of nonfatal suicidal behaviors (i.e. suicide attempts) than are fatally injured, and an even greater number are either treated in ambulatory settings (e.g., emergency departments) or not treated at all (Crosby, Han, et al., 2011). For example, during 2014, among adults aged 18 years and older, for every one suicide there were 9 adults treated in hospital emergency departments for self-harm injuries, 27 who reported making a suicide attempt, and over 227 who reported seriously considering suicide (i.e. ideation) (Ferdon et al., In press). Suicides, suicide attempts, and ideation take an immense emotional, physical, and economic toll (see p. 9) on individuals, families and communities. By one conservative estimate, for every death by suicide six people are directly impacted (i.e. survivors). Based on this figure it is estimated that there are over 13 million survivors in the U.S. and unfortunately, survivorship itself is a risk factor for suicide (Crosby & Sacks, 2002).

### **Suicide is associated with several risk and protective factors.**

Suicide, like other human behaviors, is complex with no single determining cause. Instead, suicide occurs in response to multiple biological, psychological, interpersonal, environmental and societal influences that interact with one another, often over time. The social-ecological model is a useful framework for viewing and understanding suicide risk factors identified in the literature (Dahlber & Krug, 2002):



Some risk Factors for suicide include (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014):

- **Individual:** History of depression and other mental illnesses, alcohol and drug abuse, previous suicide attempt, violence victimization, genetic and biological determinants, hopelessness
- **Relationship:** High conflict or violent relationships, sense of isolation and lack of social support, family/loved one's history of suicide, financial and work stress
- **Community:** Inadequate community connectedness, barriers to health care (e.g., lack of access to providers and medications)
- **Societal:** Availability of lethal means of suicide, unsafe media portrayals of suicide, stigma associated with help-seeking and mental illness

It is important to recognize that the vast majority of individuals who are depressed (or who have other risk factors) do *not* die by suicide. Furthermore, the relevance of each risk factor can vary by age, race, gender, sexual orientation, residential geography, and socio-cultural and economic status (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014)

Protective factors, or those influences that guard *against* the risk for suicide, can also be found across the different levels of the social-ecological model. Protective factors identified in the literature include: effective coping and problem solving skills, moral objections to suicide, strong and supportive relationships with partners, friends, and family; connectedness to school, community and other social institutions; availability of quality and ongoing physical and mental health care, and reduced access to lethal means (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014). These protective factors can either counter a specific risk factor or guard against a number of risks associated with suicide.

### **Suicide is connected to other forms of violence.**

As indicated above, suicide is connected to other forms of violence. Suicide and other forms of violence often share some of the same root causes (Butchart, Phinney, Check, & Villaveces, 2004; Kleven, Simon, & Chen, 2012). For example, in neighborhoods where there is low social cohesion, or where residents don't support and trust each other, people are at higher risk for suicide (Desai, Dausey, &



Rosenheck, 2005) as well as perpetration of child maltreatment (Coulton, Crampton, Irwin, Spilsbury, & Korbin, 2007; Freisthler, Merritt, & LaScala, 2006), teen dating violence (Capaldi, Knoble, Shortt, & Kim, 2012), intimate partner violence (Pinchevsky & Wright, 2012), and youth violence (Sampson, Morenoff, & Gannon-Rowley, 2002). Additionally, a lack of economic opportunities and unemployment are associated with suicide (Luo, Florence, Quispe-Agnoli, Ouyang, & Crosby, 2011; Reeves et al., 2012), as well as perpetration of child maltreatment (D. Runyan, Wattam, Ikeda, Hassan, & Ramiro, 2002), intimate partner violence (Heise & Garcia-Moreno, 2002; Pinchevsky & Wright, 2012), sexual violence (Centers for Disease Control and Prevention, 2016c) and youth violence (Wilson, 2011). Other shared risk factors for suicide and violence occur at the individual level and include substance abuse, mental health problems, witnessing violence, and a lack of problem-solving skills (Centers for Disease Control and Prevention, 2016a, 2016c, 2016e; U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012).

Just as risk factors may be shared across suicide and violence, so too may protective factors overlap. For example, connectedness increases individual's and communities' resilience to suicide and other forms of violence, including connectedness to one's community (Basile, Hamburger, Swahn, & Choi, 2013; Borowsky, Hogan, & Ireland, 1997; Centers for Disease Control and Prevention, 2016b; Coulton et al., 2007; Kleiman, Riskind, Schaefer, & Weingarden, 2012; Pinchevsky & Wright, 2012; Widome, Sieving, Harpin, & Hearst, 2008), school (Basile, Espelage, Rivers, McMahon, & Simon, 2009; Capaldi et al., 2012; Carter, McGee, Taylor, & Williams, 2007; DeGue et al., 2013; Hong, Kral, Espelage, & Allen-Meares, 2012; Losel & Farrington, 2012), family (Capaldi et al., 2012; Centers for Disease Control and Prevention, 2016a; Elgar, Craig, Boyce, Morgan, & Vella-Zarb, 2009; Maimon, Browning, & Brooks-Gunn, 2010; Resnick, Ireland, & Borowsky, 2004), caring adults (Capaldi et al., 2012; Losel & Farrington, 2012; Maimon et al., 2010), and pro-social peers (Capaldi et al., 2012; Losel & Farrington, 2012).

### **The health and economic consequences of suicide are substantial.**

Suicide and suicide attempts have far-reaching consequences for individuals, families, and communities (Dunne, McIntosh, & Dunne-Maxim, 1987; Mishara, 1995; National Action Alliance for Suicide Prevention: Suicide Attempt Survivors Task Force, 2014; National Action Alliance for Suicide Prevention: Survivors of Suicide Loss Task Force, 2015). Research indicates that the health consequences of violence, including suicide, are much more extensive than injury and death. Suicide attempt survivors (i.e. those with lived experience) may suffer long-term health and mental health consequences ranging from anger, guilt, and physical impairment, depending on the means and severity of the attempt (Chapman & Dixon-Gordon, 2007). Similarly, survivors of a loved one's suicide may experience ongoing pain and suffering including complicated grief (Mitchell, Kim, Prigerson, & Mortimer-Stephens, 2004), stigma, depression, anxiety, post-traumatic stress disorder, and increased risk of suicidal ideation and suicide (Julie Cerel, McIntosh, Neimeyer, Maple, & Marshall, 2014; Sudak, Maxim, & Carpenter, 2008).

The economic toll of suicide is immense as well. The total lifetime costs associated with nonfatal injuries and deaths caused by self-directed violence in 2013 were approximately \$93.5 billion after adjusting for under-reporting of suicide (Shepard, Gurewich, Lwin, Reed, & Silverman, 2016). The overwhelming burden of these costs results from lost productivity over the life course, with the average cost per suicide being over \$1.3 million (Shepard et al., 2016).

### **Suicide can be prevented.**

Despite the myths surrounding suicide, like most public health problems, suicide is preventable (U.S. Public Health Service, 1999). And while progress will continue to be made into the future, evidence for numerous programs, practices, and policies currently exists, and many programs are ready to be implemented now. Just as suicide is not caused by a single factor, research suggests that suicide will not be prevented by any single intervention taking place in any single setting (Silverman & Maris, 1995; U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). Rather, suicide prevention is best achieved by a focus across the individual-, relationship-, family-, community, and societal-levels and across all sectors, private and public (e.g., business, public health, physical and behavioral healthcare, justice, education, labor) (National Action Alliance for Suicide Prevention, 2014; World Health Organization, 2014). According to Frieden (2014), successful public health programs also require political commitment, funding, communication, and performance monitoring.

### **Assessing the Evidence**

This technical package includes programs, practices, and policies with evidence of impact on suicide or risk or protective factors for suicide. To be considered for inclusion in the technical package, the program, practice, or policy selected had to meet at least one of these criteria: a) meta-analyses or systematic reviews showing impact on suicide; b) evidence from at least one rigorous (e.g., randomized controlled trial [RCT] or quasi-experimental design) evaluation study that found significant preventive effects on suicide; c) meta-analyses or systematic reviews showing impact on risk or protective factors for suicide, or d) evidence from at least one rigorous (e.g., RCT or quasi-experimental design) evaluation study that found significant impacts on risk or protective factors for suicide. Finally, consideration was also given to the likelihood of achieving beneficial effects on multiple forms of violence; no evidence of harmful effects on specific outcomes or with particular subgroups; and feasibility of implementation in a U.S. context if the program, policy, or practice has been evaluated in another country.

Within this technical package, some approaches do not yet have research evidence demonstrating impact on rates of suicide but instead are supported by evidence indicating impacts on risk or protective factors for suicide (e.g., help-seeking, stigma reduction, depression, connectedness). In terms of the strength of the evidence, programs that have demonstrated effects on suicidal behavior (e.g., reductions in deaths, attempts) provide a higher-level of evidence, but the evidence base is not that strong in all areas. For instance, there has been less evaluation of community engagement and



family programs on suicidal behavior. Thus, approaches in this package that have effects on risk or protective factors reflect the developmental nature of the evidence base and the use of the best available evidence at a given time.

It is also important to note that there is often significant heterogeneity among the programs, policies, or practices that fall within one approach or strategy area in terms of the nature and quality of the available evidence. Not all programs, policies, or practices that utilize the same approach (e.g., gatekeeper training) are equally effective, and even those that are effective may not work across all populations. Tailoring programs and more evaluation may be necessary to address different population groups. The examples provided are not intended to be a comprehensive list of evidence-based programs, policies, or practices for each approach, but rather illustrate models that have been shown to impact suicide or have beneficial effects on risk or protective factors for suicide. In practice, the effectiveness of the programs, policies and practices identified in this package will be strongly dependent on the quality of their implementation and the communities in which they are implemented. Implementation guidance to assist practitioners, organizations and communities will be developed separately.

### Context and Cross-Cutting Themes

The strategies and approaches that have been included in this technical package represent different levels of the social ecology, with efforts intended to impact the community and societal levels, as well individual and relationship levels. The strategies and approaches are intended to work in combination and reinforce each other to prevent suicide (see box below). The strategies are arranged in order such that those strategies hypothesized to have the greatest potential for broad public health impact on suicide are included first, followed by those that might impact more select populations (e.g., persons who have already made a suicide attempt).

Preventing Suicide	
Strategy	Approach
Strengthen economic supports	<ul style="list-style-type: none"> <li>Strengthen financial security</li> <li>Housing stabilization policies</li> </ul>
Strengthen access to mental health care	<ul style="list-style-type: none"> <li>Coverage of mental health conditions in health insurance policies</li> </ul>
Establish protective environments	<ul style="list-style-type: none"> <li>Means restriction</li> <li>Organizational policies and culture</li> <li>Community-based policies to reduce excessive alcohol use</li> </ul>
Promote connectedness to protect against suicide	<ul style="list-style-type: none"> <li>Peer norm approaches</li> <li>Community engagement activities</li> </ul>

Teach coping and problem-solving skills	<ul style="list-style-type: none"> <li>• Social-emotional learning</li> <li>• Parenting skill and family relationship approaches</li> </ul>
Identify and support people at risk	<ul style="list-style-type: none"> <li>• Gatekeeper training</li> <li>• Screening combined with care management</li> <li>• Crisis intervention</li> </ul>
Intervene to lessen harms and prevent future risk	<ul style="list-style-type: none"> <li>• Treatment for people at-risk of suicide</li> <li>• Treatment to prevent re-attempts</li> <li>• Postvention</li> <li>• Safe messaging following a suicide</li> </ul>

The example programs, policies, and practices have been implemented within particular contexts. The social and cultural context of communities is critically important to take into account when selecting strategies and approaches. Practitioners in the field may be in the best position to assess the needs and strengths of their communities and work with community members to make decisions about the combination of approaches included here that are best suited to their context.

Suicide ideation, attempts, morbidity and mortality vary by gender, race/ethnicity, age, occupation, and other important population characteristics. Barriers to disclosure, help seeking, timely access to quality care, and ongoing support are profoundly complex and may also vary by population and community characteristics. Ideally, the availability of multiple approaches tailored to the economic, cultural, and environmental context of individuals and communities are desirable as they may increase the likelihood of removing barriers to supportive and effective care and provide opportunities to develop individual and community resilience. These culturally appropriate approaches can then be included in comprehensive strategies to maximize the public health impact on reducing suicide-related morbidity and mortality among individuals and within communities.

This package includes strategies where public health agencies are well positioned to bring leadership and resources to implementation efforts. It also includes strategies where public health can serve as an important collaborator (e.g., strategies addressing community and societal level risks), but where leadership and commitment from other sectors such as business/labor or health care is critical to implement a particular policy or program (e.g., workplace policies; screening combined with care management). The role of various sectors in the implementation of a strategy or approach in preventing suicide is described further in the section on *Sector Involvement*.

In the sections that follow, the strategies and approaches with the best available evidence for preventing suicide are described.



## Strengthen Economic Supports

### Rationale

Public health research suggests that some of the biggest impacts on health come from policies developed to improve socioeconomic conditions (Frieden, 2010). Downturns in the economy and increases in unemployment and home foreclosures are associated with increased rates of suicide (Fowler, Gladden, Vagi, Barnes, & Frazier, 2015; Luo et al., 2011). Policies that strengthen financial security and keep housing stable may help prevent suicide by reducing stress and anxiety and the potential for a crisis situation and at the same time assist people to improve their financial situations.

### Approaches

Economic and housing supports for individuals and families can be strengthened by improving policies that enhance financial security and stabilize housing for people, especially in times of economic need.

- **Strengthen household financial security.** Findings from the U.S. show that suicide rates increase during economic recessions marked by high unemployment rates, job losses, and economic instability and decrease during economic expansions and periods marked by low unemployment rates, particularly for working-age individuals 25 to 64 years old (Luo et al., 2011; Fowler et al., 2015). Policies that support financial security during difficult economic times have been shown to mitigate the risk of economic crises on suicide rates.
- **Housing stabilization policies** aim to keep people in their homes during times of financial insecurity. This may occur through programs that provide affordable housing such as through government subsidies or through other options available to potential homebuyers such as loan modification programs, move-out planning, or financial counseling services that help minimize the risk or impact of foreclosures and eviction.

### Potential Outcomes

- Reduced suicide rates
- Lower foreclosure rates
- Lower eviction rates
- Reduced emotional distress

### Evidence

There is evidence that policies that strengthen household financial security and that stabilize housing can reduce suicide risk.

- **Strengthen household financial security.** *Unemployment benefit programs* provide income protection during periods of unemployment in an effort to prevent or lessen the economic

**Comment [A]:** I think we need to describe what this approach is more specifically so that we can then show the evidence in the next section.

hardship for those experiencing job loss and enduring unemployment. An examination of variations in U.S. *unemployment benefit programs* across states demonstrated that the impact of unemployment on suicide was offset in those states that provided greater than average unemployment benefits greater (Cylus, Glymour, & Avendano, 2014). Another U.S. study examining the link between unemployment and suicide risk using monthly suicide data, length of unemployment, and job losses found that the duration of unemployment, as opposed to just the loss of job, predicted suicide risk (Classen & Dunn, 2012). Together, these results suggest that not only should state unemployment benefit programs be **generous** in their financial allocations, but also in their duration.

- **Housing stabilization policies.** *The National Neighborhood Stabilization Program* provides affordable housing options for low, moderate, and middle-income homebuyers and offers financial assistance to eligible individuals for the purchase of a new home. While it has not been rigorously evaluated for its impact on suicide outcomes, specifically, it addresses foreclosure and evictions, risk factors for suicide. A longitudinal analysis of annual data on suicides and foreclosures demonstrated that as the proportion of foreclosed properties increased in U.S. states, so did the state suicide rate, particularly among working-aged adults (Houle & Light, 2014). Another study of data from 16 U.S. states participating in the National Violent Death Reporting System found that suicides precipitated by home foreclosures and evictions increased more than 100% from 2005 (before the housing crisis began) to 2010 (after it had peaked; Fowler et al. (2015)). Most of these suicides occurred prior to the actual loss of the decedent's home. These findings suggest that integrating suicide prevention resources, messaging, and referrals into financial, foreclosure, and move-out planning and counseling services may help to prevent suicide.

**Comment [A]:** Tom had a concern about this term so we've tried to explain it above. Hopefully it's a bit clearer. The interpretation from the study isn't the easiest.

**Comment [A]:** Did the National Neighborhood Stab. Program increase housing options and decrease evictions for people who participated? I think this would be useful to say.



## Strengthen Access to Mental Health Care

### Rationale

Mental illness is a risk factor for suicide-- Studies suggest that up to 90% of people who die by suicide may have had a mental illness at the time of their deaths (Cavanagh, Carson, Sharpe, & Lawrie, 2003) and research on state-level suicide rates have been found to be correlated with general mental health measures such as depression (Arsenault-Lapierre, Kim, & Turecki, 2004). While most people with mental health problems do not attempt or die by suicide (Olfson, Gerhard, Huang, Crystal, & Stroup, 2015) and most people who have attempted suicide will not go on to die by suicide (Owens, 2002), assuring access to affordable mental health care for people in need is critical to suicide prevention.

### Approaches

A major approach to strengthening access to mental health care is through the provision of health insurance policies that include coverage for such services.

- **Coverage of mental health conditions in health insurance policies.** Historically, mental health care was viewed as separate from physical health care and many health insurance plans either did not provide coverage of mental health services or such services were available but not affordable--due to higher co-pays or co-insurance-- or set limits on the number of visits allowed. More recently, improvements have been made with many health insurance policies providing greater levels of mental health coverage and more provide coverage that is on par with coverage for other health concerns, i.e. mental health parity. These policies can help prevent suicide by increasing the accessibility and affordability, and ultimately the use of, needed mental health services. As more people access mental health services this helps normalize treatment seeking in the population, reduces symptoms of mental illnesses like depression and bipolar disorder, and in turn, reduce rates of suicide and suicide attempts.

### Potential Outcomes

- Increased utilization of mental health services
- Decreased symptoms of mental illnesses
- Decreased rates of suicide attempts
- Decreased rates of suicide

### Evidence

There is evidence suggesting that coverage of mental health conditions in health insurance policies can reduce risk factors associated with suicide and may directly impact suicide rates.

- **Coverage of mental health conditions in health insurance policies.** The National Survey of Drug Use and Health is a nationally representative survey of the U.S. population that provides

data on substance use, mental health conditions, and services utilization. Using data from this survey, Harris, Carpenter, and Bao (2006) found that 12 months after states enacted *mental health parity laws*, self-reported use of mental healthcare services significantly increased. Moreover, subsequent research by Lang (2013) examined state mental health laws and suicide rates between 1990 and 2004 and found that mental health parity laws, specifically, were associated with an approximate 5% reduction in suicide rates. This reduction, in the 29 states with parity laws, equated to the prevention of 592 suicides per year and a cost savings of \$1.3-3.1 million per suicide prevented (Lang, 2013).



## Establish Protective Environments

### Rationale

Prevention efforts that focus not only on individual behavior change (e.g., help-seeking, treatment interventions) but on changes to the environment (e.g., policy-level interventions, modifications to the environment) as well, increase the likelihood of success (Haddon, 1980). Protective environments may be defined in part, as those where risk factors associated with suicide are limited and where protective factors are encouraged. Examples of risk factors include easy access to lethal means, stigma related to help-seeking, and substance abuse (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). Protective factors include such things as social connectedness and access to mental health services (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). Establishing environments that address these factors where individuals live, work, and play, can help prevent suicide.

### Approaches

The current evidence suggests three promising approaches for creating environments that protect against suicide.

- **Reducing access to lethal means.** Means of suicide such as firearms, hanging/suffocation, or jumping from heights provide little opportunity for rescue and, as such, have high case fatality rates (e.g., about 85% of people who use a firearm in a suicide attempt will die from the injury). Research also indicates that 1) the interval between thinking about and attempting suicide can be as short as 5 or 10 minutes (Deisenhammer et al., 2009; Simon et al., 2001) and 2) that people tend *not* to substitute a different method when a highly lethal method is unavailable or difficult to access (Hawton, 2007; Yip et al., 2012). Therefore, increasing the time interval between the thought and the suicide attempt, for example, by making it more difficult to access lethal means, can be lifesaving. The following are examples of approaches reducing access to lethal means:
  - *Intervening at Suicide Hotspots.* Suicide hotspots, or places where suicides may take place relatively easily, include tall structures (e.g., bridges and cliffs), railway tracks, and isolated locations such as parks. Efforts to prevent suicide at these locations include erecting barriers to prevent jumping and installing signs and telephones to encourage individuals who are considering suicide, to seek help (Cox et al., 2013).
  - *Safe Storage Practices.* Safe storage of medications, firearms, and other household products can reduce the risk for suicide by separating individuals who may be vulnerable and/or impulsive from easy access to lethal means. Such practices may

include education and counseling around storing firearms--locked in a secure place (e.g., in a gun safe or lock box), preferably unloaded and separate from the ammunition--and keeping medicines in a locked cabinet or other secure location away from people who may be at risk or who have made prior attempts (Rowhani-Rahbar, Simonetti, & Rivara, 2016; C. W. Runyan et al., 2016).

- **Organizational policies and culture** that promote protective environments may be implemented in places of employment. Such policies and cultural values may promote prosocial behavior (e.g., asking for help), skill building, changing social norms, referral and access to helping services (e.g. mental health, substance abuse treatment, financial counseling), and encourage leadership support from the top down. Such policies and cultural shifts can positively impact organizational climate and morale and help prevent suicide and its related risk factors (e.g. depression, social isolation).
- **Community-based policies to reduce excessive alcohol use.** Research studies in the United States have found that greater alcohol availability is positively associated with alcohol-involved suicides (Escobedo & Ortiz, 2002; Giesbrecht et al., 2015). Policies to reduce excessive alcohol use broadly include zoning to limit alcohol outlet locations and density, taxes on alcohol, and bans on the sale of alcohol for individuals under the legal drinking age. These policies are important because acute alcohol use has been found to be associated with more than one-third of suicides and approximately 40% of suicide attempts (Cherpitel, Borges, & Wilcox, 2004).

### Potential Outcomes

- Increase in safe storage of lethal means
- Reduction in suicide attempts
- Reduction in suicide deaths
- Increase in help-seeking
- Reduction in alcohol-related suicide deaths

### Evidence

The evidence for the effectiveness of means restriction and other ways to establish protective environments is some of the strongest in the field (Zalsman et al., 2016), as described below.

- **Means restriction.** A meta-analysis examining the impact of *suicide hotspot interventions* implemented in combination or in isolation, both in the U.S. and abroad, found associated reduced rates of suicide (Cox et al., 2013; Pirkis et al., 2015). For example, after erecting a barrier on the Jacques-Cartier bridge in Canada, the suicide rate from jumping from the bridge decreased from about 10 suicide deaths per year to about 3 deaths per year (Perron, Burrows, Fournier, Perron, & Ouellet, 2013). Moreover, the reduction in suicides by jumping was



sustained even when all bridges and nearby jumping sites were considered, suggesting little to no displacement of suicides to other jumping sites (Perron et al., 2013). Further evidence for the effectiveness of bridge barriers was demonstrated by a study examining the impact of the *removal* of safety barriers from the Grafton Bridge in Auckland, New Zealand. After removal of the barrier, sadly, both the number and rate of suicide increased fivefold (Beautrais, 2001; Beautrais, Gibb, Fergusson, Horwood, & Larkin, 2009).

Another form of means reduction involves implementation of *safe storage practices*. In a case-control study of firearm-related events identified from 37 counties in Washington, Oregon, and Missouri, and from 5 trauma centers, Grossman et al. (2005) found that storing firearms unloaded, separate from ammunition, in a locked place and/or secured with a safety device was protective of suicide attempts among adolescents. Further, a recent systematic review of clinic and community-based education and counseling interventions suggested that the provision of safety devices significantly increased safe firearm storage practices compared to counseling alone or compared to the provision of economic incentives to acquire safety devices on one's own (Rowhani-Rahbar et al., 2016). Another program, *The Emergency Department Counseling on Access to Lethal Means (ED CALM)*, trained psychiatric emergency clinicians in a large children's hospital to provide lethal means counseling and safe storage boxes to parents of patients under age 18 receiving care for suicidal behavior. In a pre-post quality improvement project, Runyan et al. (2016) found that at post-test 76% (of the 55% of parents follow-up, n=114) reported that all medications in the home were locked up as compared to fewer than 10% at the time of the initial emergency department visit. Among parents who indicated the presence of guns in the home at pre-test (i.e. 67%), all (100%) reported guns were currently locked up at post-test (C. W. Runyan et al., 2016).

- **Organizational policies and culture.** *Together for Life* is a workplace program of the Montreal Police Force implemented to address suicide among officers. Policy and program components were designed to foster an organizational culture that promoted mutual support and solidarity among all members of the Force. The program included training of supervisors, managers and all units to improve competencies in identifying suicidal risk and to improve use and awareness of existing resources. The program also included an education campaign to improve awareness and help-seeking (Mishara & Martin, 2012). Police suicides were tracked over 12 years and compared to rates in the control city of Quebec. The suicide rate in the intervention group decreased significantly by 78.9% to a rate of 6.42 suicides per 100,000 population per year compared to an 11% increase in the control city (rate: 29.0 per 100,000) (Mishara & Martin, 2012).

Another example of this approach is the *United States Air Force Suicide Prevention Program (AFSPP)*. AFSPP included 11 policy and education initiatives and was designed to change the

culture of the Air Force surrounding suicide. The program uses leaders as role models and agents of change, establishes expectations for behavior related to awareness of suicide risk, develops population skills and knowledge (i.e., education and training), and investigates every suicide (i.e., outcomes measurement). The program represents a fundamental shift from viewing suicide and mental illness solely as medical problem and instead sees them as larger service-wide problems impacting the whole community (K. L. Knox, Litts, Talcott, Feig, & Caine, 2003). Using a time-series design to examine the impact of the AFSPP program on various violence-related outcomes, researchers found that the program was associated with a 33% relative risk reduction in suicide (K. L. Knox et al., 2003). The program was also associated with relative risk reductions in related outcomes including moderate and severe family violence (30% and 54%, respectively), homicide (51%), and accidental death (18%) (K. L. Knox et al., 2003). A longitudinal assessment of the program over the period 1981 to 2008 (16 years before the 1997 launch of the program and 11 years post-launch) found significantly lower rates of suicide after the program was launched than before (K. L. Knox et al., 2010). These effects were sustained over time, except in 2004, which the authors found was associated with less rigorous implementation in that year than in the other years (K. L. Knox et al., 2010).

- **Community-based policies to reduce excessive alcohol use.** While multiple policies to limit alcohol use exist, several studies on alcohol outlet *density*, specifically, suggest that measures to reduce alcohol outlet density can potentially reduce alcohol-involved suicides. Additionally, a longitudinal analysis of alcohol outlet density, suicide mortality, and hospitalizations for suicide attempts over 6 years in 581 California zip codes indicated that the density of bars, specifically, is related to suicide and suicide attempts, particularly in rural areas (Johnson, Gruenewald, & Remer, 2009).



## Promote Connectedness to Protect Against Suicide

### Rationale

Sociologist, Emile Durkheim theorized in 1897 that weak social bonds, i.e. lack of connectedness, are among the chief causes for suicidality (Durkheim, 1951). *Connectedness* is the degree to which an individual or group of individuals are socially close, interrelated, or share resources with others (Centers for Disease Control and Prevention, 2009). Social connections can be formed within and between multiple levels of the social ecology (Dahlber & Krug, 2002), for instance between individuals (e.g. peers, neighbors, co-workers), families, schools, neighborhoods, workplace, faith communities, cultural groups, and society as a whole. Related to connectedness, *social capital* refers to a sense of trust in one's community and neighborhood, social integration, and also the availability and participation in social organizations (Beyer, Layde, Hamberger, & Laud, 2015; Muennig, Cohen, Palmer, & Zhu, 2013). Many ecological cross-sectional and longitudinal studies have examined the impact of aspects of social capital on depression symptoms, depressive disorder, mental health more generally, and suicide. While the evidence is still being built the pattern is towards an inverse association between social capital measured by social trust, community/ neighborhood engagement, and improved mental health. Connectedness and social capital together can serve to protect against suicidal behaviors by decreasing isolation, encouraging adaptive coping behaviors, increasing belongingness, personal value and worth all of which helps individuals to build resilience in the face of adversity. Connectedness can also provide individuals with better access to formal supports and resources, mobilize communities to meet the needs of its members and provide collective primary prevention activities to the community as a whole (Centers for Disease Control and Prevention, 2009)

### Approaches

Promoting connectedness among individuals and within communities through modeling peer norms and enhancing community engagement can protect against suicide.

- **Peer norm approaches** seek to normalize prosocial behaviors/protective factors for suicide such as help-seeking, reaching out and talking to trusted adults, and peer connectedness. These approaches typically target youth and are delivered in school settings but can also be implemented in community settings.

- **Community engagement activities.** Community engagement is an aspect of social capital. Community engagement approaches may involve residents participating in a range of activities, including religious activities, community clean-up and greening activities, and physical exercise. These activities provide opportunities for residents to become more involved in the community and to connect with other community members, organizations, and resources, resulting in enhanced overall physical health, reduced stress, and decreased depressive symptoms, thereby reducing risk of suicide.

### Potential Outcomes

- Reduction in maladaptive coping attitudes and behaviors
- Increase in healthy coping attitudes and behaviors
- Increase in referrals for youth in distressed
- Increase help-seeking behaviors
- Positive perception of adult support

### Evidence

Current evidence suggests that peer norm approaches and community engagement can reduce risk factors associated with suicidal behaviors.

- **Peer norm approaches.** Evaluations show that programs such as *Sources of Strength* can improve school norms and beliefs about suicide that are created and disseminated by student peers. In a randomized controlled trial of *Sources of Strength* conducted with 18 high-schools (6 metropolitan, 12 rural), Wyman et al. (2010) found that the program improved peer leaders' adaptive norms regarding suicide, their connectedness to adults, and school engagement. Peer leaders were also more likely than controls to refer a suicidal friend to an adult. Among students, the intervention increased perceptions of adult support for suicidal youths and the acceptability of seeking help. Perception of adult support increased most in students with a history of suicidal ideation. Finally, trained peer leaders also reported a greater decrease in maladaptive coping attitudes compared with untrained leaders (Wyman et al., 2010).
- **Community engagement activities.** A vacant lot greening initiative was undertaken in Philadelphia between 1999 and 2008. Local residents and community members worked together to green 4,436 lots (or 7.8 million square feet) in 4 areas of the city. Researchers found significant associated reductions in community residents' self-reported stress levels and engagement in more physical exercise than residents in control vacant lot areas. Other benefits included reductions in firearm assaults and vandalism (Branas et al., 2011).

**Comment [A]:** Linda, I still might like to research this approach a bit more to find a more robust study.



## Teach Coping and Problem-Solving Skills

### Rationale

Building life skills prepares individuals to successfully tackle every day challenges and adapt to stress and adversity. Life skills encompasses many concepts, but most often include coping and problem-solving skills, conflict resolution, and critical thinking. Life skills are important in shielding individuals from suicidal behaviors (World Health Organization, 2014). Suicide prevention programs that focus on life and social skills training are drawn from social cognitive theories (Bandura, 1986), surmising that individuals who engage in suicidal behavior is attributed to either direct learning, modeling, and environmental and individual (e.g. hopelessness) characteristics. The literature linking life skills and suicide is robust--- The inability to employ adequate coping strategies to cope with immediate stressors or identify and find solutions for problems have been characterized among suicide attempters (Pollock & Williams, 2004). Treatments that include bolstering problem skills (Goldsmith, Pellmar, Kleinman, & Bunney, 2002) and include problem-solving techniques (Ghahramanlou-Holloway, Bhar, Brown, Olsen, & Beck, 2012; Townsend et al., 2001) appear to reduce suicidal ideation and attempts more effectively. Prevention programs focused on teaching these skills target youth, parents and families and have been used with both universal and at-risk populations. While many do not target suicidal behaviors directly, these programs strive to train youth and parents important life skills to offset the underlying vulnerabilities that contribute to engaging in high risk behaviors early in life.

### Approaches

Current evidence provides support for the following two approaches:

- **Social emotional learning programs** focus on developing and strengthening communication and problem-solving skills, emotion regulation, conflict resolution, help seeking and coping skills. These approaches address a range of risk and protective factors for suicidal behavior. They provide children and youth with skills to resolve problems in relationships, school, and with peers, and help youth to address other negative influences (e.g., substance use) associated with suicide. These approaches are typically delivered to all students in a particular grade or school, although some programs also focus on groups of students considered to be at high-risk for suicide. Opportunities to practice and reinforce skills are an important part of programs that work (Herman, Borden, Reinke, & Webster-Stratton, 2011).
- **Parenting skill and family relationship programs** are designed to strengthen parenting skills, enhance positive parent-child interactions, and improve children's behavioral and emotional skills and abilities. Several parenting and family relationship programs have been shown in rigorous evaluations to improve resilience and reduce risk factors for various behaviors,

including ones closely related to suicide, such as depression, internalizing behaviors, and substance abuse (M. S. Knox, Burkhart, & Hunter, 2010).

### Potential Outcomes

- Reduction in suicide attempts and suicide ideation
- Enhanced knowledge of risk and protective factors associated with suicide
- Reduction in suicide risk behaviors (i.e., depression, anxiety, conduct problems, substance abuse)
- Improve and normalize help-seeking behavior
- Enhance social competence and emotional regulation skills
- Enhance problem-solving and conflict management skills

### Evidence

There are several programs with evidence that supports teaching social, emotional and parenting skills to reduce suicidal behaviors and associated risk factors.

- **Social emotional learning programs.** In a cluster-randomized controlled trial of **YAM** conducted across 10 European Union countries and 168 schools, students participating in the **YAM** program were significantly less likely to have an incident suicide attempt (OR 0.45, 95%CI 0.24–0.85;  $p=0.014$ ) and severe suicidal ideation (0.50, 0.27-0.92;  $p=0.025$ ) at the 12-month follow-up compared to the control group. Additionally, related to severe suicide ideation, in the **YAM** group absolute risk fell by 0.50% and RR fell by 49.6% (Wasserman et al., 2014).

Additionally, in a randomized controlled trial, **SOS** was shown to reduce self-reported suicide attempts at 3-months post intervention among participating students compared to control students. The **SOS** program also increased students' knowledge of how to get help for themselves or friends for depression and/or suicidal thoughts, and favorable attitudes toward help-seeking. **SOS** participants with a lifetime history of suicide attempt were also less likely to report planning a suicide in the 3 months following the program compared to lower-risk participants (Schilling, Aseltine, & James, 2016).

Finally, in an outcome evaluation of the **GBG**, first graders assigned to **GBG** reported half the adjusted odds of suicidal ideation and suicide attempts. The beneficial effect of the program was consistent for suicidal ideation regardless of whether baseline covariates were included. The **GBG** effect on attempts was less robust in some adjusted models including caregiver mental health. In the second cohort of **GBG** students, neither suicidal ideation nor suicide attempts were significantly different between **GBG** and the control interventions

Comment [A]: Kristin, can you add what the acronym stands for and a sentence or two about the program?

Comment [A]: Same comment as above.

Comment [A]: Same comment.



(Wilcox et al., 2008). This finding likely arose due to the lack of implementation fidelity and pointed to the need for *GBG* to be delivered with precision, consistency, and teacher support. *GBG* was also found to be associated with reduced risk of later substance abuse, a risk factor for suicide (Kellam et al., 2008).

- **Parenting skill and family relationship programs.** Parenting and family skills training approaches have shown promising impacts in preventing key risk factors associated with suicide. Several studies have demonstrated the effect of *The Incredible Years* program on reducing internalizing symptoms, such as anxiety and depression, and child conduct problems (C. H. Webster-Stratton, Reid, & Beauchaine, 2011; Webster-Stratton, Jamila Reid, & Stoolmiller, 2008). The program is also associated with improved problem-solving and conflict management; these skills were maintained at 1-year follow-up (Reid, Webster-Stratton, & Hammond, 2003; C. Webster-Stratton & Hammond, 1997; C. Webster-Stratton, Reid, & Hammond, 2001). The program demonstrated greater benefits as the dosage of the intervention increased (Herman et al., 2011).

Additionally, *Strengthening Families* has been shown to decrease externalizing behaviors, alcohol use, and drug use among youth participants and reductions in depression, alcohol use, and drug use among participating families (Spath, Gyll, & Day, 2002).

Comment [A]: Sentence or two about the program is needed here.

Comment [A]: Same comment.

## Identify and Support People At-Risk

### Rationale

In order to decrease suicide, attention to people at increased or high risk is necessary as these individuals tend to experience suicidal behavior at higher than average rates. These vulnerable or disadvantaged populations include, but are not limited to, individuals with lower socio-economic status or who are living with a mental health problem; people who have attempted suicide previously, individuals who are institutionalized, have been victims of violence, or are homeless; and members of certain ethnic minority groups. Supporting these vulnerable groups requires proactive case finding along with access to, and retention in, mental health services. Finding effective ways of identifying at-risk or vulnerable groups, customizing services to make them accessible and maintaining care remain key challenges. For example, simply improving services does not guarantee that those services will be used by those most in need of them, nor will it necessarily increase the number of people who follow treatments that are recommended. People who are disadvantaged face social and economic issues that may adversely affect their ability to respond to the treatments or advice that are offered.

### Approaches

The following three approaches focus on identifying and supporting people at increased risk.

- **Gatekeeper training** is designed to train teachers, coaches, providers and others in the community to identify people who may be at risk of suicide and to respond effectively, including facilitating treatment seeking and support services. Gatekeeper training is typically implemented in schools to identify at-risk youth and within health care settings to identify adults (and youth).
- **Screening combined with care management and overall continuity of care** has been used in primary care and behavioral health care settings to assure that people who may be at high-risk of suicide are identified and receive ongoing treatment as needed, particularly after inpatient discharge and other transitions within the healthcare system so they don't 'slip through the cracks'. These approaches typically employ screening for depression and/or suicide combined with collaborative treatment planning between patients and their providers and patient follow-up.
- **Crisis intervention.** These approaches provide support and referral services, typically by connecting a person in crisis (or a friend or family member of someone at-risk) to trained volunteers and/or professional staff via telephone hotline, online chat, or text messaging. Crisis intervention approaches are intended to impact key risk factors for suicide, including feelings of



depression, hopelessness, and subsequent mental health care utilization. Like means reduction, crisis interventions can put space or time between an individual who may be considering suicide and harmful behavior.

### Potential Outcomes

- Reduction in suicide attempts
- Reduction in suicide deaths
- Increased identification of individuals at-risk for suicidal behavior
- Increased at-risk individuals in treatment
- Increased community members trained to identify at-risk individuals
- Increased referrals for health care

### Evidence

There is evidence that community gatekeeper programs are successful in reducing suicides and suicide attempts but the efforts must be maintained (Substance Abuse and Mental Health Services Administration, Center for Mental Health Services. Report to Congress: Garret Lee Smith Suicide Prevention Program. US Department of Health and Human Services: Rockville, MD, 2014). However, there is limited evidence for effectiveness screening programs, but at the same time, standard principles for public health screening make them promising (Pena & Caine, 2006). The number of studies evaluating crisis intervention services is limited, but a few studies do indicate that those who use the hotline services have decreased suicidal thoughts and behavior.

- **Gatekeeper training.** In a randomized controlled trial of 300 participants of *Mental Health First Aid (MHFA)*, the intervention group reported greater confidence in providing help to others, greater likelihood of advising people to seek professional help, improved concordance with health professionals about treatments, and decreased stigmatizing attitudes. Additionally, the intervention resulted in improved mental health of the participants themselves. All results were statistically significant at  $p < .05$ . (Kitchener & Jorm, 2004). Additional research rigorously evaluating *MHFA* for its impact on the first aid recipients themselves and suicidal behavior is needed (Kitchener & Jorm, 2006).
- **Screening combined with care management and overall continuity of care.** An examination of the impact of the *Henry Ford Perfect Depression Care (Pre-cursor to Zero Suicide)* program found that there was a dramatic and statistically significant decrease in the rate of suicide between the baseline years prior to the intervention (1999 and 2000) to the intervention years (2002-2009). During this time period, the suicide rate fell 82% (C. E. Coffey, 2006; C. E. Coffey,

**Comment [A]:** Kristin can you do me a favor and create an endnote reference for this in the endnote library called (Suicide.enl) and then insert the ref here? Thank you!

**Comment [A]:** Please add a sentence describing MHFA

**Comment [A]:** Please add sentence here describing the program.

Coffey, & Ahmedani, 2013). Further, suicide rates also declined among HMO members who participated in targeted suicide prevention efforts and received mental health specialty services. However, for those HMO members who accessed only general medical services as opposed to specialty mental health services, the suicide rate increased (M. Coffey, Coffey, & Ahmedani, 2015).

- **Crisis intervention.** In an evaluation of the effectiveness of the National Suicide Prevention Lifeline (NSPL) to prevent suicide, 1,085 suicidal individuals who called the hotline completed a standard risk assessment for suicide, and 380 of those completed a follow-up assessment between 1 and 52 days after the initial assessment. Researchers found that over half of the initial sample were seriously considering suicide when they called, and they had a plan for their suicide. Researchers also found that participants experienced significant decreases in suicidality over the course of the telephone session, and that levels of hopelessness and psychological pain continued to decrease after their initial call (Gould, Kalafat, Harrismunfakh, & Kleinman, 2007).

In another study, this time employing a randomized controlled trial, Gould, Cross, Pisani, Munfakh, and Kleinman (2013) assessed the impact of the *Applied Suicide Intervention Skills Training (ASIST)*, a widely implemented gatekeeper training program, across the NSPL network of hotlines over the period 2008-2009. Using data from 1,410 suicidal individuals who called 17 Lifeline centers, researchers found that compared to callers who spoke to counselors that received the usual care training, individuals who spoke with counselors trained in ASIST were significantly more likely to feel less depressed, less suicidal, less overwhelmed, and more hopeful by the end of their call to the hotline. Counselors trained in ASIST were also more skilled at keeping callers on the phone longer and establishing a connection with them. However, training in ASIST did not result in more comprehensive suicide risk assessments than usual care training (Gould et al., 2013).

Comment [A]: Maybe add a detail here about ASIST



## Intervene to Lessen Harms and Prevent Future Risk

### Rationale

Individuals who have experienced mental health challenges, suicidal ideation, and/or who have made suicide attempts and/or have engaged in non-suicidal self-injury are at increased risk of suicide (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). Risk of suicide can also increase among those who have lost a friend, family member, co-worker, or other acquaintance to suicide (Pitman, Osborn, King, & Erlangsen, 2014). Exposure to sensationalized or uninformed reporting regarding on suicide may heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to suicide contagion (Etzersdorfer & Sonneck, 1998; Niederkrotenthaler & Sonneck, 2007).

### Approaches

A broad array of approaches to lessen harms and reduce future risk of suicide among those at increased risk include the provision of mental health care and improved continuity of care, improving linkage to care through active post-discharge planning and follow-up that decreases barriers to ongoing therapeutic support, increasing connectedness to supportive others, addressing bereavement, and framing communications to emphasize resilience, decrease negative affect, and to prevent contagion.

- **Treatment for people at-risk of suicide** typically includes various forms of psychotherapy delivered by licensed providers to help individuals with mental health problems and other risk factors for suicide with problem-solving, impulsivity and emotion regulation.
- **Treatment to prevent re-attempts.** These approaches typically include follow-up contact and use diverse modalities (e.g., home visits, mail, telephone, e-mail) to engage recent suicide attempt survivors in continued treatment to prevent re-attempts. Treatment may focus on improved coping skills, mindfulness, and other emotional regulation skills, and may include case management home visits to increase adherence to treatment and continuity of care; and one-on-one interpersonal therapy and/or group therapy. Approaches that engage and connect attempters to peers and providers are especially important because many attempters do not present to aftercare; 12%-25% reattempt within a year, and 3%-9% of attempt survivors die by suicide within 1 to 5 years of their initial attempt (Inagaki et al., 2015)
- **Postvention** approaches are implemented *after* a suicide has taken place and may include debriefing sessions, counseling, and/or bereavement support groups for surviving friends and family members/loved ones. These programs have not typically been evaluated for their impact on suicide or suicidal behavior but may reduce survivors' guilt, feelings of depression, and complicated grief (Szumilas & Kutcher, 2011).

- **Safe messaging following a suicide.** The manner in which information on a recent suicide is communicated to the public (e.g. school assemblies, mass media, social media) can heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to suicide contagion. Therefore, responsible and safe reporting may help prevent suicide and/or suicide contagion.

### Potential Outcomes

- Reduction in mental health-related sequelae
- Increase connectedness
- Improved coping skills
- Improved messaging following suicide
- Reduction in re-attempts

### Evidence

The evidence addressing strategies to lessen harm and prevent future risk of suicide includes the evaluation of effects of specific approaches on risk and protective factors as well as suicide-related mortality. However, because the evaluation of suicide-related mortality requires large sample sizes and extended follow-up, much of the evidence in this area primarily focuses on risk and protective factors.

- **Treatment for people at-risk of suicide.**

**Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)** has been shown to significantly improve quality of life, and to reduce functional impairment, depression and suicidal ideation over 24-months of follow-up (Hunkeler et al., 2006; Unutzer et al., 2006) relative to patients who received care as usual.

**Collaborative Assessment and Management of Suicidality (CAMS)** has been tested and supported in 6 correlational studies (Jobes, 2012), in a variety of inpatient and outpatient settings and in one RCT with several additional RCTs under way. CAMS has been associated with significant improvements in suicidal ideation, overall symptom distress, and feelings of hopelessness at 12 month follow-up among a community-based sample of suicidal outpatients. (Comtois et al., 2011).

**Dialectical Behavioral Therapy.** In a randomized controlled trial of women with recent suicidal or self-injurious behavior, those receiving DBT were half as likely to make a suicide attempt at

**Comment [A]:** Need sentences for the rest of the programs. Ugh. Sorry.



two-year follow-up than women receiving community treatment (23% vs 46%), required less hospitalization for suicide ideation, and had lower medical risk across all suicide attempts and self-injurious acts combined (Linehan et al., 2006).

**Attachment-Based Family Therapy (ABFT).** A randomized controlled trial of ABFT (Diamond et al., 2010) found that suicidal adolescents assigned to ABFT experienced significantly greater improvement in suicidal ideation over 24 weeks of follow-up than did adolescents assigned to enhanced usual care (-4.37 vs. -2.34;  $p = .001$ ;  $d=0.97$ ). Additionally, a higher percentage of ABFT participants reported no suicidal ideation in the week prior to assessment at 12 weeks than did adolescents receiving enhanced usual care (69.2% vs. 34.6%;  $p = .01$ ; OR= 4.25) and at 24 weeks (82.1% vs. 46.2%;  $p = .006$ ; OR=5.37) (Diamond et al., 2010).

- **Treatment to prevent re-attempts.**

**Emergency Department Brief Intervention with Follow-up Visits.** A randomized controlled trial that enrolled suicide attempters from eight hospital emergency departments in five culturally different sites found that a brief intervention combined with 9 follow-up visits over 18-months was associated with significantly fewer deaths from suicide relative to a treatment-as-usual group (0.2% versus 2.2%, respectively;  $\chi^2 = 13.83$ ,  $P < 0.001$ ) (Fleischmann et al., 2008).

**Active follow-up contact approaches** intended to prevent reattempts among patients that have been hospitalized and subsequently discharged for suicide attempts have been found in a meta-analysis conducted by Inagaki et al. (2015) to reduce reattempts by approximately 17% for up to 12 months post-discharge, however, the long-term effects of these approaches on reattempts has not yet been demonstrated. Also, because the number of trials and associated sample sizes included in this meta-analysis were small, it was not possible to determine the effect of active contact and follow-up approaches on death by suicide. In a randomized controlled trial of postcrisis suicide prevention long-term follow-up contact approach, Motto and Bostrom (2001) found that patients who refused ongoing care but who were randomized to be contacted by letter four times per year had a lower rate of suicide over two years of follow-up than did patients in the control group who received no further contact. Other studies have also shown post-crisis letters and coping cards to be protective against suicide ideation and attempts (Hassanian-Moghaddam, Sarjani, Kolahi, & Carter, 2011; Wang et al., 2016).

- **Postvention.** In a study by Visser, Comans, and Scuffham (2014), *StandBy* clients were significantly less likely to be at high risk for suicidality than a suicide bereaved comparison group who had not had contact with the *StandBy* program (48% and 64% respectively,  $p = 0.005$ ). Additionally, research suggests that active postvention approaches in which outreach to

suicide survivors occurs at the scene of a suicide is associated with intake into treatment sooner, greater attendance at support group meetings, and attendance at more meetings compared to passive postvention (versus passive approaches where survivors self-refer for services) (J. Cerel & Campbell, 2008).

**Safe messaging following a suicide.** The most compelling evidence supporting the effect of *media guidelines* on reduction in suicides comes from Austria. After a sharp increase in suicides on the Viennese subway, media guidelines were introduced and an interrupted time series design was used to evaluate the national impact of the guidelines on subsequent suicides. Changes in the quality and quantity of media reporting resulted in a reduction of 81 suicides annually (95% confidence interval: -149 to -13;  $t = -2.32$ ,  $df = 54$ ,  $p < 0.024$ ) in the Viennese subway system (Niederkrötenenthaler & Sonneck, 2007)



## Sector Involvement

Public health can play an important and unique role in addressing suicide. Public health agencies, which typically place prevention at the forefront of efforts and work to create broad population-level impact, can bring critical leadership and resources to bear on this problem. For example, these agencies can serve as a convener, bringing together partners and stakeholders to plan, prioritize, and coordinate suicide prevention efforts. Public health agencies are also well positioned to collect and disseminate data, implement preventive measures, evaluate programs, and track progress. Although public health can play a leadership role in preventing suicide, the strategies and approaches outlined in this technical package cannot be accomplished by the public health sector alone.

Other sectors vital to implementing this package include, but are not limited to, education, government (local, state, and federal), social services, health services, business/labor, justice, housing, media, and organizations that comprise the civil society sector such as faith-based organizations, youth-serving organizations, foundations, and other non-governmental organizations. Collectively, these sectors can make a difference in preventing suicide by impacting the various contexts and underlying risks that contribute to suicide.

The strategies and approaches described in this technical package are summarized in Appendix A along with the relevant sectors that are well positioned to lead implementation efforts.

[I can write the text specific to the strategies and approaches. I've done this for the other TPs and am happy to do the same here. This is the section where we distinguish the strategies where public health is best positioned to lead from those where leadership is necessary from other sectors and how public health can assist, etc.]

Regardless of strategy, action by many sectors will be necessary for the successful implementation of this package. In this regard, all sectors can play an important and influential role in creating safe and protective environments where individuals who are at high risk of suicide can easily access the mental healthcare and services they need.



## Monitoring and Evaluation

Monitoring and evaluation are necessary components of the public health approach to prevention. It is important to have timely and reliable data to monitor the extent of the problem and to evaluate the impact of prevention efforts. Data are necessary for program implementation; planning, implementation, and assessment all rely on accurate measurement of the problem.

Surveillance data helps researchers and practitioners track changes in the burden of suicide. Surveillance systems exist at the federal, state, and local levels. It is important to assess the availability of surveillance data and data systems across these levels to identify and address gaps in the systems. CDC's National Vital Statistics System and the National Violent Death Reporting System (NVDRS) are examples of surveillance systems that provide data on deaths from suicide. NVDRS, for example, is a state-based surveillance system that combines data from death certificates, law enforcement reports, and coroner or medical examiner reports to provide detailed information on the circumstances of violent deaths, including suicide, which can assist communities in guiding prevention approaches (Blair, Fowler, Jack, & Crosby, 2016). The National Electronic Injury Surveillance System-All Injury Program (NEISS-AIP) provides nationally representative data about all types and causes of nonfatal injuries treated in U.S. hospital emergency departments, and can be used to assess national rates of, and trends in, self-harm injuries by cause (e.g., falls, poisoning, etc.), age, race/ethnicity, sex, disposition (where the injured person goes when released from the Emergency Department (<http://www.cdc.gov/injury/wisqars/nonfatal.html>)).

In addition to information on deaths and nonfatal injuries, there are also surveillance systems that provide national, state, and some local estimates of suicidal behavior. The Youth Risk Behavior Surveillance System (YRBSS) collects information from a nationally representative sample of 9-12 grade students and is a key resource in monitoring health-risk behaviors among youth, including whether youth have seriously considered attempting suicide, attempted suicide, made a plan, or required treatment by a doctor or nurse for a suicide attempt that resulted in an injury, poisoning, or overdose (Brener et al., 2013). The YRBSS data are obtained from a national school-based survey conducted by CDC as well as school-based state, territorial, tribal, and large urban school district survey conducted by education and health agencies. The National Survey on Drug Use and Health (NSDUH) is an annual nationwide survey of individuals aged 12 years and older that provides national and state-level estimates of drug use and mental health-related issues, including suicide ideation and suicide attempts (<https://nsduhweb.rti.org/respweb/homepage.cfm>).

It is also important at all levels (local, state, and federal) to address gaps in responses, track progress of prevention efforts and evaluate the impact of those efforts, including the impact of this technical package. Evaluation data, produced through program implementation and monitoring, is essential to provide information on what does and does not work to reduce rates of suicide and its associated risk



and protective factors. Theories of change and logic models that identify short, intermediate, and long-term outcomes are an important part of program evaluation.

The evidence-base for suicide prevention has advanced greatly over the last few decades. However, additional research is needed to understand the impact of prevention programs on preventing suicide, as opposed to merely examining the effectiveness of programs to impact risk factors associated with suicide. More research is also needed to examine the effectiveness of upstream and community-level strategies to prevent suicide at the population level. Lastly, it will be important for researchers to test the effectiveness of combinations of the strategies and approaches included in this package. Most existing evaluations focus on approaches implemented in isolation. However, there is potential to understand the synergistic effects within a comprehensive prevention approach. Additional research is needed to understand the extent to which combinations of strategies and approaches result in greater reductions in suicide than individual programs, practices, or policies.

## Conclusion

## References

(See last 7 pages after Appendix—EndNote put them there because it thought the Appendix/table was part of the regular text; Didn't want to cut and paste table for fear it'd get de-formatted)



## Appendix A: Summary of Strategies and Approaches to Prevent Suicide

Strategy	Approach/Program, Practice or Policy	Best Available Evidence			Lead Sectors <sup>1</sup>
		Suicide	Suicide Attempts or Ideation	Other Risk/Protective Factors for Suicide	
Strengthen economic supports	Strengthen financial security				
	Unemployment benefit programs	X			Government (local, state, Federal)
	Housing stabilization policies				
	The National Neighborhood Stabilization Program			X	Government (local, state, Federal)
Strengthen access to mental health care	Coverage of mental health conditions in health insurance policies				
	Mental Health Parity Laws	X		X	Healthcare  Government (local, state, Federal)
Establish protective environments	Means restriction				
	Intervening at hot spots	X			Government (local, state, Federal)
	Safe storage practices		X (attempts)	X (Safe storage of firearms and medication)	Government (local, state, Federal)
	Organizational policies and culture				

**Comment [A]:** I'll help you complete the lead sector column. For the other columns, you just need to insert a check-mark based on the evidence you describe in the narrative for a particular program or policy. For example, if the evidence shows impact on suicide, then put a check-mark in that column. If the study also found effects on risk or protective factors, then put a check-mark in that column as well.

		Best Available Evidence			
	<i>Together for Life</i>	X			Business/Labor
	<i>US Air Force Suicide Prevention Program</i>	X		X (family violence)	Government (local, state, Federal)  Business/Labor
	Community-based policies to reduce excessive alcohol use				
	<i>Alcohol outlet density</i>	X		X	Government (local, state, Federal)
Promote connectedness to protect against suicide	Peer norm approaches				
	<i>Sources of Strength</i>			X	Public Health Social Services
	Community-engagement activities				
	<i>Greening vacant urban spaces</i>			X	Public Health
Teach coping and problem-solving skills	Social emotional learning				
	<i>Youth Aware of Mental Health Program</i>		X		Public Health Social Services
	<i>Signs of Suicide</i>		X	X	
	<i>Good Behavior Game</i>		X	X	
	Parenting skill and family relationship approaches				
	<i>The Incredible Years</i>			X	Public Health Social Services



		Best Available Evidence			
	Strengthening Families 10-14			X	
Identify and support people at-risk	Gatekeeper training				
	Mental Health First Aid			X	Public Health Healthcare Social Services
	Screening combined with care management				
	Henry Ford Perfect Depression Care (Pre-cursor to Zero Suicide)	X		X	Healthcare
	Crisis Intervention				
	National Suicide Prevention Lifeline		X	X	Public Health Social Services
	Applied Suicide Intervention Skills Training		X	X	
Intervene to lessen harms and prevent future risk	Treatment for people at risk of suicide				
	Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)		X	X	Healthcare Social Services
	Collaborative Assessment and Management of Suicidality (CAMS)		X	X	
	Dialectical Behavioral Therapy		X	X	
	Attachment-Based Family Therapy		X		
	Treatment to prevent re-attempts				

		Best Available Evidence			
	<i>ED Brief Intervention with Follow-up Visits</i>	X			Healthcare
	<i>Active follow-up contact approaches</i>	X	X		
	<i>CBT for Suicide Prevention</i>				
	Postvention				
	<i>StandBy Response Service</i>		X		Healthcare
	Safe messaging following a suicide				
	<i>Media Guidelines</i>	X			Public Health

<sup>1</sup>This column refers to the lead sectors well positioned to bring leadership and resources to implementation efforts. For each strategy, there are many other sectors such as non-governmental organizations that are instrumental to prevention planning and implementing the specific programmatic activities.



## REFERENCES

- Arsenault-Lapierre, G., Kim, C., & Turecki, G. (2004). Psychiatric diagnoses in 3275 suicides: a meta-analysis. *BMC Psychiatry*, 4, 37. doi:10.1186/1471-244X-4-37
- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*: Prentice-Hall, Inc.
- Basile, K. C., Espelage, D. L., Rivers, I., McMahon, P. M., & Simon, T. R. (2009). The theoretical and empirical links between bullying behavior and male sexual violence perpetration. *Aggression and violent behavior*, 14(5), 336-347.
- Basile, K. C., Hamburger, M. E., Swahn, M. H., & Choi, C. (2013). Sexual violence perpetration by adolescents in dating versus same-sex peer relationships: differences in associated risk and protective factors. *Western Journal of Emergency Medicine*, 14(4), 329.
- Beautrais, A. L. (2001). Effectiveness of barriers at suicide jumping sites: A case study. *Aust NZ J Psychiat*, 35. doi:10.1080/0004867010060501
- Beautrais, A. L., Gibb, S. J., Fergusson, D. M., Horwood, L. J., & Larkin, G. L. (2009). Removing bridge barriers stimulates suicides: An unfortunate natural experiment. *Aust NZ J Psychiat*, 43. doi:10.1080/00048670902873714
- Beyer, K. M., Layde, P. M., Hamberger, L. K., & Laud, P. W. (2015). Does neighborhood environment differentiate intimate partner femicides from other femicides? *Violence Against Women*, 21(1), 49-64. doi:10.1177/1077801214564075
- Blair, J. M., Fowler, K. A., Jack, S. P., & Crosby, A. E. (2016). The National Violent Death Reporting System: overview and future directions. *Inj Prev*, 22 Suppl 1, i6-i11. doi:10.1136/injuryprev-2015-041819
- Borowsky, I. W., Hogan, M., & Ireland, M. (1997). Adolescent sexual aggression: risk and protective factors. *Pediatrics*, 100(6), E7.
- Branas, C. C., Cheney, R. A., MacDonald, J. M., Tam, V. W., Jackson, T. D., & Ten Have, T. R. (2011). A difference-in-differences analysis of health, safety, and greening vacant urban space. *Am J Epidemiol*, 174(11), 1296-1306. doi:10.1093/aje/kwr273
- Butchart, A., Phinney, A., Check, P., & Villaveces, A. (2004). *Preventing Violence: A Guide to Implementing the Recommendations of the World Report on Violence and Health*. Geneva, Switzerland: World Health Organization.
- Capaldi, D. M., Knoble, N. B., Shortt, J. W., & Kim, H. K. (2012). A Systematic Review of Risk Factors for Intimate Partner Violence. *Partner Abuse*, 3(2), 231-280. doi:10.1891/1946-6560.3.2.231
- Carter, M., McGee, R., Taylor, B., & Williams, S. (2007). Health outcomes in adolescence: associations with family, friends and school engagement. *J Adolesc*, 30(1), 51-62. doi:10.1016/j.adolescence.2005.04.002
- Cavanagh, J. T., Carson, A. J., Sharpe, M., & Lawrie, S. M. (2003). Psychological autopsy studies of suicide: a systematic review. *Psychol Med*, 33(3), 395-405.
- Centers for Disease Control and Prevention. (2009). Strategic direction for the prevention of suicidal behavior: Promoting individual, family, and community connectedness to prevent suicidal behavior. Retrieved from Available at: [http://www.cdc.gov/ViolencePrevention/pdf/Suicide\\_Strategic\\_Direction\\_Full\\_version-a.pdf](http://www.cdc.gov/ViolencePrevention/pdf/Suicide_Strategic_Direction_Full_version-a.pdf)
- Centers for Disease Control and Prevention. (2016a). Child Maltreatment: Risk and Protective Factors. Retrieved from Available at: <http://www.cdc.gov/violenceprevention/childmaltreatment/riskprotectivefactors.html>
- Centers for Disease Control and Prevention. (2016b). Elder Maltreatment: Risk and Protective Factors. Retrieved from Available at: <http://www.cdc.gov/ViolencePrevention/eldermaltreatment/riskprotectivefactors.html>.
- Centers for Disease Control and Prevention. (2016c). Sexual Violence: Risk and Protective Factors. Retrieved from Available at: <http://www.cdc.gov/ViolencePrevention/sexualviolence/riskprotectivefactors.html>

- Centers for Disease Control and Prevention. (2016d). Web-Based Injury Statistics Query and Reporting System (WISQARS). Retrieved June 3, 2016 Available at: <http://www.cdc.gov/injury/wisqars/index.html>
- Centers for Disease Control and Prevention. (2016e). Youth Violence: Risk and Protective Factors. Retrieved from Available at: <http://www.cdc.gov/violenceprevention/youthviolence/riskprotectivefactors.html>
- Cerel, J., & Campbell, F. R. (2008). Suicide survivors seeking mental health services: a preliminary examination of the role of an active postvention model. *Suicide Life Threat Behav*, 38(1), 30-34. doi:10.1521/suli.2008.38.1.30
- Cerel, J., McIntosh, J. L., Neimeyer, R. A., Maple, M., & Marshall, D. (2014). The Continuum of "Survivorship": Definitional Issues in the Aftermath of Suicide. *Suicide and life-threatening behavior*, 44(6), 591-600. doi:10.1111/sltb.12093
- Chapman, A. L., & Dixon-Gordon, K. L. (2007). Emotional antecedents and consequences of deliberate self-harm and suicide attempts. *Suicide Life Threat Behav*, 37(5), 543-552. doi:10.1521/suli.2007.37.5.543
- Cherpitel, C. J., Borges, G. L. G., & Wilcox, H. C. (2004). Acute alcohol use and suicidal behavior: A review of the literature. *Alcoholism: Clinical and Experimental Research*, 28(5 SUPPL.), 18S-28S.
- Classen, T. J., & Dunn, R. A. (2012). The effect of job loss and unemployment duration on suicide risk in the United States: a new look using mass-layoffs and unemployment duration. *Health Econ*, 21(3), 338-350. doi:10.1002/hecl.1719
- Coffey, C. E. (2006). Pursuing perfect depression care. *Psychiatr Serv*, 57(10), 1524-1526. doi:10.1176/ps.2006.57.10.1524
- Coffey, C. E., Coffey, M. J., & Ahmedani, B. K. (2013). An update on perfect depression care. *Psychiatr Serv*, 64(4), 396. doi:10.1176/appi.PS.640422
- Coffey, M., Coffey, C., & Ahmedani, B. K. (2015). Suicide in a health maintenance organization population. *JAMA Psychiatry*, 72(3), 294-296. doi:10.1001/jamapsychiatry.2014.2440
- Comtois, K. A., Jobes, D. A., S. O'Connor, S., Atkins, D. C., Janis, K., E. Chessen, C., . . . Yuodelis-Flores, C. (2011). Collaborative assessment and management of suicidality (CAMS): feasibility trial for next-day appointment services. *Depress Anxiety*, 28(11), 963-972. doi:10.1002/da.20895
- Coulton, C. J., Crampton, D. S., Irwin, M., Spilsbury, J. C., & Korbin, J. E. (2007). How neighborhoods influence child maltreatment: a review of the literature and alternative pathways. *Child Abuse Negl*, 31(11-12), 1117-1142. doi:10.1016/j.chiabu.2007.03.023
- Cox, G. R., Owens, C., Robinson, J., Nicholas, A., Lockley, A., Williamson, M., . . . Pirkis, J. (2013). Interventions to reduce suicides at suicide hotspots: a systematic review. *BMC Public Health*, 13(1), 1-12. doi:10.1186/1471-2458-13-214
- Crosby, A. E., Han, B., Ortega, L., Parks, S. E., & Gfroerer, J. (2011). Suicidal Thoughts and Behaviors Among Adults Aged ≥18 Years — United States, 2008–2009. *MMWR*, 60(No. SS-13), 1-22.
- Crosby, A. E., Ortega, L., & Melanson, C. (2011). *Self-directed Violence Surveillance: Uniform Definitions and Recommended Data Elements, Version 1.0*. Retrieved from Atlanta, GA:
- Crosby, A. E., & Sacks, J. J. (2002). Exposure to suicide: incidence and association with suicidal ideation and behavior: United States, 1994. *Suicide Life Threat Behav*, 32(3), 321-328.
- Curtin, S. C., Warner, M., & Hedegaard, H. (2016). *Increase in suicide in the United States, 1999-2014*. ( ). Hyattsville, MD: National Center for Health Statistics Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/25116188>.
- Cylus, J., Glymour, M. M., & Avendano, M. (2014). Do generous unemployment benefit programs reduce suicide rates? A state fixed-effect analysis covering 1968-2008. *Am J Epidemiol*, 180(1), 45-52. doi:10.1093/aje/kwu106
- Dahlber, L. L., & Krug, E. G. (2002). Violence-a global public health problem. In E. Krug, L. L. Dahlberg, J. A. Mercy, A. B. Zwi, & R. Lozano (Eds.), *World Report on Violence and Health* (pp. 1-56). Geneva, Switzerland: World Health Organization.



- DeGue, S., Massetti, G. M., Holt, M. K., Tharp, A. T., Valle, L. A., Matjasko, J. L., & Lippy, C. (2013). Identifying links between sexual violence and youth violence perpetration: New opportunities for sexual violence prevention. *Psychology of violence*, 3(2), 140.
- Deisenhammer, E. A., Ing, C. M., Strauss, R., Kemmler, G., Hinterhuber, H., & Weiss, E. M. (2009). The duration of the suicidal process: how much time is left for intervention between consideration and accomplishment of a suicide attempt? *J Clin Psychiatry*, 70(1), 19-24.
- Desai, R. A., Dausey, D. J., & Rosenheck, R. A. (2005). Mental health service delivery and suicide risk: the role of individual patient and facility factors. *Am J Psychiatry*, 162(2), 311-318. doi:10.1176/appi.ajp.162.2.311
- Diamond, G. S., Wintersteen, M. B., Brown, G. K., Diamond, G. M., Gallop, R., Shelef, K., & Levy, S. (2010). Attachment-based family therapy for adolescents with suicidal ideation: a randomized controlled trial. *J Am Acad Child Adolesc Psychiatry*, 49(2), 122-131.
- Dunne, E. J., McIntosh, J. L., & Dunne-Maxim, K. (Eds.). (1987). *Suicide and its aftermath: Understanding and counseling the survivors*. New York: Norton.
- Durkheim, E. (1951). Suicide: A study in sociology (JA Spaulding & G. Simpson, trans.). *Glencoe, IL: Free Press. (Original work published 1897)*.
- Elgar, F. J., Craig, W., Boyce, W., Morgan, A., & Vella-Zarb, R. (2009). Income inequality and school bullying: multilevel study of adolescents in 37 countries. *J Adolesc Health*, 45(4), 351-359. doi:10.1016/j.jadohealth.2009.04.004
- Escobedo, L. G., & Ortiz, M. (2002). The relationship between liquor outlet density and injury and violence in New Mexico. *Accid Anal Prev*, 34(5), 689-694.
- Etzersdorfer, E., & Sonneck, G. (1998). Preventing suicide by influencing mass-media reporting: The Viennese experience, 1980-1996. *Arch Suicide Res*, 4.
- Ferdon, C., Crosby, A. E., Caine, E. D., Hindman J., Reed, G. A., & Iskander, J. (In press). CDC Public Health Grand Rounds: Preventing Suicide through a Comprehensive Public Health Approach. *MMWR*.
- Fleischmann, A., Bertolote, J. M., Wasserman, D., De Leo, D., Bolhari, J., Botega, N. J., . . . Thanh, H. T. (2008). Effectiveness of brief intervention and contact for suicide attempters: a randomized controlled trial in five countries. *Bulletin of the World Health Organization*, 86(9), 703-709. doi:S0042-96862008000900014 [pii]
- Fowler, K. A., Gladden, R. M., Vagi, K. J., Barnes, J., & Frazier, L. (2015). Increase in suicides associated with home eviction and foreclosure during the US housing crisis: findings from 16 National Violent Death Reporting System States, 2005-2010. *Am J Public Health*, 105(2), 311-316. doi:10.2105/AJPH.2014.301945
- Freisthler, B., Merritt, D. H., & LaScala, E. A. (2006). Understanding the ecology of child maltreatment: a review of the literature and directions for future research. *Child Maltreat*, 11(3), 263-280. doi:10.1177/1077559506289524
- Frieden, T. R. (2010). A framework for public health action: the health impact pyramid. *Am J Public Health*, 100(4), 590-595. doi:10.2105/AJPH.2009.185652
- Frieden, T. R. (2014). Six components necessary for effective public health program implementation. *Am J Public Health*, 104(1), 17-22. doi:10.2105/AJPH.2013.301608
- Ghahramanlou-Holloway, M., Bhar, S., Brown, G., Olsen, C., & Beck, A. T. (2012). Changes in problem-solving appraisal after cognitive therapy for the prevention of suicide. *Psychological Medicine*, 42(06), 1185-1193.
- Giesbrecht, N., Huguette, N., Ogden, L., Kaplan, M. S., McFarland, B. H., Caetano, R., . . . Nolte, K. B. (2015). Acute alcohol use among suicide decedents in 14 US states: impacts of off-premise and on-premise alcohol outlet density. *Addiction*, 110(2), 300-307. doi:10.1111/add.12762
- Goldsmith, S. K., Pellmar, T. C., Kleinman, A. M., & Bunney, W. E. (2002). *Reducing suicide: A national imperative*: National Academies Press.

- Gould, M. S., Cross, W., Pisani, A. R., Munfakh, J. L., & Kleinman, M. (2013). Impact of Applied Suicide Intervention Skills Training on the National Suicide Prevention Lifeline. *Suicide Life Threat Behav*, 43(6), 676-691. doi:10.1111/sltb.12049
- Gould, M. S., Kalafat, J., Harrismunfakh, J. L., & Kleinman, M. (2007). An evaluation of crisis hotline outcomes. Part 2: Suicidal callers. *Suicide Life Threat Behav*, 37(3), 338-352. doi:10.1521/suli.2007.37.3.338
- Grossman, D. C., Mueller, B. A., Riedy, C., Dowd, M. D., Villaveces, A., Prodzinski, J., . . . Harruff, R. (2005). Gun storage practices and risk of youth suicide and unintentional firearm injuries. *JAMA*, 293(6), 707-714. doi:10.1001/jama.293.6.707
- Haddon, W. (1980). Advances in the epidemiology of injuries as a basis for public policy. *Public Health Reports*, 95(5), 411-421.
- Harris, K. M., Carpenter, C., & Bao, Y. (2006). The effects of state parity laws on the use of mental health care. *Med Care*, 44(6), 499-505. doi:10.1097/01.mlr.0000215813.16211.00
- Hassanian-Moghaddam, H., Sarjami, S., Kolahi, A. A., & Carter, G. L. (2011). Postcards in Persia: randomised controlled trial to reduce suicidal behaviours 12 months after hospital-treated self-poisoning. *British Journal of Psychiatry*, 198(4), 309-316.
- Hawton, K. (2007). Restricting access to methods of suicide: Rationale and evaluation of this approach to suicide prevention. *Crisis*, 28. doi:10.1027/0227-5910.28.s1.4
- Heise, L., & Garcia-Moreno, C. (2002). Violence by Intimate Partners. In E. Krug, L. L. Dahlberg, J. A. Mercy, A. B. Zwi, & R. Lozano (Eds.), *World Report on Violence and Health* (pp. 87-121). Geneva, Switzerland: World Health Organization.
- Herman, K. C., Borden, L. A., Reinke, W. M., & Webster-Stratton, C. (2011). The Impact of the Incredible Years Parent, Child, and Teacher Training Programs on Children's Co-Occurring Internalizing Symptoms. *Sch Psychol Q*, 26(3), 189-201. doi:10.1037/a0025228
- Hong, J. S., Kral, M. J., Espelage, D. L., & Allen-Meares, P. (2012). The social ecology of adolescent-initiated parent abuse: a review of the literature. *Child Psychiatry Hum Dev*, 43(3), 431-454. doi:10.1007/s10578-011-0273-y
- Houle, J. N., & Light, M. T. (2014). The home foreclosure crisis and rising suicide rates, 2005 to 2010. *Am J Public Health*, 104(6), 1073-1079. doi:10.2105/AJPH.2013.301774
- Hunkeler, E. M., Katon, W., Tang, L., Williams, J. W., Jr., Kroenke, K., Lin, E. H., . . . Unutzer, J. (2006). Long term outcomes from the IMPACT randomised trial for depressed elderly patients in primary care. *BMJ*, 332(7536), 259-263. doi:10.1136/bmj.38683.710255.BE
- Inagaki, M., Kawashima, Y., Kawanishi, C., Yonemoto, N., Sugimoto, T., Furuno, T., . . . Yamada, M. (2015). Interventions to prevent repeat suicidal behavior in patients admitted to an emergency department for a suicide attempt: a meta-analysis. *J Affect Disord*, 175, 66-78. doi:10.1016/j.jad.2014.12.048
- Jobes, D. A. (2012). The Collaborative Assessment and Management of Suicidality (CAMS): an evolving evidence-based clinical approach to suicidal risk. *Suicide Life Threat Behav*, 42(6), 640-653. doi:10.1111/j.1943-278X.2012.00119.x
- Johnson, F. W., Gruenewald, P. J., & Remer, L. G. (2009). Suicide and alcohol: do outlets play a role? *Alcohol Clin Exp Res*, 33(12), 2124-2133. doi:10.1111/j.1530-0277.2009.01052.x
- Kellam, S. G., Brown, C. H., Poduska, J. M., Ialongo, N. S., Wang, W., Toyinbo, P., . . . Wilcox, H. C. (2008). Effects of a universal classroom behavior management program in first and second grades on young adult behavioral, psychiatric, and social outcomes. *Drug Alcohol Depend*, 95 Suppl 1, S5-S28. doi:10.1016/j.drugalcdep.2008.01.004
- Kitchener, B. A., & Jorm, A. F. (2004). Mental health first aid training in a workplace setting: a randomized controlled trial [ISRCTN13249129]. *BMC Psychiatry*, 4, 23. doi:10.1186/1471-244X-4-23
- Kitchener, B. A., & Jorm, A. F. (2006). Mental health first aid training: review of evaluation studies. *Aust N Z J Psychiatry*, 40(1), 6-8. doi:10.1111/j.1440-1614.2006.01735.x



- Kleiman, E. M., Riskind, J. H., Schaefer, K. E., & Weingarden, H. (2012). The moderating role of social support on the relationship between impulsivity and suicide risk. *Crisis*, 33(5), 273-279. doi:10.1027/0227-5910/a000136
- Klevens, J., Simon, T. R., & Chen, J. (2012). Are the perpetrators of violence one and the same? Exploring the co-occurrence of perpetration of physical aggression in the United States. *J Interpers Violence*, 27(10), 1987-2002. doi:10.1177/0886260511431441
- Knox, K. L., Litts, D. A., Talcott, G. W., Feig, J. C., & Caine, E. D. (2003). Risk of suicide and related adverse outcomes after exposure to a suicide prevention programme in the US Air Force: cohort study. *BMJ*, 327(7428), 1376.
- Knox, K. L., Pflanz, S., Talcott, G. W., Campise, R. L., Lavigne, J. E., Bajorska, A., . . . Caine, E. D. (2010). The US Air Force suicide prevention program: implications for public health policy. *Am J Public Health*, 100(12), 2457-2463. doi:10.2105/ajph.2009.159871
- Knox, M. S., Burkhart, K., & Hunter, K. E. (2010). ACT against violence parents raising safe kids program: Effects on maltreatment-related parenting behaviors and beliefs. *Journal of Family Issues*.
- Lang, M. (2013). The impact of mental health insurance laws on state suicide rates. *Health Econ*, 22(1), 73-88. doi:10.1002/hec.1816
- Linehan, M. M., Comtois, K. A., Murray, A. M., Brown, M. Z., Gallop, R. J., Heard, H. L., . . . Lindenboim, N. (2006). Two-year randomized controlled trial and follow-up of dialectical behavior therapy vs therapy by experts for suicidal behaviors and borderline personality disorder. *Arch Gen Psychiatry*, 63(7), 757-766. doi:10.1001/archpsyc.63.7.757
- Losel, F., & Farrington, D. P. (2012). Direct protective and buffering protective factors in the development of youth violence. *Am J Prev Med*, 43(2 Suppl 1), S8-S23. doi:10.1016/j.amepre.2012.04.029
- Luo, F., Florence, C. S., Quispe-Agnoli, M., Ouyang, L., & Crosby, A. E. (2011). Impact of business cycles on US suicide rates, 1928-2007. *Am J Public Health*, 101(6), 1139-1146. doi:10.2105/ajph.2010.300010
- Maimon, D., Browning, C. R., & Brooks-Gunn, J. (2010). Collective efficacy, family attachment, and urban adolescent suicide attempts. *J Health Soc Behav*, 51(3), 307-324. doi:10.1177/0022146510377878
- Mishara, B. L. (Ed.) (1995). *The Impact of Suicide*. New York: Springer.
- Mishara, B. L., & Martin, N. (2012). Effects of a comprehensive police suicide prevention program. *Crisis: Journal of Crisis Intervention & Suicide*, 33(3), 162-168.
- Mitchell, A. M., Kim, Y., Prigerson, H. G., & Mortimer-Stephens, M. (2004). Complicated grief in survivors of suicide. *Crisis*, 25(1), 12-18. doi:10.1027/0227-5910.25.1.12
- Motto, J. A., & Bostrom, A. G. (2001). A randomized controlled trial of postcrisis suicide prevention. *Psychiatr Serv*, 52(6), 828-833.
- Muennig, P., Cohen, A. K., Palmer, A., & Zhu, W. (2013). The relationship between five different measures of structural social capital, medical examination outcomes, and mortality. *Soc Sci Med*, 85, 18-26. doi:10.1016/j.socscimed.2013.02.007
- National Action Alliance for Suicide Prevention. (2014). Research Prioritization Task Force.(2014). *A prioritized research agenda for suicide prevention: An action plan to save lives*.
- National Action Alliance for Suicide Prevention. (2016). Action Alliance Priorities. Retrieved from <http://actionallianceforsuicideprevention.org/priorities>
- National Action Alliance for Suicide Prevention: Suicide Attempt Survivors Task Force. (2014). *The Way Forward: Pathways to hope, recovery, and wellness with insights from lived experience*. Washington, D.C. : Author.
- National Action Alliance for Suicide Prevention: Survivors of Suicide Loss Task Force. (2015). *Responding to Grief, Trauma, and Distress After a Suicide: U.S. National Guidelines*. Washington, D.C. : Author.
- Niederkrotenthaler, T., & Sonneck, G. (2007). Assessing the impact of media guidelines for reporting on suicides in Austria: Interrupted time series analysis. *Aust N Z J Psychiatry*, 41. doi:10.1080/00048670701266680

- Olfson, M., Gerhard, T., Huang, C., Crystal, S., & Stroup, T. S. (2015). Premature Mortality Among Adults With Schizophrenia in the United States. *JAMA Psychiatry*, 72(12), 1172-1181. doi:10.1001/jamapsychiatry.2015.1737
- Owens, D. (2002). Fatal and non-fatal repetition of self-harm: Systematic review. *British Journal of Psychiatry*, 181(3), 193-199.
- Pena, J. B., & Caine, E. D. (2006). Screening as an approach for adolescent suicide prevention. *Suicide Life Threat Behav*, 36(6), 614-637. doi:10.1521/suli.2006.36.6.614
- Perron, S., Burrows, S., Fournier, M., Perron, P. A., & Ouellet, F. (2013). Installation of a bridge barrier as a suicide prevention strategy in Montreal, Quebec, Canada. *Am J Public Health*, 103(7), 1235-1239. doi:10.2105/ajph.2012.301089
- Pinchevsky, G. M., & Wright, E. M. (2012). The impact of neighborhoods on intimate partner violence and victimization. *Trauma Violence Abuse*, 13(2), 112-132. doi:10.1177/1524838012445641
- Pirkis, J., Too, L. S., Spittal, M. J., Krysinaka, K., Robinson, J., & Cheung, Y. T. D. (2015). Interventions to reduce suicides at suicide hotspots: a systematic review and meta-analysis. *The Lancet Psychiatry*, 2(11), 994-1001. doi:http://dx.doi.org/10.1016/S2215-0366(15)00266-7
- Pitman, A., Osborn, D., King, M., & Erlangsen, A. (2014). Effects of suicide bereavement on mental health and suicide risk. *Lancet Psychiatry*, 1, 86-94.
- Pollock, L. R., & Williams, J. M. (2004). Problem-solving in suicide attempters. *Psychol Med*, 34(1), 163-167.
- Reeves, A., Stuckler, D., McKee, M., Gunnell, D., Chang, S. S., & Basu, S. (2012). Increase in state suicide rates in the USA during economic recession. *Lancet*, 380(9856), 1813-1814. doi:10.1016/S0140-6736(12)61910-2
- Reid, M. J., Webster-Stratton, C., & Hammond, M. (2003). Follow-up of children who received the Incredible Years intervention for oppositional-defiant disorder: Maintenance and prediction of 2-year outcome. *Behavior Therapy*, 34(4), 471-491.
- Resnick, M. D., Ireland, M., & Borowsky, I. (2004). Youth violence perpetration: what protects? What predicts? Findings from the National Longitudinal Study of Adolescent Health. *J Adolesc Health*, 35(5), 424 e421-410. doi:10.1016/j.jadohealth.2004.01.011
- Rowhani-Rahbar, A., Simonetti, J. A., & Rivara, F. P. (2016). Effectiveness of Interventions to Promote Safe Firearm Storage. *Epidemiol Rev*, 38(1), 111-124. doi:10.1093/epirev/mxv006
- Runyan, C. W., Becker, A., Brandspigel, S., Barber, C., Trudeau, A., & Novins, D. (2016). Lethal Means Counseling for Parents of Youth Seeking Emergency Care for Suicidality. *West J Emerg Med*, 17(1), 8-14. doi:10.5811/westjem.2015.11.28590
- Runyan, D., Wattam, C., Ikeda, R., Hassan, F., & Ramiro, L. (2002). Child abuse and neglect by parents and other caregivers. In E. Krug, L. L. Dahlberg, J. A. Mercy, A. B. Zwi, & R. Lozano (Eds.), *World Report on Violence and Health* (pp. 59-86). Geneva, Switzerland: World Health Organization.
- Sampson, R. J., Morenoff, J. D., & Gannon-Rowley, T. (2002). Assessing "Neighborhood Effects": Social Processes and New Directions in Research. *Annual Review of Sociology*, 28, 443-478.
- Schilling, E. A., Aseltine, R. H., Jr., & James, A. (2016). The SOS Suicide Prevention Program: Further Evidence of Efficacy and Effectiveness. *Prev Sci*, 17(2), 157-166. doi:10.1007/s11121-015-0594-3
- Shepard, D. S., Gurewicz, D., Lwin, A. K., Reed, G. A., Jr., & Silverman, M. M. (2016). Suicide and Suicidal Attempts in the United States: Costs and Policy Implications. *Suicide Life Threat Behav*, 46(3), 352-362. doi:10.1111/sltb.12225
- Silverman, M. M., & Maris, R. W. (1995). The prevention of suicidal behaviors: An overview. *Suicide and life-threatening behavior*, 25(1), 10-21.
- Simon, O. R., Swann, A. C., Powell, K. E., Potter, L. B., Kresnow, M. J., & O'Carroll, P. W. (2001). Characteristics of impulsive suicide attempts and attempters. *Suicide Life Threat Behav*, 32(1 Suppl), 49-59.
- Spoth, R. L., Gyll, M., & Day, S. X. (2002). Universal family-focused interventions in alcohol-use disorder prevention: cost-effectiveness and cost-benefit analyses of two interventions. *J Stud Alcohol*, 63(2), 219-228.



- Sudak, H., Maxim, K., & Carpenter, M. (2008). Suicide and stigma: a review of the literature and personal reflections. *Acad Psychiatry*, 32(2), 136-142. doi:10.1176/appi.ap.32.2.136
- Szumilas, M., & Kutcher, S. (2011). Post-suicide intervention programs: a systematic review. *Can J Public Health*, 102(1), 18-29.
- Townsend, E., Hawton, K., Altman, D. G., Arensman, E., Gunnell, D., Hazell, P., . . . Van Heeringen, K. (2001). The efficacy of problem-solving treatments after deliberate self-harm: meta-analysis of randomized controlled trials with respect to depression, hopelessness and improvement in problems. *Psychological Medicine*, 31(6), 979-988.
- U.S. Office of the Surgeon General, & National Action Alliance for Suicide Prevention. (2012). *2012 National Strategy for Suicide Prevention: Goals and Objectives for Action*. Washington, D.C.: HHS.
- U.S. Public Health Service. (1999). *The Surgeon General's Call to Action to Prevent Suicide*. Washington, D.C.
- Unutzer, J., Tang, L., Oishi, S., Katon, W., Williams, J. W., Jr., Hunkeler, E., . . . Langston, C. (2006). Reducing suicidal ideation in depressed older primary care patients. *J Am Geriatr Soc*, 54(10), 1550-1556.
- Visser, V. S., Comans, T. A., & Scuffham, P. A. (2014). Evaluation Of The Effectiveness Of A Community-Based Crisis Intervention Program For People Bereaved By Suicide. *Journal of Community Psychology*, 42(1), 19-28. doi:10.1002/jcop.21586
- Wang, Y. C., Hsieh, L. Y., Wang, M. Y., Chou, C. H., Huang, M. W., & Ko, H. C. (2016). Coping Card Usage can Further Reduce Suicide Reattempt in Suicide Attempter Case Management Within 3-Month Intervention. *Suicide Life Threat Behav*, 46(1), 106-120. doi:10.1111/sltb.12177
- Wasserman, D., Hoven, C. W., Wasserman, C., Wall, M., Eisenberg, R., Hadlaczk, G., . . . Carli, V. (2014). School-based suicide prevention programmes: The SEYLE cluster-randomised, controlled trial. *The Lancet*, 385(9977), 1536-1544. doi:10.1016/S0140-6736(14)61213-7
- Webster-Stratton, C., & Hammond, M. (1997). Treating children with early-onset conduct problems: a comparison of child and parent training interventions. *J Consult Clin Psychol*, 65(1), 93-109.
- Webster-Stratton, C., Reid, M. J., & Hammond, M. (2001). Preventing conduct problems, promoting social competence: a parent and teacher training partnership in head start. *J Clin Child Psychol*, 30(3), 283-302. doi:10.1207/S15374424JCCP3003\_2
- Webster-Stratton, C. H., Reid, M. J., & Beauchaine, T. (2011). Combining parent and child training for young children with ADHD. *Journal of Clinical Child & Adolescent Psychology*, 40(2), 191-203.
- Webster-Stratton, C., Jamila Reid, M., & Stoolmiller, M. (2008). Preventing conduct problems and improving school readiness: evaluation of the incredible years teacher and child training programs in high-risk schools. *Journal of child psychology and psychiatry*, 49(5), 471-488.
- Widome, R., Sieving, R. E., Harpin, S. A., & Hearst, M. O. (2008). Measuring neighborhood connection and the association with violence in young adolescents. *J Adolesc Health*, 43(5), 482-489. doi:10.1016/j.jadohealth.2008.04.013
- Wilcox, H. C., Kellam, S. G., Brown, C. H., Poduska, J. M., Ialongo, N. S., Wang, W., & Anthony, J. C. (2008). The impact of two universal randomized first- and second-grade classroom interventions on young adult suicide ideation and attempts. *Drug Alcohol Depend*, 95 Suppl 1, S60-73.
- Wilson, W. J. (2011). *When work disappears: The world of the new urban poor*: Vintage.
- World Health Organization. (2014). *Suicide Prevention: A Global Imperative*. Geneva, Switzerland: WHO Press.
- Wyman, P. A., Brown, C. H., LoMurray, M., Schmeelk-Cone, K., Petrova, M., Yu, Q., . . . Wang, W. (2010). An outcome evaluation of the Sources of Strength suicide prevention program delivered by adolescent peer leaders in high schools. *Am J Public Health*, 100(9), 1653-1661. doi:
- Yip, P., Caine, E., Yousuf, S., Chang, S.-S., Wu, K., & Chen, Y.-Y. (2012). Means restriction for suicide prevention. *Lancet*, 379. doi:10.1016/s0140-6736(12)60521-2

Title...

## A Technical Package to Prevent Suicide

Prepared by:

**Comment [A]:** Need to come up with a title for the package and insert it where indicated.

**Comment [A]:** Insert the names of the TP group members who contributed to the development of the package – assume everyone has contributed in some way. You and Kristin should be listed first given all of your work on the package to date.

Division of Violence Prevention  
National Center for Injury Prevention and Control (NCIPC)  
Centers for Disease Control and Prevention

2016



**[Title]** is a publication of the National Center for Injury Prevention and Control of the Centers for Disease Control and Prevention.

Centers for Disease Control and Prevention  
Thomas R. Frieden, MD, MPH, Director

National Center for Injury Prevention and Control  
Debra E. Houry, MD, MPH, Director

Division of Violence Prevention  
James A. Mercy, PhD, Director

*Suggested Citation:* [authors] *A Technical Package to Prevent...* Atlanta, GA: National Center for Injury Prevention and Control, Centers for Disease Control and Prevention, 2016.

**Contents**

**Comment [A]:** Insert the table of contents; see other packages as example of how to structure this section



## External Reviewers

[to be inserted later]

## Acknowledgments

[to be inserted later]



## Overview

This technical package represents a select group of strategies based on the best available evidence to help communities and states sharpen their focus on prevention activities with the greatest potential to prevent suicide. These strategies include strengthening economic supports; strengthening access to mental health care; creating protective environments; promoting connectedness to protect against suicide; teaching coping and problem-solving skills; identifying and supporting people at-risk; and intervening to lessen harms and prevent future risk. The strategies represented in this package include those with a focus on preventing suicide from happening in the first place as well as approaches to lessen the immediate and long-term harms of suicidal behavior for individuals, families, communities, and society. The strategies in the technical package support the goals and objectives of the National Suicide Prevention Strategy and the National Action Alliance for Suicide Prevention's priority to strengthen community-based prevention. Commitment, cooperation, and leadership from numerous sectors, including public health, education, justice, health care, social services, business/labor, and government can bring about the successful implementation of this package.

### What is a Technical Package?

A technical package is a compilation of a core set of strategies to achieve and sustain substantial reductions in a specific risk factor or outcome (Frieden, 2014). Technical packages help communities and states prioritize prevention activities based on the best available evidence. This technical package has three components. The first component is the **strategy** or the preventive direction or actions to achieve the goal of preventing suicide. The second component is the **approach**. The approach includes the specific ways to advance the strategy. This can be accomplished through *programs, policies, and practices*. The approaches included come primarily from studies based in the United States. The **evidence** for each of the approaches in preventing suicide or its associated risk factors is included as the third component. This package is intended as a resource to guide and inform prevention decision-making in communities and states.

### Preventing Suicide is a Priority

Suicide, as defined by the Centers for Disease Control and Prevention (CDC), is part of a broader class of behavior called *self-directed violence*. Self-directed violence refers to behavior directed at oneself that deliberately results in injury or the *potential* for injury (Crosby, Ortega, & Melanson, 2011). Self-directed violence may be *suicidal* or *non-suicidal* in nature. For the purposes of this document, we refer only to behavior where suicide is intended:

- **Suicide** is a death caused by self-directed injurious behavior with any intent to die as a result of the behavior.



- **Suicide attempt** is defined as a *non-fatal* self-directed and potentially injurious behavior with any intent to die as a result of the behavior. A suicide attempt may or may not result in injury.

**Suicide is highly prevalent.** Suicide presents a major challenge to public health in the United States and worldwide. It contributes to premature death, morbidity, lost productivity, and health care costs (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014). In 2014 (the most recent year of available death data), suicide was responsible for 42,773 deaths in the U.S., which is approximately one suicide every 12 minutes (Centers for Disease Control and Prevention, 2016d). In 2014, suicide ranked as the 10th leading cause of death and has been among the top 12 leading causes of death since 1975 in the U.S (Centers for Disease Control and Prevention, 2016d). Overall suicide rates have increased 24% from 1999 to 2014 (Curtin, Warner, & Hedegaard, 2016). Suicide is a problem throughout the life span; it is the second leading cause of death among those aged 10–19 years, also second among persons in their 20s and 30s; it is the fourth leading cause among persons in their 40s and seventh among persons in their 50s (Centers for Disease Control and Prevention, 2016d).

Suicides reflect only a portion of the problem (Crosby, Han, Ortega, Parks, & Gfroerer, 2011). Substantially more people are hospitalized as a result of nonfatal suicidal behavior (i.e. suicide attempts) than are fatally injured, and an even greater number are either treated in ambulatory settings (e.g., emergency departments) or not treated at all (Crosby, Han, et al., 2011). For example, during 2014, among adults aged 18 years and older, for every one suicide there were 9 adults treated in hospital emergency departments for self-harm injuries, 27 who reported making a suicide attempt, and over 227 who reported seriously considering suicide (i.e. ideation) (Ferdon et al., In press).

**Suicide is associated with several risk and protective factors.** Suicide, like other human behaviors, is complex with no single determining cause. Instead, suicide occurs in response to multiple biological, psychological, interpersonal, environmental and societal influences that interact with one another, often over time. The social-ecological model is a useful framework for viewing and understanding suicide risk factors identified in the literature (Dahlberg & Krug, 2002):



Some risk Factors for suicide include (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014):



- **Individual:** History of depression and other mental illnesses, alcohol and drug abuse, previous suicide attempt, violence victimization, genetic and biological determinants, hopelessness
- **Relationship:** High conflict or violent relationships, sense of isolation and lack of social support, family/loved one's history of suicide, financial and work stress
- **Community:** Inadequate community connectedness, barriers to health care (e.g., lack of access to providers and medications)
- **Societal:** Availability of lethal means of suicide, unsafe media portrayals of suicide, stigma associated with help-seeking and mental illness

**Comment [A]:** Need to drop the figure and write the factors up in narrative form.

It is important to recognize that the vast majority of individuals who are depressed (or who have other risk factors) do *not* die by suicide. Furthermore, the relevance of each risk factor can vary by age, race, gender, sexual orientation, residential geography, and socio-cultural and economic status (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014)

Protective factors, or those influences that guard *against* the risk for suicide, can also be found across the different levels of the social-ecological model. Protective factors identified in the literature include: effective coping and problem solving skills, moral objections to suicide, strong and supportive relationships with partners, friends, and family; connectedness to school, community and other social institutions; availability of quality and ongoing physical and mental health care, and reduced access to lethal means (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014). These protective factors can either counter a specific risk factor or guard against a number of risks associated with suicide.

**Suicide is connected to other forms of violence.** Suicide and other forms of violence often share some of the same root causes (Butchart, Phinney, Check, & Villaveces, 2004; Kleven, Simon, & Chen, 2012). For example, in neighborhoods where there is low social cohesion, or where residents don't support and trust each other, people are at higher risk for suicide (Desai, Dausey, & Rosenheck, 2005) as well as perpetration of child maltreatment (Coulton, Crampton, Irwin, Spilsbury, & Korbin, 2007; Freisthler, Merritt, & LaScala, 2006), teen dating violence (Capaldi, Noble, Shortt, & Kim, 2012), intimate partner violence (Pinchevsky & Wright, 2012), and youth violence (Sampson, Morenoff, & Gannon-Rowley, 2002). Additionally, a lack of economic opportunities and unemployment are associated with suicide (Luo, Florence, Quispe-Agnoli, Ouyang, & Crosby, 2011; Reeves et al., 2012), as well as perpetration of child maltreatment (D. Runyan, Wattam, Ikeda, Hassan, & Ramiro, 2002), intimate partner violence (Heise & Garcia-Moreno, 2002; Pinchevsky & Wright, 2012), sexual violence (Centers for Disease Control and Prevention, 2016c) and youth violence (Wilson, 2011). Other shared risk factors for suicide and violence occur at the individual level and include substance abuse, mental health problems, witnessing violence, and a lack of problem-solving skills (Centers for Disease Control and Prevention, 2016a, 2016c, 2016e; U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012).

Just as risk factors may be shared across suicide and violence, so too may protective factors overlap. For example, connectedness increases individual's and communities' resilience to suicide and other forms of violence, including connectedness to one's community (Basile, Hamburger, Swahn, & Choi, 2013; Borowsky, Hogan, & Ireland, 1997; Centers for Disease Control and Prevention, 2016b; Coulton et al., 2007; Kleiman, Riskind, Schaefer, & Weingarden, 2012; Pinchevsky & Wright, 2012; Widome, Sieving, Harpin, & Hearst, 2008), school (Basile, Espelage, Rivers, McMahon, & Simon, 2009; Capaldi et al., 2012; Carter, McGee, Taylor, & Williams, 2007; DeGue et al., 2013; Hong, Kral, Espelage, & Allen-Meares, 2012; Losel & Farrington, 2012), family (Capaldi et al., 2012; Centers for Disease Control and Prevention, 2016a; Elgar, Craig, Boyce, Morgan, & Vella-Zarb, 2009; Maimon, Browning, & Brooks-Gunn, 2010; Resnick, Ireland, & Borowsky, 2004), caring adults (Capaldi et al., 2012; Losel & Farrington, 2012; Maimon et al., 2010), and pro-social peers (Capaldi et al., 2012; Losel & Farrington, 2012).

**The health and economic consequences of suicide are substantial.** Suicide and suicide attempts have far-reaching consequences for individuals, families, and communities (Dunne, McIntosh, & Dunne-Maxim, 1987; Mishara, 1995; National Action Alliance for Suicide Prevention: Suicide Attempt Survivors Task Force, 2014; National Action Alliance for Suicide Prevention: Survivors of Suicide Loss Task Force, 2015). By one conservative estimate, for every death by suicide six people are directly impacted (i.e. survivors). Based on this figure it is estimated that there are over 13 million survivors in the U.S. and unfortunately, survivorship itself is a risk factor for suicide (Crosby & Sacks, 2002). Research indicates that the health consequences of violence, including suicide, are also much more extensive than injury and death. Suicide attempt survivors (i.e. those with lived experience) may suffer long-term health and mental health consequences ranging from anger, guilt, and physical impairment, depending on the means and severity of the attempt (Chapman & Dixon-Gordon, 2007). Similarly, survivors of a loved one's suicide may experience ongoing pain and suffering including complicated grief (Mitchell, Kim, Prigerson, & Mortimer-Stephens, 2004), stigma, depression, anxiety, post-traumatic stress disorder, and increased risk of suicidal ideation and suicide (Julie Cerel, McIntosh, Neimeyer, Maple, & Marshall, 2014; Sudak, Maxim, & Carpenter, 2008).

The economic toll of suicide is immense as well. The total lifetime costs associated with nonfatal injuries and deaths caused by self-directed violence in 2013 were approximately \$93.5 billion after adjusting for under-reporting of suicide (Shepard, Gurewich, Lwin, Reed, & Silverman, 2016). The overwhelming burden of these costs results from lost productivity over the life course, with the average cost per suicide being over \$1.3 million (Shepard et al., 2016).

**Suicide can be prevented.** Despite the myths surrounding suicide, like most public health problems, suicide is preventable (U.S. Public Health Service, 1999). And while progress will continue to be made into the future, evidence for numerous programs, practices, and policies currently exists, and many programs are ready to be implemented now. Just as suicide is not caused by a single factor, research



suggests that suicide will not be prevented by any single intervention taking place in any single setting (Silverman & Maris, 1995; U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). Rather, suicide prevention is best achieved by a focus across the individual-, relationship-, family-, community, and societal-levels and across all sectors, private and public (e.g., business, public health, physical and behavioral healthcare, justice, education, labor) (National Action Alliance for Suicide Prevention, 2014; World Health Organization, 2014).

## Assessing the Evidence

This technical package includes programs, practices, and policies with evidence of impact on suicide or risk or protective factors for suicide. To be considered for inclusion in the technical package, the program, practice, or policy selected had to meet at least one of these criteria: a) meta-analyses or systematic reviews showing impact on suicide; b) evidence from at least one rigorous (e.g., randomized controlled trial [RCT] or quasi-experimental design) evaluation study that found significant preventive effects on suicide; c) meta-analyses or systematic reviews showing impact on risk or protective factors for suicide, or d) evidence from at least one rigorous (e.g., RCT or quasi-experimental design) evaluation study that found significant impacts on risk or protective factors for suicide. Finally, consideration was also given to the likelihood of achieving beneficial effects on multiple forms of violence; no evidence of harmful effects on specific outcomes or with particular subgroups; and feasibility of implementation in a U.S. context if the program, policy, or practice has been evaluated in another country.

Within this technical package, some approaches do not yet have research evidence demonstrating impact on rates of suicide but instead are supported by evidence indicating impacts on risk or protective factors for suicide (e.g., help-seeking, stigma reduction, depression, connectedness). In terms of the strength of the evidence, programs that have demonstrated effects on suicidal behavior (e.g., reductions in deaths, attempts) provide a higher-level of evidence, but the evidence base is not that strong in all areas. For instance, there has been less evaluation of community engagement and family programs on suicidal behavior. Thus, approaches in this package that have effects on risk or protective factors reflect the developmental nature of the evidence base and the use of the best available evidence at a given time.

It is also important to note that there is often significant heterogeneity among the programs, policies, or practices that fall within one approach or strategy area in terms of the nature and quality of the available evidence. Not all programs, policies, or practices that utilize the same approach (e.g., gatekeeper training) are equally effective, and even those that are effective may not work across all populations. Tailoring programs and more evaluation may be necessary to address different population groups. The examples provided are not intended to be a comprehensive list of evidence-based programs, policies, or practices for each approach, but rather illustrate models that have been shown to impact suicide or have beneficial effects on risk or protective factors for suicide. In practice, the effectiveness of the programs, policies and practices identified in this package will be strongly dependent on the quality of their



implementation and the communities in which they are implemented. Implementation guidance to assist practitioners, organizations and communities will be developed separately.

### Context and Cross-Cutting Themes

The strategies and approaches that have been included in this technical package represent different levels of the social ecology, with efforts intended to impact the community and societal levels, as well individual and relationship levels. The strategies and approaches are intended to work in combination and reinforce each other to prevent suicide (see box below). The strategies are arranged in order such that those strategies hypothesized to have the greatest potential for broad public health impact on suicide are included first, followed by those that might impact more select populations (e.g., persons who have already made a suicide attempt).

Preventing Suicide	
Strategy	Approach
Strengthen economic supports	<ul style="list-style-type: none"> <li>Strengthen household financial security</li> <li>Housing stabilization policies</li> </ul>
Strengthen access to mental health care	<ul style="list-style-type: none"> <li>Coverage of mental health conditions in health insurance policies</li> </ul>
Create protective environments	<ul style="list-style-type: none"> <li>Reducing access to lethal means among persons at-risk of suicide</li> <li>Organizational policies and culture</li> <li>Community-based policies to reduce excessive alcohol use</li> </ul>
Promote connectedness to protect against suicide	<ul style="list-style-type: none"> <li>Peer norm approaches</li> <li>Community engagement activities</li> </ul>
Teach coping and problem-solving skills	<ul style="list-style-type: none"> <li>Social-emotional learning</li> <li>Parenting skill and family relationship approaches</li> </ul>
Identify and support people at risk	<ul style="list-style-type: none"> <li>Gatekeeper training</li> <li>Screening combined with care management</li> <li>Crisis intervention</li> </ul>
Intervene to lessen harms and prevent future risk	<ul style="list-style-type: none"> <li>Treatment for people at-risk of suicide</li> <li>Treatment to prevent re-attempts</li> <li>Postvention</li> <li>Safe messaging following a suicide</li> </ul>

The example programs, policies, and practices have been implemented within particular contexts. The social and cultural context of communities is critically important to take into account when selecting strategies and approaches. Practitioners in the field may be in the best position to assess the needs and



strengths of their communities and work with community members to make decisions about the combination of approaches included here that are best suited to their context.

Suicide ideation, attempts, morbidity and mortality vary by gender, race/ethnicity, age, occupation, and other important population characteristics. Barriers to disclosure, help seeking, timely access to quality care, and ongoing support are profoundly complex and may also vary by population and community characteristics. Ideally, the availability of multiple approaches tailored to the economic, cultural, and environmental context of individuals and communities are desirable as they may increase the likelihood of removing barriers to supportive and effective care and provide opportunities to develop individual and community resilience. These culturally appropriate approaches can then be included in comprehensive strategies to maximize the public health impact on reducing suicide-related morbidity and mortality among individuals and within communities.

This package includes strategies where public health agencies are well positioned to bring leadership and resources to implementation efforts. It also includes strategies where public health can serve as an important collaborator (e.g., strategies addressing community and societal level risks), but where leadership and commitment from other sectors such as business/labor or health care is critical to implement a particular policy or program (e.g., workplace policies; screening combined with care management). The role of various sectors in the implementation of a strategy or approach in preventing suicide is described further in the section on *Sector Involvement*.

In the sections that follow, the strategies and approaches with the best available evidence for preventing suicide are described.

## Strengthen Economic Supports

### Rationale

Public health research suggests that some of the biggest impacts on health come from policies developed to improve socioeconomic conditions (Frieden, 2010). Downturns in the economy and increases in unemployment and home foreclosures are associated with increased rates of suicide (Fowler, Gladden, Vagi, Barnes, & Frazier, 2015; Luo et al., 2011). Policies that strengthen economic supports can help people stay in their homes, pay for necessities such as food and medical care, and get job training, among other things. In providing this support, stress and anxiety and the potential for a crisis situation may be reduced, thereby preventing suicide.

### Approaches

Economic and housing supports for individuals and families can be strengthened by improving policies that enhance financial security and stabilize housing for people, especially in times of economic need.

- **Strengthen household financial security.** Studies from the U.S. indicate that suicide rates increase during economic recessions marked by high unemployment rates, job losses, and economic instability and decrease during economic expansions and periods marked by low unemployment rates, particularly for working-age individuals 25 to 64 years old (Luo et al., 2011; Fowler et al., 2015).

### Potential Outcomes

- Reduced suicide rates
- Lower foreclosure rates
- Lower eviction rates
- Reduced emotional distress

### Evidence

There is evidence suggesting that strengthening household financial security and stabilizing housing can reduce suicide risk.

- **Strengthen household financial security.** An examination of variations in U.S. *unemployment benefit programs* across states demonstrated that the impact of unemployment on suicide was offset in those states that provided greater than average unemployment benefits (Cylus, Glymour, & Avendano, 2014). Another U.S. study examining the link between unemployment and suicide risk using monthly suicide data, length of unemployment, and job losses found that the duration of unemployment, as opposed to just the loss of job, predicted suicide risk (Classen & Dunn, 2012). Together, these results suggest that not only should state unemployment benefit programs be generous in their financial allocations, but also in their duration. Other measures to

**Comment [A]:** The rationale should focus on the strategy – strengthening economic supports – and how and why that might be beneficial in reducing suicide. As part of the rationale you can talk about how suicide relates to economic factors (e.g., historical data shows that suicide rates rise during periods of economic recessions and decreases during periods of economic expansion); how economic stressors (job loss, long periods of unemployment, reduced income, difficulty covering medical, food, housing expenses, etc.) increase risk for suicide and how buffering these risks can potentially protect against suicide. You cover this a

**Comment [A]:** Statement should be more along the lines of:

“There are a number of approaches that can help strengthen economic supports and buffer against the risk for suicide.”

Or

“Economic supports for individuals and families can be strengthened by targeting household financial security and ensuring stability in housing during periods of economic stress.”

**Comment [A]:** This would be a good introductory sentence to the rationale. For the two approaches, suggest saying something along the following lines:

**Strengthening household financial security** can reduce the risk for suicide by providing individuals with the necessary means to cover basic expenses and lessen the stress and hardship associated with a job loss or other unanticipated financial problems. The provision of unemployment benefits, livable wages, Temporary Assistance to Needy Families (TANF), medical benefits, and retirement and disability insurance to help cover the costs of basic necessities or to offset costs



strengthen household financial security (e.g., transfer payments related to retirement and disability insurance, unemployment insurance compensation, medical benefits, and other forms of family assistance) have also shown an impact on suicide. A study by Flavin and Radcliff (2009) examined the impact of states' per capita spending on transfer payments, medical benefits, and family assistance and total state spending on suicide rates between 1990-2000, controlling for a number of suicide risk factors (e.g., residential mobility, divorce rate, unemployment rate) at the state level. As per capita spending on total transfer payments, medical benefits, and family assistance increased there was an associated decrease in state suicide rates. Moreover, it wasn't spending in general that was associated with the reduction but spending on these types of assistance. In terms of lives saved, Flavin & Radcliff calculated the cost of reducing a state's suicide rate by a full point for the years studied. At the national level, an estimated 3,000 fewer suicides would occur per year nationwide if every state increased their per capita spending on these types of assistance by \$45 per year (Flavin & Radcliff, 2009).

- **Housing stabilization policies.** The *National Neighborhood Stabilization Program* was designed to help neighborhoods suffering from high rates of foreclosure and abandonment by slowing the deterioration of the neighborhoods and providing affordable housing options for low, moderate, and middle-income homebuyers. This program also offers financial assistance to eligible individuals for the purchase of a new home. Although this program has not been rigorously evaluated for its impact on suicide outcomes, it addresses foreclosure and eviction, which are risk factors for suicide. A longitudinal analysis of annual data on suicides and foreclosures demonstrated that as the proportion of foreclosed properties increased in U.S. states, so did the state suicide rate, particularly among working-aged adults (Houle & Light, 2014). Another study of data from 16 U.S. states participating in the National Violent Death Reporting System found that suicides precipitated by home foreclosures and evictions increased more than 100% from 2005 (before the housing crisis began) to 2010 (after it had peaked; Fowler et al. 2015). Most of these suicides occurred prior to the actual loss of the decedent's home. These findings suggest that integrating suicide prevention resources, messaging, and referrals into financial, foreclosure, and move-out planning and counseling services may help to prevent suicide.



## Strengthen Access to Mental Health Care

### Rationale

While most people with mental health problems do not attempt or die by suicide (Olfson, Gerhard, Huang, Crystal, & Stroup, 2015), previous research indicates that mental illness is an important risk factor for suicide (WHO, 2014). Studies suggest that up to 90% of people who die by suicide may have had a mental illness at the time of their deaths (Cavanagh, Carson, Sharpe, & Lawrie, 2003). State-level suicide rates have also been found to be correlated with general mental health measures such as depression (Arsenault-Lapierre, Kim, & Turecki, 2004). Findings from the National Comorbidity Survey indicate that relatively few people in the U.S. with mental health disorders receive treatment for those conditions (Kessler et al., 2005). Lack of access to mental health care is one of the contributing factors related to the underuse of mental health services (Cunningham, 2009). Identifying ways to improve access to timely, affordable, and quality mental health care for people in need is a critical component to suicide prevention (WHO, 2014). Apart from the treatment benefits, it can also serve to normalize help-seeking behavior and increase the use of such services.

### Approaches

One approach to strengthening access to mental health care is through the provision of mental health coverage in health insurance policies.

- **Coverage of mental health conditions in health insurance policies.** Federal and state laws include provisions for equal coverage of mental health services in health insurance plans that is on par with coverage for other health concerns (i.e., mental health parity). Benefits and services covered include such things as the number of visits, co-pays, deductibles, inpatient/outpatient services, prescription drugs, and hospitalizations. If a state has a stronger mental health parity law than the federal parity law, then insurance plans regulated by the state must follow the state parity law. Federal parity replaces the state law only in cases where the state law prevents the application of the federal parity law (e.g., includes coverage for some mental health conditions but not others). Equal coverage does not necessarily imply good coverage as health insurance plans vary in the extent to which benefits and services are offered to address various health conditions. Rather it helps to ensure that mental health services are covered on par with other health concerns.

### Potential Outcomes

- Increased utilization of mental health services
- Decreased symptoms of mental illnesses
- Decreased rates of suicide attempts
- Decreased rates of suicide

**Comment [A]:** Add more citations here. You could also add a sentence indicating that suicide risk varies by type of disorder and the presence of other co-morbidities such as alcohol use disorders – see pg 40 in the World Suicide Report 2014

**Comment [A]:** Kessler RC, Demler O, Frank RG, Olfson M, Pincus HA, Walters EE, Wang P, Wells KB, Zaslavsky AM. Prevalence and treatment of mental disorders, 1990 to 2003. *N Engl J Med.* 2005 Jun 16;352(24):2515-23.

**Comment [A]:** Cunningham, P. J. (2009). Beyond Parity: Primary Care Physicians' Perspectives On Access To Mental Health Care. *Health Affairs*, 28(3), w490-w501. doi: 10.1377/hlthaff.28.3.w490 originally published online April 14, 2009



## Evidence

There is evidence suggesting that coverage of mental health conditions in health insurance policies can reduce risk factors associated with suicide and may directly impact suicide rates.

- **Coverage of mental health conditions in health insurance policies.** The National Survey of Drug Use and Health is a nationally representative survey of the U.S. population that provides data on substance use, mental health conditions, and services utilization. Using data from this survey, Harris, Carpenter, and Bao (2006) found that 12 months after states enacted *mental health parity laws*, self-reported use of mental healthcare services significantly increased. Moreover, subsequent research by Lang (2013) examined state mental health laws and suicide rates between 1990 and 2004 and found that mental health parity laws, specifically, were associated with an approximate 5% reduction in suicide rates. This reduction, in the 29 states with parity laws, equated to the prevention of 592 suicides per year and a cost savings of \$1.3-3.1 million per suicide prevented (Lang, 2013).

## Create Protective Environments

### Rationale

Prevention efforts that focus not only on individual behavior change (e.g., help-seeking, treatment interventions) but on changes to the environment can increase the likelihood of positive behavioral and health outcomes (Haddon, 1980). Creating environments that address risk and protective factors where individuals live, work, and play, can help prevent suicide. Such approaches can involve changes to organizational climates, policy changes, and changes to the physical and social environment to reduce risk characteristics, encourage help-seeking and increase other protective factors. Modifying characteristics of the environment helps to create a context that promotes positive behavior and limits harmful behavior.

**Comment [A]:** I edited the text in the rationale to more closely align with the notion of creating a protective environment. More could probably be added in terms of the research, but this gives you a sense of what the rationale for this section might look like.

### Approaches

The current evidence suggests three promising approaches for creating environments that protect against suicide.

- **Reducing access to lethal means among persons at-risk of suicide.** Means of suicide such as firearms, hanging/suffocation, or jumping from heights provide little opportunity for rescue and, as such, have high case fatality rates (e.g., about 85% of people who use a firearm in a suicide attempt will die from the injury). Research also indicates that 1) the interval between thinking about and attempting suicide can be as short as 5 or 10 minutes (Deisenhammer et al., 2009; Simon et al., 2001) and 2) that people tend *not* to substitute a different method when a highly lethal method is unavailable or difficult to access (Hawton, 2007; Yip et al., 2012). Therefore, increasing the time interval between the thought and the suicide attempt, for example, by making it more difficult to access lethal means, can be lifesaving. The following are examples of approaches reducing access to lethal means for persons at-risk of suicide:
  - *Intervening at Suicide Hotspots.* Suicide hotspots, or places where suicides may take place relatively easily, include tall structures (e.g., bridges and cliffs), railway tracks, and isolated locations such as parks. Efforts to prevent suicide at these locations include erecting barriers to prevent jumping and installing signs and telephones to encourage individuals who are considering suicide, to seek help (Cox et al., 2013).
  - *Safe Storage Practices.* Safe storage of medications, firearms, and other household products can reduce the risk for suicide by separating individuals who may be vulnerable and/or impulsive from easy access to lethal means. Such practices may include education and counseling around storing firearms--locked in a secure place (e.g., in a gun safe or lock box), unloaded and separate from the ammunition--and keeping medicines in a



locked cabinet or other secure location away from people who may be at risk or who have made prior attempts (Rowhani-Rahbar, Simonetti, & Rivara, 2016; C. W. Runyan et al., 2016).

- **Organizational policies and culture** that promote protective environments may be implemented in places of employment. Such policies and cultural values may promote prosocial behavior (e.g., asking for help), skill building, changing social norms, referral and access to helping services (e.g. mental health, substance abuse treatment, financial counseling), and encourage leadership support from the top down. Such policies and cultural shifts can positively impact organizational climate and morale and help prevent suicide and its related risk factors (e.g. depression, social isolation).
- **Community-based policies to reduce excessive alcohol use.** Research studies in the United States have found that greater alcohol availability is positively associated with alcohol-involved suicides (Escobedo & Ortiz, 2002; Giesbrecht et al., 2015). Policies to reduce excessive alcohol use broadly include zoning to limit alcohol outlet locations and density, taxes on alcohol, and bans on the sale of alcohol for individuals under the legal drinking age. These policies are important because acute alcohol use has been found to be associated with more than one-third of suicides and approximately 40% of suicide attempts (Cherpitel, Borges, & Wilcox, 2004).

### Potential Outcomes

- Increase in safe storage of means
- Reduction in suicide attempts
- Reduction in suicide deaths
- Increase in help-seeking
- Reduction in alcohol-related suicide deaths

### Evidence

The evidence for the effectiveness of means restriction and other ways to establish protective environments is some of the strongest in the field (Zalsman et al., 2016), as described below.

- **Reducing access to lethal means among persons at-risk of suicide.** A meta-analysis examining the impact of *suicide hotspot interventions* implemented in combination or in isolation, both in the U.S. and abroad, found associated reduced rates of suicide (Cox et al., 2013; Pirkis et al., 2015). For example, after erecting a barrier on the Jacques-Cartier bridge in Canada, the suicide rate from jumping from the bridge decreased from about 10 suicide deaths per year to about 3 deaths per year (Perron, Burrows, Fournier, Perron, & Ouellet, 2013). Moreover, the reduction in suicides by jumping was sustained even when all bridges and nearby jumping sites were considered, suggesting little to no displacement of suicides to other jumping sites (Perron et al.,

2013). Further evidence for the effectiveness of bridge barriers was demonstrated by a study examining the impact of the *removal* of safety barriers from the Grafton Bridge in Auckland, New Zealand. After removal of the barrier, sadly, both the number and rate of suicide increased fivefold (Beautrais, 2001; Beautrais, Gibb, Fergusson, Horwood, & Larkin, 2009).

Another form of means reduction involves implementation of *safe storage practices*. In a case-control study of firearm-related events identified from 37 counties in Washington, Oregon, and Missouri, and from 5 trauma centers, Grossman et al. (2005) found that storing firearms unloaded, separate from ammunition, in a locked place and/or secured with a safety device was protective of suicide attempts among adolescents. Further, a recent systematic review of clinic and community-based education and counseling interventions suggested that the provision of safety devices significantly increased safe firearm storage practices compared to counseling alone or compared to the provision of economic incentives to acquire safety devices on one's own (Rowhani-Rahbar et al., 2016).

Another program, *The Emergency Department Counseling on Access to Lethal Means (ED CALM)*, trained psychiatric emergency clinicians in a large children's hospital to provide lethal means counseling and safe storage boxes to parents of patients under age 18 receiving care for suicidal behavior. In a pre-post quality improvement project, Runyan et al. (2016) found that at post-test 76% (of the 55% of parents followed up, n=114) reported that all medications in the home were locked up as compared to fewer than 10% at the time of the initial emergency department visit. Among parents who indicated the presence of guns in the home at pre-test (i.e. 67%), all (100%) reported guns were currently locked up at post-test (C. W. Runyan et al., 2016).

- **Organizational policies and culture.** *Together for Life* is a workplace program of the Montreal Police Force implemented to address suicide among officers. Policy and program components were designed to foster an organizational culture that promoted mutual support and solidarity among all members of the Force. The program included training of supervisors, managers and all units to improve competencies in identifying suicidal risk and to improve use and awareness of existing resources. The program also included an education campaign to improve awareness and help-seeking (Mishara & Martin, 2012). Police suicides were tracked over 12 years and compared to rates in the control city of Quebec. The suicide rate in the intervention group decreased significantly by 78.9% to a rate of 6.42 suicides per 100,000 population per year compared to an 11% increase in the control city (rate: 29.0 per 100,000) (Mishara & Martin, 2012).

Another example of this approach is the *United States Air Force Suicide Prevention Program (AFSPP)*. AFSPP included 11 policy and education initiatives and was designed to change the culture of the Air Force surrounding suicide. The program uses leaders as role models and agents



of change, establishes expectations for behavior related to awareness of suicide risk, develops population skills and knowledge (i.e., education and training), and investigates every suicide (i.e., outcomes measurement). The program represents a fundamental shift from viewing suicide and mental illness solely as medical problem and instead sees them as larger service-wide problems impacting the whole community (K. L. Knox, Litts, Talcott, Feig, & Caine, 2003). Using a time-series design to examine the impact of the AFSPP program on various violence-related outcomes, researchers found that the program was associated with a 33% relative risk reduction in suicide (K. L. Knox et al., 2003). The program was also associated with relative risk reductions in related outcomes including moderate and severe family violence (30% and 54%, respectively), homicide (51%), and accidental death (18%) (K. L. Knox et al., 2003). A longitudinal assessment of the program over the period 1981 to 2008 (16 years before the 1997 launch of the program and 11 years post-launch) found significantly lower rates of suicide after the program was launched than before (K. L. Knox et al., 2010). These effects were sustained over time, except in 2004, which the authors found was associated with less rigorous implementation in that year than in the other years (K. L. Knox et al., 2010).

- **Community-based policies to reduce excessive alcohol use.** While multiple policies to limit alcohol use exist, several studies on alcohol outlet *density*, specifically, suggest that measures to reduce alcohol outlet density can potentially reduce alcohol-involved suicides. Additionally, a longitudinal analysis of alcohol outlet density, suicide mortality, and hospitalizations for suicide attempts over 6 years in 581 California zip codes indicated that the density of bars, specifically, is related to suicide and suicide attempts, particularly in rural areas (Johnson, Gruenewald, & Remer, 2009).

## Promote Connectedness to Protect Against Suicide

### Rationale

Sociologist, Emile Durkheim theorized in 1897 that weak social bonds, i.e. lack of connectedness, are among the chief causes for suicidality (Durkheim, 1897/1951). *Connectedness* is the degree to which an individual or group of individuals are socially close, interrelated, or share resources with others (Centers for Disease Control and Prevention, 2009). Social connections can be formed within and between multiple levels of the social ecology (Dahlberg & Krug, 2002), for instance between individuals (e.g. peers, neighbors, co-workers), families, schools, neighborhoods, workplace, faith communities, cultural groups, and society as a whole. Related to connectedness, *social capital* refers to a sense of trust in one's community and neighborhood, social integration, and also the availability and participation in social organizations (Beyer, Layde, Hamberger, & Laud, 2015; Muennig, Cohen, Palmer, & Zhu, 2013). Many ecological cross-sectional and longitudinal studies have examined the impact of aspects of social capital on depression symptoms, depressive disorder, mental health more generally, and suicide. While the evidence is still being built the pattern is towards an inverse association between social capital measured by social trust, community/ neighborhood engagement, and improved mental health. Connectedness and social capital together can serve to protect against suicidal behaviors by decreasing isolation, encouraging adaptive coping behaviors, increasing belongingness, personal value and worth all of which helps individuals to build resilience in the face of adversity. Connectedness can also provide individuals with better access to formal supports and resources, mobilize communities to meet the needs of its members and provide collective primary prevention activities to the community as a whole (Centers for Disease Control and Prevention, 2009).

### Approaches

Promoting connectedness among individuals and within communities through modeling peer norms and enhancing community engagement can protect against suicide.

- **Peer norm approaches** seek to normalize prosocial behaviors/protective factors for suicide such as help-seeking, reaching out and talking to trusted adults, and peer connectedness. These approaches typically target youth and are delivered in school settings but can also be implemented in community settings.



- **Community engagement activities.** Community engagement is an aspect of social capital. Community engagement approaches may involve residents participating in a range of activities, including religious activities, community clean-up and greening activities, and physical exercise. These activities provide opportunities for residents to become more involved in the community and to connect with other community members, organizations, and resources, resulting in enhanced overall physical health, reduced stress, and decreased depressive symptoms, thereby reducing risk of suicide.

### Potential Outcomes

- Reduction in maladaptive coping attitudes and behaviors
- Increase in healthy coping attitudes and behaviors
- Increase in referrals for youth in distressed
- Increase help-seeking behaviors
- Positive perception of adult support

### Evidence

Current evidence suggests that peer norm approaches and community engagement can reduce risk factors associated with suicidal behaviors.

- **Peer norm approaches.** Evaluations show that programs such as *Sources of Strength* can improve school norms and beliefs about suicide that are created and disseminated by student peers. In a randomized controlled trial of *Sources of Strength* conducted with 18 high-schools (6 metropolitan, 12 rural), Wyman et al. (2010) found that the program improved peer leaders' adaptive norms regarding suicide, their connectedness to adults, and school engagement. Peer leaders were also more likely than controls to refer a suicidal friend to an adult. Among students, the intervention increased perceptions of adult support for suicidal youths and the acceptability of seeking help. Perception of adult support increased most in students with a history of suicidal ideation. Finally, trained peer leaders also reported a greater decrease in maladaptive coping attitudes compared with untrained leaders (Wyman et al., 2010).
- **Community engagement activities.** A vacant lot greening initiative was undertaken in Philadelphia between 1999 and 2008. Local residents and community members worked together to green 4,436 lots (or 7.8 million square feet) in 4 areas of the city. Researchers found significant associated reductions in community residents' self-reported stress levels and engagement in more physical exercise than residents in control vacant lot areas. Other benefits included reductions in firearm assaults and vandalism (Branas et al., 2011).

## Teach Coping and Problem-Solving Skills

### Rationale

Building life skills prepares individuals to successfully tackle every day challenges and adapt to stress and adversity. Life skills encompasses many concepts, but most often include coping and problem-solving skills, conflict resolution, and critical thinking. Life skills are important in shielding individuals from suicidal behaviors (World Health Organization, 2014). Suicide prevention programs that focus on life and social skills training are drawn from social cognitive theories (Bandura, 1986), surmising that individuals who engage in suicidal behavior is attributed to either direct learning, modeling, and environmental and individual (e.g. hopelessness) characteristics. The literature linking life skills and suicide is robust--- The inability to employ adequate coping strategies to cope with immediate stressors or identify and find solutions for problems have been characterized among suicide attempters (Pollock & Williams, 2004). Treatments that include bolstering problem skills (Goldsmith, Pellmar, Kleinman, & Bunney, 2002) and include problem-solving techniques (Ghahramanlou-Holloway, Bhar, Brown, Olsen, & Beck, 2012; Townsend et al., 2001) appear to reduce suicidal ideation and attempts more effectively. Prevention programs focused on teaching these skills target youth, parents and families and have been used with both universal and at-risk populations. While many do not target suicidal behaviors directly, these programs strive to train youth and parents important life skills to offset the underlying vulnerabilities that contribute to engaging in high risk behaviors early in life.

### Approaches

Current evidence provides support for the following two approaches:

- **Social emotional learning programs** focus on developing and strengthening communication and problem-solving skills, emotion regulation, conflict resolution, help seeking and coping skills. These approaches address a range of risk and protective factors for suicidal behavior. They provide children and youth with skills to resolve problems in relationships, school, and with peers, and help youth to address other negative influences (e.g., substance use) associated with suicide. These approaches are typically delivered to all students in a particular grade or school, although some programs also focus on groups of students considered to be at high-risk for suicide. Opportunities to practice and reinforce skills are an important part of programs that work (Herman, Borden, Reinke, & Webster-Stratton, 2011).
- **Parenting skill and family relationship programs** are designed to strengthen parenting skills, enhance positive parent-child interactions, and improve children's behavioral and emotional skills and abilities. Several parenting and family relationship programs have been shown in rigorous evaluations to improve resilience and reduce risk factors for various behaviors, including



ones closely related to suicide, such as depression, internalizing behaviors, and substance abuse (M. S. Knox, Burkhart, & Hunter, 2010).

### Potential Outcomes

- Reduction in suicide attempts and suicide ideation
- Enhanced knowledge of risk and protective factors associated with suicide
- Reduction in suicide risk behaviors (i.e., depression, anxiety, conduct problems, substance abuse)
- Improve and normalize help-seeking behavior
- Enhance social competence and emotional regulation skills
- Enhance problem-solving and conflict management skills

### Evidence

There are several programs with evidence that support teaching social, emotional and parenting skills to reduce suicidal behaviors and associated risk factors.

- **Social emotional learning programs.** The *Youth Aware of Mental Health Program (YAM)* is a program developed for teenagers that uses interactive dialogue and role-playing to teach adolescents about the risk and protective factors associated with suicide (including knowledge about depression and anxiety) and enhances their problem-solving skills for dealing with adverse life events, stress, school and other problems. The program includes 3 hours of role-play sessions and interactive workshops combined with a booklet that students can keep, educational posters displayed in classroom, and interactive lectures about mental health at the beginning and end of the program (Wasserman et al., 2014). In a cluster-randomized controlled trial of YAM conducted across 10 European Union countries and 168 schools, students participating in the YAM program were significantly less likely to have an incident suicide attempt (OR 0.45, 95%CI 0.24–0.85;  $p=0.014$ ) and severe suicidal ideation (0.50, 0.27-0.92;  $p=0.025$ ) at the 12-month follow-up compared to the control group. Additionally, related to severe suicide ideation, in the YAM group absolute risk fell by 0.50% and RR fell by 49.6% (Wasserman et al., 2014).

*Signs of Suicide (SOS)* is another school-based prevention program for students aged 13-17. The program includes guided classroom discussions about suicide and depression. As part of the program, students are screened for depression and suicide risk and referred for professional help as indicated. The program is designed to increase knowledge about suicide and risk factors associated with suicidal behavior as well as improve and normalize help-seeking behavior (Schilling, Aseltine, & James, 2016). In a randomized controlled trial, SOS was shown to reduce self-reported suicide attempts at 3-months post intervention among

participating students compared to control students. The SOS program also increased students' knowledge of how to get help for themselves or friends for depression and/or suicidal thoughts, and favorable attitudes toward help-seeking. SOS participants with a lifetime history of suicide attempt were also less likely to report planning a suicide in the 3 months following the program compared to lower-risk participants (Schilling et al., 2016).

Finally, the *Good Behavior Game (GBG)* is a classroom-based program for elementary school children aged 6-10; it represents an example of upstream suicide prevention programming. The program uses a team-based behavior management strategy that promotes good behavior by setting clear expectations for good behavior and consequences for maladaptive behavior. The goal of the GBG is to create an integrated classroom social system that is supportive of all children being able to learn with little aggressive or disruptive behavior (Wilcox et al., 2008). In an outcome evaluation of the GBG, first graders assigned to GBG reported half the adjusted odds of suicidal ideation and suicide attempts. The beneficial effect of the program was consistent for suicidal ideation regardless of whether baseline covariates were included. The GBG effect on attempts was less robust in some adjusted models including caregiver mental health. In the second cohort of GBG students, neither suicidal ideation nor suicide attempts were significantly different between GBG and the control interventions (Wilcox et al., 2008). This finding likely arose due to the lack of implementation fidelity and pointed to the need for GBG to be delivered with precision, consistency, and teacher support. GBG was also found to be associated with reduced risk of later substance abuse, a risk factor for suicide (Kellam et al., 2008).

- **Parenting skill and family relationship programs.** Parenting and family skills training approaches have shown promising impacts in preventing key risk factors associated with suicide. For example, the *Incredible Years (IY)* is a comprehensive group training program for parents, teachers and children designed to reduce conduct and substance abuse problems, two important suicide risk factors, in youth by improving protective factors such as responsive and positive parent-teacher-child interactions and relationships, emotion self-regulation and social competence (all protective factors for suicide) (Herman et al., 2011). The program includes 9- 20 sessions offered in community-based settings (e.g., religious, recreation centers, mental health treatment centers, and hospitals). Several studies have demonstrated the effect of the IY program on reducing internalizing symptoms, such as anxiety and depression, and child conduct problems (C. H. Webster-Stratton, Reid, & Beauchaine, 2011; Webster-Stratton, Jamila Reid, & Stoolmiller, 2008). The program is also associated with improved problem-solving and conflict management; these skills were maintained at 1-year follow-up (Reid, Webster-Stratton, & Hammond, 2003; C. Webster-Stratton & Hammond,



1997; C. Webster-Stratton, Reid, & Hammond, 2001). The program demonstrated greater benefits as the dosage of the intervention increased (Herman et al., 2011).

Additionally, *Strengthening Families 10-14* is a program that involves sessions between parents, youth, and family with the goal of improving parents' skills for disciplining, managing emotions and conflict, and communicating with their children; promoting youths' interpersonal and problem-solving skills; and creating family activities to build cohesion and positive parent-child interactions. The premise of the program is that developing these skills for both parents and children will reduce internalizing behavior and adolescent substance abuse, two important risk factors for suicide (Spoth, Gyll, & Day, 2002). *Strengthening Families* has been shown to decrease externalizing behaviors, alcohol use, and drug use among youth participants and reductions in depression, alcohol use, and drug use among participating families (Spoth et al., 2002).

## Identify and Support People At-Risk

### Rationale

In order to decrease suicide, attention to people at increased or high risk is necessary as these individuals tend to experience suicidal behavior at higher than average rates. These vulnerable or disadvantaged populations include, but are not limited to, individuals with lower socio-economic status or who are living with a mental health problem; people who have attempted suicide previously, individuals who are institutionalized, have been victims of violence, or are homeless; and members of certain ethnic minority groups. Supporting these vulnerable groups requires proactive case finding along with access to, and retention in, mental health services. Finding effective ways of identifying at-risk or vulnerable groups, customizing services to make them accessible and maintaining care remain key challenges. For example, simply improving services does not guarantee that those services will be used by those most in need of them, nor will it necessarily increase the number of people who follow treatments that are recommended. People who are disadvantaged face social and economic issues that may adversely affect their ability to respond to the treatments or advice that are offered.

### Approaches

The following three approaches focus on identifying and supporting people at increased risk.

- **Gatekeeper training** is designed to train teachers, coaches, providers and others in the community to identify people who may be at risk of suicide and to respond effectively, including facilitating treatment seeking and support services. Gatekeeper training is typically implemented in schools to identify at-risk youth and within health care settings to identify adults (and youth).
- **Screening combined with care management and overall continuity of care** has been used in primary care and behavioral health care settings to assure that people who may be at high-risk of suicide are identified and receive ongoing treatment as needed, particularly after inpatient discharge and other transitions within the healthcare system so they don't 'slip through the cracks'. These approaches typically employ screening for depression and/or suicide combined with collaborative treatment planning between patients and their providers and patient follow-up.
- **Crisis intervention.** These approaches provide support and referral services, typically by connecting a person in crisis (or a friend or family member of someone at-risk) to trained volunteers and/or professional staff via telephone hotline, online chat, or text messaging. Crisis intervention approaches are intended to impact key risk factors for suicide, including feelings of depression, hopelessness, and subsequent mental health care utilization. Like means reduction,



crisis interventions can put space or time between an individual who may be considering suicide and harmful behavior.

### Potential Outcomes

- Reduction in suicide attempts
- Reduction in suicide deaths
- Increased identification of individuals at-risk for suicidal behavior
- Increased at-risk individuals in treatment
- Increased community members trained to identify at-risk individuals
- Increased referrals for health care

### Evidence

There is evidence that community gatekeeper programs are successful in reducing suicides and suicide attempts but the efforts must be maintained (Substance Abuse and Mental Health Services Administration, 2014). However, there is limited evidence for effectiveness screening programs, but at the same time, standard principles for public health screening make them promising (Pena & Caine, 2006). The number of studies evaluating crisis intervention services is limited, but a few studies do indicate that those who use the hotline services have decreased suicidal thoughts and behavior.

- **Gatekeeper training.** One example of gatekeeper training is the *Mental Health First Aid (MHFA)* program. This program is designed for the lay public and consists of three weekly sessions of three hours each. Participants learn the symptoms of people in mental health crises and/or in the early stages of mental health problems (i.e., those experiencing suicidal thoughts and behavior, acute stress reaction, panic attacks and acute psychotic behavior, and depression, anxiety, and psychotic disorders), possible risk factors, and where and how to get evidence-based effective help (Kitchener & Jorm, 2004). In a randomized controlled trial of 300 participants of *MHFA*, the intervention group reported greater confidence in providing help to others, greater likelihood of advising people to seek professional help, improved concordance with health professionals about treatments, and decreased stigmatizing attitudes. Additionally, the intervention resulted in improved mental health of the participants themselves. All results were statistically significant at  $p < .05$ . (Kitchener & Jorm, 2004). Additional research rigorously evaluating *MHFA* for its impact on the first aid recipients themselves and suicidal behavior is needed (Kitchener & Jorm, 2006).

Gatekeeper training has also been a core part of all *Garret Lee Smith (GLS) Suicide Prevention Program* which is in place in 49 states and 48 tribes. A multi-site evaluation assessed the



connection between community gatekeeper training and a reduction of suicide attempts and deaths by comparing the change in suicide mortality rates and nonfatal suicidal behavior among the population aged 10-24 in counties implementing GLS trainings, with the trajectory observed in similar counties that did not implement these trainings. Counties implementing GLS trainings had significantly lower youth suicide rates the year following the training implementation (-1.07,  $p=.03$ ) (Walrath, et al., 2015). This finding represents a decrease of 1 suicide death per 100,000 10 to 24 year olds or the avoidance of approximately 237 deaths in this age group between 2007 and 2010. Counties implementing GLS program activities also had significantly lower suicide attempt rates among youths 16 to 23 years of age in the year following implementation of the GLS program than did similar counties that did not implement GLS program activities (4.9 fewer attempts per 1000 youths [95% CI, 1.8-8.0 fewer attempts per 1000 youths];  $p = .003$ ; Godoy Garraza et al., 2015). More than 79 000 suicide attempts may have been averted during the period studied following implementation of the GLS program.

- Screening combined with care management and overall continuity of care.** The *Henry Ford Perfect Depression Care* program was the pre-cursor to *Zero Suicide*, and its overall goal was to eliminate suicide. More broadly, though, the aim was to completely redesign depression care delivery to achieve breakthrough improvement in quality and safety by focusing on six aims: effectiveness, safety, patient centeredness, timeliness, efficiency, and equity among patients. The program developed concrete measures to assess progress on each of these aims and began with screening and assessment of each patient for suicide risk with coordinated continuous follow-up care system wide (C. E. Coffey, 2006). An examination of the impact of the *Henry Ford Perfect Depression Care (Pre-cursor to Zero Suicide)* program found that there was a dramatic and statistically significant decrease in the rate of suicide between the baseline years prior to the intervention (1999 and 2000) to the intervention years (2002-2009). During this time period, the suicide rate fell 82% (C. E. Coffey, 2006; C. E. Coffey, Coffey, & Ahmedani, 2013). Further, suicide rates also declined among HMO members who participated in targeted suicide prevention efforts and received mental health specialty services. However, for those HMO members who accessed only general medical services as opposed to specialty mental health services, the suicide rate increased (M. Coffey, Coffey, & Ahmedani, 2015).
- Crisis intervention.** Suicide prevention hotlines are one way to provide crisis intervention. In an evaluation of the effectiveness of the *National Suicide Prevention Lifeline (NSPL)* to prevent suicide, 1,085 suicidal individuals who called the hotline completed a standard risk assessment for suicide, and 380 of those completed a follow-up assessment between 1 and 52 days after the initial assessment. Researchers found that over half of the initial sample were seriously considering suicide when they called, and they had a plan for their suicide. Researchers also found that participants experienced significant decreases in suicidality over the course of the



telephone session, and that levels of hopelessness and psychological pain continued to decrease after their initial call (Gould, Kalafat, Harrismunfakh, & Kleinman, 2007).

In another study, this time employing a randomized controlled trial, Gould, Cross, Pisani, Munfakh, and Kleinman (2013) assessed the impact of the *Applied Suicide Intervention Skills Training (ASIST)*, a widely implemented training program that helps hotline counselors, emergency workers, and other gatekeepers to identify and connect with suicidal individuals, understand their reasoning for living and dying, and assist with safely connecting those in need to available resources. The training was evaluated across the NSPL network of hotlines over the period 2008-2009. Using data from 1,410 suicidal individuals who called 17 Lifeline centers, researchers found that compared to callers who spoke to counselors that received the usual care training, individuals who spoke with counselors trained in *ASIST* were significantly more likely to feel less depressed, less suicidal, less overwhelmed, and more hopeful by the end of their call to the hotline. Counselors trained in *ASIST* were also more skilled at keeping callers on the phone longer and establishing a connection with them. However, training in *ASIST* did not result in more comprehensive suicide risk assessments than usual care training (Gould et al., 2013).

## Intervene to Lessen Harms and Prevent Future Risk

### Rationale

Individuals who have experienced mental health challenges, suicidal ideation, and/or who have made suicide attempts and/or have engaged in non-suicidal self-injury are at increased risk of suicide (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). Risk of suicide can also increase among those who have lost a friend, family member, co-worker, or other acquaintance to suicide (Pitman, Osborn, King, & Erlangsen, 2014). Exposure to sensationalized or uninformed reporting regarding on suicide may heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to suicide contagion (Etzersdorfer & Sonneck, 1998; Niederkrotenthaler & Sonneck, 2007).

### Approaches

A broad array of approaches to lesson harms and reduce future risk of suicide among those at increased risk include the provision of mental health care and improved continuity of care, improving linkage to care through active post-discharge planning and follow-up that decreases barriers to ongoing therapeutic support, increasing connectedness to supportive others, addressing bereavement, and framing communications to emphasize resilience, decrease negative affect, and to prevent contagion.

- **Treatment for people at-risk of suicide** typically includes various forms of psychotherapy delivered by licensed providers to help individuals with mental health problems and other risk factors for suicide with problem-solving, impulsivity and emotion regulation.
- **Treatment to prevent re-attempts.** These approaches typically include follow-up contact and use diverse modalities (e.g., home visits, mail, telephone, e-mail) to engage recent suicide attempt survivors in continued treatment to prevent re-attempts. Treatment may focus on improved coping skills, mindfulness, and other emotional regulation skills, and may include case management home visits to increase adherence to treatment and continuity of care; and one-on-one interpersonal therapy and/or group therapy. Approaches that engage and connect attempters to peers and providers are especially important because many attempters do not present to aftercare; 12%-25% reattempt within a year, and 3%-9% of attempt survivors die by suicide within 1 to 5 years of their initial attempt (Inagaki et al., 2015)
- **Postvention** approaches are implemented *after* a suicide has taken place and may include debriefing sessions, counseling, and/or bereavement support groups for surviving friends and family members/loved ones. These programs have not typically been evaluated for their impact on suicide or suicidal behavior but may reduce survivors' guilt, feelings of depression, and complicated grief (Szumilas & Kutcher, 2011).



- **Safe messaging following a suicide.** The manner in which information on a recent suicide is communicated to the public (e.g. school assemblies, mass media, social media) can heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to suicide contagion. Therefore, responsible and safe reporting may help prevent suicide and/or suicide contagion.

### Potential Outcomes

- Reduction in mental health-related sequelae
- Increase connectedness
- Improved coping skills
- Improved messaging following suicide
- Reduction in re-attempts

### Evidence

The evidence addressing strategies to lesson harm and prevent future risk of suicide includes the evaluation of effects of specific approaches on risk and protective factors as well as suicide-related mortality. However, because the evaluation of suicide-related mortality requires large sample sizes and extended follow-up, much of the evidence in this area primarily focuses on risk and protective factors.

- **Treatment for people at-risk of suicide.** There are a number of treatments with evidence of impact on risk and protective factors for suicide. One example is the *Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)* program. IMPACT aims to prevent suicide among older primary care patients by reducing suicide ideation and depression in primary care settings. It facilitates the development of a therapeutic alliance, a personalized treatment plan that includes patient preferences, as well as proactive follow-up (biweekly during an acute phase and monthly during continuation phase) by a depression care manager (Hunkeler et al., 2006). The program has been shown to significantly improve quality of life, and to reduce functional impairment, depression and suicidal ideation over 24-months of follow-up (Hunkeler et al., 2006; Unutzer et al., 2006) relative to patients who received care as usual.

Another example is *Collaborative Assessment and Management of Suicidality (CAMS)*, which is a therapeutic approach for suicide-specific assessment and treatment of patient's suicide risk. This flexible approach can be used across treatment settings and clinician theoretical orientations and involves the clinician and patient working together in an interactive assessment process to develop patient-specific treatment plans. CAMS sessions are collaborative and involve constant

**Comment [A]:** The write-up of the evidence for this strategy needs to follow the format used in the other sections of the TP. I modified the write-up for the first approach to illustrate the format. You will need to do something similar for the second approach.

patient about what is and is not working with the ultimate goal of enhancing the therapeutic alliance and increasing treatment motivation in the suicidal patient. CAMS been tested and supported in 6 correlational studies (Jobes, 2012), in a variety of inpatient and outpatient settings and in one RCT with several additional RCTs under way. CAMS has been associated with significant improvements in suicidal ideation, overall symptom distress, and feelings of hopelessness at 12 month follow-up among a community-based sample of suicidal outpatients. (Comtois et al., 2011).

Other examples include *Dialectical Behavioral Therapy (DBT)* and *Attachment-Based Family Therapy (ABFT)*. DBT is a multicomponent therapy for individuals at high risk for suicide and who may struggle with impulsivity and emotional regulation. The components of DBT include individual therapy, group skills training, between-session telephone coaching and a therapist consultation team. In a randomized controlled trial of women with recent suicidal or self-injurious behavior, those receiving DBT were half as likely to make a suicide attempt at two-year follow-up than women receiving community treatment (23% vs 46%), required less hospitalization for suicide ideation, and had lower medical risk across all suicide attempts and self-injurious acts combined (Linehan et al., 2006).

ABFT is a program for adolescents aged 12-18 and is designed to treat clinically diagnosed major depressive disorder, eliminate suicidal ideation, and reduce dispositional anxiety (Diamond et al., 2010). A randomized controlled trial of ABFT found that suicidal adolescents assigned to ABFT experienced significantly greater improvement in suicidal ideation over 24 weeks of follow-up than did adolescents assigned to enhanced usual care (-4.37 vs. -2.34;  $p = .001$ ;  $d=0.97$ ). Additionally, a higher percentage of ABFT participants reported no suicidal ideation in the week prior to assessment at 12 weeks than did adolescents receiving enhanced usual care (69.2% vs. 34.6%;  $p = .01$ ; OR= 4.25) and at 24 weeks (82.1% vs. 46.2%;  $p = .006$ ; OR=5.37) (Diamond et al., 2010).

- **Treatment to prevent re-attempts.**

**Emergency Department Brief Intervention with Follow-up Visits** is a program that involves a one-hour discharge information session that addresses suicidal behavior, distress, risk and protective factors, alternatives to suicidal behavior, and referral options, combined with nine follow-up contacts over 18-months (at 1, 2, 4, 7, 11 weeks and 4, 6, 12, 18 months). Follow-up contacts are either conducted by phone or through home visits according to a specific time line for up to 18-months. A randomized controlled trial that enrolled suicide attempters from eight hospital emergency departments in five culturally different sites found that a brief intervention combined with 9 follow-up visits over 18-months was associated with significantly fewer deaths



from suicide relative to a treatment-as-usual group (0.2% versus 2.2%, respectively;  $\chi^2 = 13.83$ ,  $P < 0.001$ ) (Fleischmann et al., 2008).

**Active follow-up contact approaches** such as postcards, letters, and telephone calls, are intended to increase a patient's sense of connectedness with health care providers and decrease isolation. These approaches include expression of care and support and typically invite patients to reconnect with their provider. Contacts are made periodically (e.g., monthly or every few months in the first 12 months post-discharge with some programs continuing contact for 2 or more years). These approaches have been found in a meta-analysis conducted by Inagaki et al. (2015) to reduce reattempts by approximately 17% for up to 12 months post-discharge, however, the long-term effects of these approaches on reattempts has not yet been demonstrated. Also, because the number of trials and associated sample sizes included in this meta-analysis were small, it was not possible to determine the effect of active contact and follow-up approaches on death by suicide. In a randomized controlled trial of post-crisis suicide prevention long-term follow-up contact approach, Motto and Bostrom (2001) found that patients who refused ongoing care but who were randomized to be contacted by letter four times per year had a lower rate of suicide over two years of follow-up than did patients in the control group who received no further contact. Other studies have also shown post-crisis letters and coping cards to be protective against suicide ideation and attempts (Hassanian-Moghaddam, Sarjami, Kolahi, & Carter, 2011; Wang et al., 2016).

**Cognitive Behavior Therapy for Suicide Prevention (CBT-SP)** uses a risk reduction, relapse prevention approach that includes an analysis of proximal risk factors and stressors (e.g., relationship problems, school or work-related difficulties) leading up to and following the suicidal event; safety plan development; skill building; and psychoeducation. *CBT-SP* also has family skill modules focused on family support and communication patterns as well as improving the family's problem solving skills. A randomized controlled trial found of *CBT-SP* found that 10-session outpatient cognitive therapy designed to prevent repeat suicide attempts resulted in a 50% reduction in the likelihood of a suicide reattempt among adults who had been admitted to an emergency department for a suicide attempt relative to treatment as usual (Brown et al., 2005).

- **Postvention** programs such as *StandBy Response Service* are implemented with the goal of providing support to survivors of suicide. *StandBy* provides clients with face-to-face outreach and telephone support through a professional crisis response team. Site coordinators develop customized case management plans, referring clients to other existing community services matched to their needs (Visser, Comans, & Scuffham, 2014). In a study by Visser et al. (2014), *StandBy* clients were significantly less likely to be at high risk for suicidality than a suicide bereaved comparison group who had not had contact with the *StandBy* program (48% and 64% respectively,  $p = 0.005$ ). Additionally, research suggests that active postvention approaches in

which outreach to suicide survivors occurs at the scene of a suicide is associated with intake into treatment sooner, greater attendance at support group meetings, and attendance at more meetings compared to passive postvention (versus passive approaches where survivors self-refer for services) (J. Cerel & Campbell, 2008).

- **Safe messaging following a suicide.** *Media guidelines* for reporting on suicides can help assure that stories on suicide are communicated in a safe and effective way. Reports that are both inclusive of suicide prevention messages, stories of hope and resilience, risk and protective factors, and links to helping resources (e.g., hotline) and that avoid sensationalizing events or reducing suicide to one cause can help reduce the likelihood of suicide contagion. The most compelling evidence supporting the effect of *media guidelines* on reduction in suicides comes from Austria. After a sharp increase in suicides on the Viennese subway, media guidelines were introduced and an interrupted time series design was used to evaluate the national impact of the guidelines on subsequent suicides. Changes in the quality and quantity of media reporting resulted in a reduction of 81 suicides annually (95% confidence interval: -149 to -13;  $t = -2.32$ ,  $df = 54$ ,  $p < 0.024$ ) in the Viennese subway system (Niederkrotenthaler & Sonneck, 2007)



## Sector Involvement

Public health can play an important and unique role in addressing suicide. Public health agencies, which typically place prevention at the forefront of efforts and work to create broad population-level impact, can bring critical leadership and resources to bear on this problem. For example, these agencies can serve as a convener, bringing together partners and stakeholders to plan, prioritize, and coordinate suicide prevention efforts. Public health agencies are also well positioned to collect and disseminate data, implement preventive measures, evaluate programs, and track progress. Although public health can play a leadership role in preventing suicide, the strategies and approaches outlined in this technical package cannot be accomplished by the public health sector alone.

Other sectors vital to implementing this package include, but are not limited to, education, government (local, state, and federal), social services, health services, business/labor, justice, housing, media, and organizations that comprise the civil society sector such as faith-based organizations, youth-serving organizations, foundations, and other non-governmental organizations. Collectively, these sectors can make a difference in preventing suicide by impacting the various contexts and underlying risks that contribute to suicide.

The strategies and approaches described in this technical package are summarized in Appendix A along with the relevant sectors that are well positioned to lead implementation efforts.

[Linda to insert text specific to the strategies and approaches]

Regardless of strategy, action by many sectors will be necessary for the successful implementation of this package. In this regard, all sectors can play an important and influential role in creating safe and protective environments where individuals who are at high risk of suicide can easily access the mental healthcare and services they need.

## Monitoring and Evaluation

Monitoring and evaluation are necessary components of the public health approach to prevention. It is important to have timely and reliable data to monitor the extent of the problem and to evaluate the impact of prevention efforts. Data are necessary for program implementation; planning, implementation, and assessment all rely on accurate measurement of the problem.

Surveillance data helps researchers and practitioners track changes in the burden of suicide. Surveillance systems exist at the federal, state, and local levels. It is important to assess the availability of surveillance data and data systems across these levels to identify and address gaps in the systems. CDC's National Vital Statistics System and the National Violent Death Reporting System (NVDRS) are examples of surveillance systems that provide data on deaths from suicide. NVDRS, for example, is a state-based surveillance system that combines data from death certificates, law enforcement reports, and coroner or medical examiner reports to provide detailed information on the circumstances of violent deaths, including suicide, which can assist communities in guiding prevention approaches (Blair, Fowler, Jack, & Crosby, 2016). The National Electronic Injury Surveillance System-All Injury Program (NEISS-AIP) provides nationally representative data about all types and causes of nonfatal injuries treated in U.S. hospital emergency departments, and can be used to assess national rates of, and trends in, self-harm injuries by cause (e.g., falls, poisoning, etc.), age, race/ethnicity, sex, disposition (where the injured person goes when released from the Emergency Department).

In addition to information on deaths and nonfatal injuries, there are also surveillance systems that provide national, state, and some local estimates of suicidal behavior. The Youth Risk Behavior Surveillance System (YRBSS) collects information from a nationally representative sample of 9-12 grade students and is a key resource in monitoring health-risk behaviors among youth, including whether youth have seriously considered attempting suicide, attempted suicide, made a plan, or required treatment by a doctor or nurse for a suicide attempt that resulted in an injury, poisoning, or overdose (Brener et al., 2013). The YRBSS data are obtained from a national school-based survey conducted by CDC as well as school-based state, territorial, tribal, and large urban school district survey conducted by education and health agencies. The National Survey on Drug Use and Health (NSDUH) is an annual nationwide survey of individuals aged 12 years and older that provides national and state-level estimates of drug use and mental health-related issues, including suicide ideation and suicide attempts.

It is also important at all levels (local, state, and federal) to address gaps in responses, track progress of prevention efforts and evaluate the impact of those efforts, including the impact of this technical package. Evaluation data, produced through program implementation and monitoring, is essential to provide information on what does and does not work to reduce rates of suicide and its associated risk and protective factors. Theories of change and logic models that identify short, intermediate, and long-term outcomes are an important part of program evaluation.



The evidence-base for suicide prevention has advanced greatly over the last few decades. However, additional research is needed to understand the impact of prevention programs on preventing suicide, as opposed to merely examining the effectiveness of programs to impact risk factors associated with suicide. More research is also needed to examine the effectiveness of upstream and community-level strategies to prevent suicide at the population level. Lastly, it will be important for researchers to test the effectiveness of combinations of the strategies and approaches included in this package. Most existing evaluations focus on approaches implemented in isolation. However, there is potential to understand the synergistic effects within a comprehensive prevention approach. Additional research is needed to understand the extent to which combinations of strategies and approaches result in greater reductions in suicide than individual programs, practices, or policies.

## Conclusion

Suicide is a serious public health problem whose rates have been on the rise for more than a decade and whose costs stretch well into the billions of dollars each year. And while suicide is a rare outcome statistically, its human impact has a ripple effect that is far-reaching. Each of us likely interacts with suicide survivors, those with lived experience, and those with thoughts of suicide, on a daily basis—at home, at work, and in our communities. Suicide and suicide attempts are therefore public health issues of societal concern. Fortunately, like many public health problems, suicide is preventable, and fortunately more is being done to prevent suicide than ever before, as evidenced by the work of the National Action Alliance for Suicide Prevention, the release of the first world report on suicide, more timely surveillance data, and critical mention in the President’s FY17 budget, to name just a few examples. Unfortunately and unlike most other public health problems, suicide still struggles against stigma, shame, and secrecy related to help-seeking, mental illness, being a survivor, or someone with lived experience; misplaced fear of asking someone about their risk of suicide (versus the fear and consequence of not asking), and fear of taking up certain strategies known to be effective but perhaps unpopular; misinformation about suicide preventability, and disproportionate funding given the public health burden. Suicide also struggles against the right degree of awareness where too much information, for example by well-meaning reporters and others, may actually do harm.

In an effort to continue pushing the field and society further towards prevention, this technical package includes strategies and approaches that ideally would be used in a comprehensive fashion, in combination—in a multi-level, multi-sectoral way. This technical package includes strategies and approaches targeting upstream prevention, e.g., social emotional learning for children and youth, as well as strategies focused more downstream, e.g., cognitive behavioral treatment to prevent re-attempts. It includes universal, selective, and indicated strategies, or strategies that focus on the whole population regardless of risk to strategies that focus on those groups at highest risk. Importantly, this technical package extends the bounds of the typical prevention strategies to consider approaches at the outer

levels of the social ecology, e.g., policies to stabilize housing and community engagement initiatives. In short, care and attention has been paid to all aspects of suicide prevention.

While the evidence base continues to be built, the collection of programs, policies, and practices laid out here are available for implementation now. And in keeping with good public health practice, the intent is that monitoring and evaluation will play a key role in that implementation. Moreover, as new evidence becomes available, this technical package can be refined to reflect the current state of the science.

In closing, and in keeping with a message of resilience as spoken by those with lived experience, ‘hope, help, and healing is possible.’



## References

- Arsenault-Lapierre, G., Kim, C., & Turecki, G. (2004). Psychiatric diagnoses in 3275 suicides: a meta-analysis. *BMC Psychiatry*, 4, 37. doi: 10.1186/1471-244X-4-37
- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*: Prentice-Hall, Inc.
- Basile, K. C., Espelage, D. L., Rivers, I., McMahon, P. M., & Simon, T. R. (2009). The theoretical and empirical links between bullying behavior and male sexual violence perpetration. *Aggression and violent behavior*, 14(5), 336-347.
- Basile, K. C., Hamburger, M. E., Swahn, M. H., & Choi, C. (2013). Sexual violence perpetration by adolescents in dating versus same-sex peer relationships: differences in associated risk and protective factors. *Western Journal of Emergency Medicine*, 14(4), 329.
- Beautrais, A. L. (2001). Effectiveness of barriers at suicide jumping sites: A case study. *Aust NZ J Psychiat*, 35. doi: 10.1080/0004867010060501
- Beautrais, A. L., Gibb, S. J., Fergusson, D. M., Horwood, L. J., & Larkin, G. L. (2009). Removing bridge barriers stimulates suicides: An unfortunate natural experiment. *Aust NZ J Psychiat*, 43. doi: 10.1080/00048670902873714
- Beyer, K. M., Layde, P. M., Hamberger, L. K., & Laud, P. W. (2015). Does neighborhood environment differentiate intimate partner femicides from other femicides? *Violence Against Women*, 21(1), 49-64. doi: 10.1177/1077801214564075
- Blair, J. M., Fowler, K. A., Jack, S. P., & Crosby, A. E. (2016). The National Violent Death Reporting System: overview and future directions. *Inj Prev*, 22 Suppl 1, i6-i11. doi: 10.1136/injuryprev-2015-041819
- Borowsky, I. W., Hogan, M., & Ireland, M. (1997). Adolescent sexual aggression: risk and protective factors. *Pediatrics*, 100(6), E7.
- Branas, C. C., Cheney, R. A., MacDonald, J. M., Tam, V. W., Jackson, T. D., & Ten Have, T. R. (2011). A difference-in-differences analysis of health, safety, and greening vacant urban space. *Am J Epidemiol*, 174(11), 1296-1306. doi: 10.1093/aje/kwr273
- Brown, G. K., Ten Have, T., Henriques, G. R., Xie, S. X., Hollander, J. E., & Beck, A. T. (2005). Cognitive therapy for the prevention of suicide attempts: a randomized controlled trial. *JAMA*, 294(5), 563-570. doi: 10.1001/jama.294.5.563
- Butchart, A., Phinney, A., Check, P., & Villaveces, A. (2004). *Preventing Violence: A Guide to Implementing the Recommendations of the World Report on Violence and Health*. Geneva, Switzerland: World Health Organization.
- Capaldi, D. M., Knoble, N. B., Shortt, J. W., & Kim, H. K. (2012). A Systematic Review of Risk Factors for Intimate Partner Violence. *Partner Abuse*, 3(2), 231-280. doi: 10.1891/1946-6560.3.2.231
- Carter, M., McGee, R., Taylor, B., & Williams, S. (2007). Health outcomes in adolescence: associations with family, friends and school engagement. *J Adolesc*, 30(1), 51-62. doi: 10.1016/j.adolescence.2005.04.002
- Cavanagh, J. T., Carson, A. J., Sharpe, M., & Lawrie, S. M. (2003). Psychological autopsy studies of suicide: a systematic review. *Psychol Med*, 33(3), 395-405.
- Centers for Disease Control and Prevention. (2009). Strategic direction for the prevention of suicidal behavior: Promoting individual, family, and community connectedness to prevent suicidal behavior. from Available at: [http://www.cdc.gov/ViolencePrevention/pdf/Suicide\\_Strategic\\_Direction\\_Full\\_version-a.pdf](http://www.cdc.gov/ViolencePrevention/pdf/Suicide_Strategic_Direction_Full_version-a.pdf)
- Centers for Disease Control and Prevention. (2016a). Child Maltreatment: Risk and Protective Factors. from Available at: <http://www.cdc.gov/violenceprevention/childmaltreatment/riskprotectivefactors.html>
- Centers for Disease Control and Prevention. (2016b). Elder Maltreatment: Risk and Protective Factors. from Available at: <http://www.cdc.gov/ViolencePrevention/eldermaltreatment/riskprotectivefactors.html>.
- Centers for Disease Control and Prevention. (2016c). Sexual Violence: Risk and Protective Factors. from Available at: <http://www.cdc.gov/ViolencePrevention/sexualviolence/riskprotectivefactors.html>

- Centers for Disease Control and Prevention. (2016d). Web-Based Injury Statistics Query and Reporting System (WISQARS). Retrieved June 3, 2016 Available at: <http://www.cdc.gov/injury/wisqars/index.html>
- Centers for Disease Control and Prevention. (2016e). Youth Violence: Risk and Protective Factors. from Available at: <http://www.cdc.gov/violenceprevention/youthviolence/riskprotectivefactors.html>
- Cerel, J., & Campbell, F. R. (2008). Suicide survivors seeking mental health services: a preliminary examination of the role of an active postvention model. *Suicide Life Threat Behav*, 38(1), 30-34. doi: 10.1521/suli.2008.38.1.30
- Cerel, J., McIntosh, J. L., Neimeyer, R. A., Maple, M., & Marshall, D. (2014). The Continuum of "Survivorship": Definitional Issues in the Aftermath of Suicide. *Suicide and life-threatening behavior*, 44(6), 591-600. doi: 10.1111/sltb.12093
- Chapman, A. L., & Dixon-Gordon, K. L. (2007). Emotional antecedents and consequences of deliberate self-harm and suicide attempts. *Suicide Life Threat Behav*, 37(5), 543-552. doi: 10.1521/suli.2007.37.5.543
- Cheripitel, C. J., Borges, G. L. G., & Wilcox, H. C. (2004). Acute alcohol use and suicidal behavior: A review of the literature. *Alcoholism: Clinical and Experimental Research*, 28(5 SUPPL.), 18S-28S.
- Classen, T. J., & Dunn, R. A. (2012). The effect of job loss and unemployment duration on suicide risk in the United States: a new look using mass-layoffs and unemployment duration. *Health Econ*, 21(3), 338-350. doi: 10.1002/hec.1719
- Coffey, C. E. (2006). Pursuing perfect depression care. *Psychiatr Serv*, 57(10), 1524-1526. doi: 10.1176/ps.2006.57.10.1524
- Coffey, C. E., Coffey, M. J., & Ahmedani, B. K. (2013). An update on perfect depression care. *Psychiatr Serv*, 64(4), 396. doi: 10.1176/appi.PS.640422
- Coffey, M., Coffey, C., & Ahmedani, B. K. (2015). Suicide in a health maintenance organization population. *JAMA Psychiatry*, 72(3), 294-296. doi: 10.1001/jamapsychiatry.2014.2440
- Comtois, K. A., Jobes, D. A., S. O'Connor, S., Atkins, D. C., Janis, K., E. Chesson, C., . . . Yuodelis-Flores, C. (2011). Collaborative assessment and management of suicidality (CAMS): feasibility trial for next-day appointment services. *Depress Anxiety*, 28(11), 963-972. doi: 10.1002/da.20895
- Coulton, C. J., Crampton, D. S., Irwin, M., Spilsbury, J. C., & Korbin, J. E. (2007). How neighborhoods influence child maltreatment: a review of the literature and alternative pathways. *Child Abuse Negl*, 31(11-12), 1117-1142. doi: 10.1016/j.chiabu.2007.03.023
- Cox, G. R., Owens, C., Robinson, J., Nicholas, A., Lockley, A., Williamson, M., . . . Pirkis, J. (2013). Interventions to reduce suicides at suicide hotspots: a systematic review. *BMC Public Health*, 13(1), 1-12. doi: 10.1186/1471-2458-13-214
- Crosby, A. E., Han, B., Ortega, L., Parks, S. E., & Gfroerer, J. (2011). Suicidal Thoughts and Behaviors Among Adults Aged ≥18 Years — United States, 2008–2009. *MMWR*, 60(No. SS-13), 1-22.
- Crosby, A. E., Ortega, L., & Melanson, C. (2011). Self-directed Violence Surveillance: Uniform Definitions and Recommended Data Elements, Version 1.0. Atlanta, GA: Centers for Disease Control and Prevention, National Center for Injury Prevention and Control.
- Crosby, A. E., & Sacks, J. J. (2002). Exposure to suicide: incidence and association with suicidal ideation and behavior: United States, 1994. *Suicide Life Threat Behav*, 32(3), 321-328.
- Curtin, S. C., Warner, M., & Hedegaard, H. (2016). *Increase in suicide in the United States, 1999-2014*. ( ). Hyattsville, MD: National Center for Health Statistics Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/25116188>.
- Cylus, J., Glymour, M. M., & Avendano, M. (2014). Do generous unemployment benefit programs reduce suicide rates? A state fixed-effect analysis covering 1968-2008. *Am J Epidemiol*, 180(1), 45-52. doi: 10.1093/aje/kwu106
- Dahlberg, L. L., & Krug, E. G. (2002). Violence-a global public health problem. In E. Krug, L. L. Dahlberg, J. A. Mercy, A. B. Zwi, & R. Lozano (Eds.), *World Report on Violence and Health* (pp. 1-56). Geneva, Switzerland: World Health Organization.



- DeGue, S., Massetti, G. M., Holt, M. K., Tharp, A. T., Valle, L. A., Matjasko, J. L., & Lippy, C. (2013). Identifying links between sexual violence and youth violence perpetration: New opportunities for sexual violence prevention. *Psychology of violence*, 3(2), 140.
- Deisenhammer, E. A., Ing, C. M., Strauss, R., Kemmler, G., Hinterhuber, H., & Weiss, E. M. (2009). The duration of the suicidal process: how much time is left for intervention between consideration and accomplishment of a suicide attempt? *J Clin Psychiatry*, 70(1), 19-24.
- Desai, R. A., Dausey, D. J., & Rosenheck, R. A. (2005). Mental health service delivery and suicide risk: the role of individual patient and facility factors. *Am J Psychiatry*, 162(2), 311-318. doi: 10.1176/appi.ajp.162.2.311
- Diamond, G. S., Wintersteen, M. B., Brown, G. K., Diamond, G. M., Gallop, R., Shelef, K., & Levy, S. (2010). Attachment-based family therapy for adolescents with suicidal ideation: a randomized controlled trial. *J Am Acad Child Adolesc Psychiatry*, 49(2), 122-131.
- Dunne, E. J., McIntosh, J. L., & Dunne-Maxim, K. (Eds.). (1987). *Suicide and its aftermath: Understanding and counseling the survivors*. New York: Norton.
- Durkheim, E. (1897/1951). *Suicide: A study in sociology* (JA Spaulding & G. Simpson, trans.). Glencoe, IL: Free Press. (Original work published 1897).
- Elgar, F. J., Craig, W., Boyce, W., Morgan, A., & Vella-Zarb, R. (2009). Income inequality and school bullying: multilevel study of adolescents in 37 countries. *J Adolesc Health*, 45(4), 351-359. doi: 10.1016/j.jadohealth.2009.04.004
- Escobedo, L. G., & Ortiz, M. (2002). The relationship between liquor outlet density and injury and violence in New Mexico. *Accid Anal Prev*, 34(5), 689-694.
- Etzersdorfer, E., & Sonneck, G. (1998). Preventing suicide by influencing mass-media reporting: The Viennese experience, 1980-1996. *Arch Suicide Res*, 4.
- Ferdon, C., Crosby, A. E., Caine, E. D., Hindman J., Reed, G. A., & Iskander, J. (In press). CDC Public Health Grand Rounds: Preventing Suicide through a Comprehensive Public Health Approach. *MMWR*.
- Flavin, P., & Radcliff, B. (2009). Public policies and suicide rates in the American states. *Social Indicators Research*, 90(2), 195-209.
- Fleischmann, A., Bertolote, J. M., Wasserman, D., De Leo, D., Bolhari, J., Botega, N. J., . . . Thanh, H. T. (2008). Effectiveness of brief intervention and contact for suicide attempters: a randomized controlled trial in five countries. *Bulletin of the World Health Organization*, 86(9), 703-709. doi: S0042-96862008000900014 [pii]
- Fowler, K. A., Gladden, R. M., Vagi, K. J., Barnes, J., & Frazier, L. (2015). Increase in suicides associated with home eviction and foreclosure during the US housing crisis: findings from 16 National Violent Death Reporting System States, 2005-2010. *Am J Public Health*, 105(2), 311-316. doi: 10.2105/AJPH.2014.301945
- Freisthler, B., Merritt, D. H., & LaScala, E. A. (2006). Understanding the ecology of child maltreatment: a review of the literature and directions for future research. *Child Maltreat*, 11(3), 263-280. doi: 10.1177/1077559506289524
- Frieden, T. R. (2010). A framework for public health action: the health impact pyramid. *Am J Public Health*, 100(4), 590-595. doi: 10.2105/AJPH.2009.185652
- Frieden, T. R. (2014). Six components necessary for effective public health program implementation. *Am J Public Health*, 104(1), 17-22. doi: 10.2105/AJPH.2013.301608
- Ghahramanlou-Holloway, M., Bhar, S., Brown, G., Olsen, C., & Beck, A. T. (2012). Changes in problem-solving appraisal after cognitive therapy for the prevention of suicide. *Psychological Medicine*, 42(06), 1185-1193.
- Giesbrecht, N., Huguette, N., Ogden, L., Kaplan, M. S., McFarland, B. H., Caetano, R., . . . Nolte, K. B. (2015). Acute alcohol use among suicide decedents in 14 US states: impacts of off-premise and on-premise alcohol outlet density. *Addiction*, 110(2), 300-307. doi: 10.1111/add.12762
- Goldsmith, S. K., Pellmar, T. C., Kleinman, A. M., & Bunney, W. E. (2002). *Reducing suicide: A national imperative*: National Academies Press.

- Gould, M. S., Cross, W., Pisani, A. R., Munfakh, J. L., & Kleinman, M. (2013). Impact of Applied Suicide Intervention Skills Training on the National Suicide Prevention Lifeline. *Suicide Life Threat Behav*, 43(6), 676-691. doi: 10.1111/sltb.12049
- Gould, M. S., Kalafat, J., Harrismunfakh, J. L., & Kleinman, M. (2007). An evaluation of crisis hotline outcomes. Part 2: Suicidal callers. *Suicide Life Threat Behav*, 37(3), 338-352. doi: 10.1521/suli.2007.37.3.338
- Grossman, D. C., Mueller, B. A., Riedy, C., Dowd, M. D., Villaveces, A., Prodzinski, J., . . . Harruff, R. (2005). Gun storage practices and risk of youth suicide and unintentional firearm injuries. *JAMA*, 293(6), 707-714. doi: 10.1001/jama.293.6.707
- Haddon, W. (1980). Advances in the epidemiology of injuries as a basis for public policy. *Public Health Reports*, 95(5), 411-421.
- Harris, K. M., Carpenter, C., & Bao, Y. (2006). The effects of state parity laws on the use of mental health care. *Med Care*, 44(6), 499-505. doi: 10.1097/01.mlr.0000215813.16211.00
- Hassanian-Moghaddam, H., Sarjami, S., Kolahi, A. A., & Carter, G. L. (2011). Postcards in Persia: randomised controlled trial to reduce suicidal behaviours 12 months after hospital-treated self-poisoning. *British Journal of Psychiatry*, 198(4), 309-316.
- Hawton, K. (2007). Restricting access to methods of suicide: Rationale and evaluation of this approach to suicide prevention. *Crisis*, 28. doi: 10.1027/0227-5910.28.s1.4
- Heise, L., & Garcia-Moreno, C. (2002). Violence by Intimate Partners. In E. Krug, L. L. Dahlberg, J. A. Mercy, A. B. Zwi, & R. Lozano (Eds.), *World Report on Violence and Health* (pp. 87-121). Geneva, Switzerland: World Health Organization.
- Herman, K. C., Borden, L. A., Reinke, W. M., & Webster-Stratton, C. (2011). The Impact of the Incredible Years Parent, Child, and Teacher Training Programs on Children's Co-Occurring Internalizing Symptoms. *Sch Psychol Q*, 26(3), 189-201. doi: 10.1037/a0025228
- Hong, J. S., Kral, M. J., Espelage, D. L., & Allen-Meares, P. (2012). The social ecology of adolescent-initiated parent abuse: a review of the literature. *Child Psychiatry Hum Dev*, 43(3), 431-454. doi: 10.1007/s10578-011-0273-y
- Hunkeler, E. M., Katon, W., Tang, L., Williams, J. W., Jr., Kroenke, K., Lin, E. H., . . . Unutzer, J. (2006). Long term outcomes from the IMPACT randomised trial for depressed elderly patients in primary care. *BMJ*, 332(7536), 259-263. doi: 10.1136/bmj.38683.710255.BE
- Inagaki, M., Kawashima, Y., Kawanishi, C., Yonemoto, N., Sugimoto, T., Furuno, T., . . . Yamada, M. (2015). Interventions to prevent repeat suicidal behavior in patients admitted to an emergency department for a suicide attempt: a meta-analysis. *J Affect Disord*, 175, 66-78. doi: 10.1016/j.jad.2014.12.048
- Jobes, D. A. (2012). The Collaborative Assessment and Management of Suicidality (CAMS): an evolving evidence-based clinical approach to suicidal risk. *Suicide Life Threat Behav*, 42(6), 640-653. doi: 10.1111/j.1943-278X.2012.00119.x
- Johnson, F. W., Gruenewald, P. J., & Remer, L. G. (2009). Suicide and alcohol: do outlets play a role? *Alcohol Clin Exp Res*, 33(12), 2124-2133. doi: 10.1111/j.1530-0277.2009.01052.x
- Kellam, S. G., Brown, C. H., Poduska, J. M., Ialongo, N. S., Wang, W., Toyinbo, P., . . . Wilcox, H. C. (2008). Effects of a universal classroom behavior management program in first and second grades on young adult behavioral, psychiatric, and social outcomes. *Drug Alcohol Depend*, 95 Suppl 1, S5-S28. doi: 10.1016/j.drugalcdep.2008.01.004
- Kitchener, B. A., & Jorm, A. F. (2004). Mental health first aid training in a workplace setting: a randomized controlled trial [ISRCTN13249129]. *BMC Psychiatry*, 4, 23. doi: 10.1186/1471-244X-4-23
- Kitchener, B. A., & Jorm, A. F. (2006). Mental health first aid training: review of evaluation studies. *Aust N Z J Psychiatry*, 40(1), 6-8. doi: 10.1111/j.1440-1614.2006.01735.x
- Kleiman, E. M., Riskind, J. H., Schaefer, K. E., & Weingarden, H. (2012). The moderating role of social support on the relationship between impulsivity and suicide risk. *Crisis*, 33(5), 273-279. doi: 10.1027/0227-5910/a000136



- Klevens, J., Simon, T. R., & Chen, J. (2012). Are the perpetrators of violence one and the same? Exploring the co-occurrence of perpetration of physical aggression in the United States. *J Interpers Violence*, 27(10), 1987-2002. doi: 10.1177/0886260511431441
- Knox, K. L., Litts, D. A., Talcott, G. W., Feig, J. C., & Caine, E. D. (2003). Risk of suicide and related adverse outcomes after exposure to a suicide prevention programme in the US Air Force: cohort study. *BMJ*, 327(7428), 1376.
- Knox, K. L., Pflanz, S., Talcott, G. W., Campise, R. L., Lavigne, J. E., Bajorska, A., . . . Caine, E. D. (2010). The US Air Force suicide prevention program: implications for public health policy. *Am J Public Health*, 100(12), 2457-2463. doi: 10.2105/ajph.2009.159871
- Knox, M. S., Burkhart, K., & Hunter, K. E. (2010). ACT against violence parents raising safe kids program: Effects on maltreatment-related parenting behaviors and beliefs. *Journal of Family Issues*.
- Lang, M. (2013). The impact of mental health insurance laws on state suicide rates. *Health Econ*, 22(1), 73-88. doi: 10.1002/hecl.1816
- Linehan, M. M., Comtois, K. A., Murray, A. M., Brown, M. Z., Gallop, R. J., Heard, H. L., . . . Lindenboim, N. (2006). Two-year randomized controlled trial and follow-up of dialectical behavior therapy vs therapy by experts for suicidal behaviors and borderline personality disorder. *Arch Gen Psychiatry*, 63(7), 757-766. doi: 10.1001/archpsyc.63.7.757
- Losel, F., & Farrington, D. P. (2012). Direct protective and buffering protective factors in the development of youth violence. *Am J Prev Med*, 43(2 Suppl 1), S8-S23. doi: 10.1016/j.amepre.2012.04.029
- Luo, F., Florence, C. S., Quispe-Agnoli, M., Ouyang, L., & Crosby, A. E. (2011). Impact of business cycles on US suicide rates, 1928-2007. *Am J Public Health*, 101(6), 1139-1146. doi: 10.2105/ajph.2010.300010
- Maimon, D., Browning, C. R., & Brooks-Gunn, J. (2010). Collective efficacy, family attachment, and urban adolescent suicide attempts. *J Health Soc Behav*, 51(3), 307-324. doi: 10.1177/0022146510377878
- Mishara, B. L. (Ed.). (1995). *The Impact of Suicide*. New York: Springer.
- Mishara, B. L., & Martin, N. (2012). Effects of a comprehensive police suicide prevention program. *Crisis: Journal of Crisis Intervention & Suicide*, 33(3), 162-168.
- Mitchell, A. M., Kim, Y., Prigerson, H. G., & Mortimer-Stephens, M. (2004). Complicated grief in survivors of suicide. *Crisis*, 25(1), 12-18. doi: 10.1027/0227-5910.25.1.12
- Motto, J. A., & Bostrom, A. G. (2001). A randomized controlled trial of postcrisis suicide prevention. *Psychiatr Serv*, 52(6), 828-833.
- Muennig, P., Cohen, A. K., Palmer, A., & Zhu, W. (2013). The relationship between five different measures of structural social capital, medical examination outcomes, and mortality. *Soc Sci Med*, 85, 18-26. doi: 10.1016/j.socscimed.2013.02.007
- National Action Alliance for Suicide Prevention. (2014). Research Prioritization Task Force.(2014). *A prioritized research agenda for suicide prevention: An action plan to save lives*.
- National Action Alliance for Suicide Prevention. (2016). Action Alliance Priorities. Retrieved July 12, 2016, from <http://actionallianceforsuicideprevention.org/priorities>
- National Action Alliance for Suicide Prevention: Suicide Attempt Survivors Task Force. (2014). *The Way Forward: Pathways to hope, recovery, and wellness with insights from lived experience*. Washington, D.C. : Author.
- National Action Alliance for Suicide Prevention: Survivors of Suicide Loss Task Force. (2015). *Responding to Grief, Trauma, and Distress After a Suicide: U.S. National Guidelines*. Washington, D.C. : Author.
- Niederkrotenthaler, T., & Sonneck, G. (2007). Assessing the impact of media guidelines for reporting on suicides in Austria: Interrupted time series analysis. *Aust N Z J Psychiatry*, 41. doi: 10.1080/00048670701266680
- Olfson, M., Gerhard, T., Huang, C., Crystal, S., & Stroup, T. S. (2015). Premature Mortality Among Adults With Schizophrenia in the United States. *JAMA Psychiatry*, 72(12), 1172-1181. doi: 10.1001/jamapsychiatry.2015.1737
- Owens, D. (2002). Fatal and non-fatal repetition of self-harm: Systematic review. *British Journal of Psychiatry*, 181(3), 193-199.

- Pena, J. B., & Caine, E. D. (2006). Screening as an approach for adolescent suicide prevention. *Suicide Life Threat Behav*, 36(6), 614-637. doi: 10.1521/suli.2006.36.6.614
- Perron, S., Burrows, S., Fournier, M., Perron, P. A., & Ouellet, F. (2013). Installation of a bridge barrier as a suicide prevention strategy in Montreal, Quebec, Canada. *Am J Public Health*, 103(7), 1235-1239. doi: 10.2105/ajph.2012.301089
- Pinchevsky, G. M., & Wright, E. M. (2012). The impact of neighborhoods on intimate partner violence and victimization. *Trauma Violence Abuse*, 13(2), 112-132. doi: 10.1177/1524838012445641
- Pirkis, J., Too, L. S., Spittal, M. J., Kryszinska, K., Robinson, J., & Cheung, Y. T. D. (2015). Interventions to reduce suicides at suicide hotspots: a systematic review and meta-analysis. *The Lancet Psychiatry*, 2(11), 994-1001. doi: [http://dx.doi.org/10.1016/S2215-0366\(15\)00266-7](http://dx.doi.org/10.1016/S2215-0366(15)00266-7)
- Pitman, A., Osborn, D., King, M., & Erlangsen, A. (2014). Effects of suicide bereavement on mental health and suicide risk. *Lancet Psychiatry*, 1, 86-94.
- Pollock, L. R., & Williams, J. M. (2004). Problem-solving in suicide attempters. *Psychol Med*, 34(1), 163-167.
- Reeves, A., Stuckler, D., McKee, M., Gunnell, D., Chang, S. S., & Basu, S. (2012). Increase in state suicide rates in the USA during economic recession. *Lancet*, 380(9856), 1813-1814. doi: 10.1016/S0140-6736(12)61910-2
- Reid, M. J., Webster-Stratton, C., & Hammond, M. (2003). Follow-up of children who received the Incredible Years intervention for oppositional-defiant disorder: Maintenance and prediction of 2-year outcome. *Behavior Therapy*, 34(4), 471-491.
- Resnick, M. D., Ireland, M., & Borowsky, I. (2004). Youth violence perpetration: what protects? What predicts? Findings from the National Longitudinal Study of Adolescent Health. *J Adolesc Health*, 35(5), 424 e421-410. doi: 10.1016/j.jadohealth.2004.01.011
- Rowhani-Rahbar, A., Simonetti, J. A., & Rivara, F. P. (2016). Effectiveness of Interventions to Promote Safe Firearm Storage. *Epidemiol Rev*, 38(1), 111-124. doi: 10.1093/epirev/mxv006
- Runyan, C. W., Becker, A., Brandspiegel, S., Barber, C., Trudeau, A., & Novins, D. (2016). Lethal Means Counseling for Parents of Youth Seeking Emergency Care for Suicidality. *West J Emerg Med*, 17(1), 8-14. doi: 10.5811/westjem.2015.11.28590
- Runyan, D., Wattam, C., Ikeda, R., Hassan, F., & Ramiro, L. (2002). Child abuse and neglect by parents and other caregivers. In E. Krug, L. L. Dahlberg, J. A. Mercy, A. B. Zwi, & R. Lozano (Eds.), *World Report on Violence and Health* (pp. 59-86). Geneva, Switzerland: World Health Organization.
- Sampson, R. J., Morenoff, J. D., & Gannon-Rowley, T. (2002). Assessing "Neighborhood Effects": Social Processes and New Directions in Research. *Annual Review of Sociology*, 28, 443-478.
- Schilling, E. A., Aseltine, R. H., Jr., & James, A. (2016). The SOS Suicide Prevention Program: Further Evidence of Efficacy and Effectiveness. *Prev Sci*, 17(2), 157-166. doi: 10.1007/s11121-015-0594-3
- Shepard, D. S., Gurewich, D., Lwin, A. K., Reed, G. A., Jr., & Silverman, M. M. (2016). Suicide and Suicidal Attempts in the United States: Costs and Policy Implications. *Suicide Life Threat Behav*, 46(3), 352-362. doi: 10.1111/sltb.12225
- Silverman, M. M., & Maris, R. W. (1995). The prevention of suicidal behaviors: An overview. *Suicide and life-threatening behavior*, 25(1), 10-21.
- Simon, O. R., Swann, A. C., Powell, K. E., Potter, L. B., Kresnow, M. J., & O'Carroll, P. W. (2001). Characteristics of impulsive suicide attempts and attempters. *Suicide Life Threat Behav*, 32(1 Suppl), 49-59.
- Spoth, R. L., Gyll, M., & Day, S. X. (2002). Universal family-focused interventions in alcohol-use disorder prevention: cost-effectiveness and cost-benefit analyses of two interventions. *J Stud Alcohol*, 63(2), 219-228.
- Substance Abuse and Mental Health Services Administration. (2014). *Report to Congress: Garrett Lee Smith Suicide Prevention Program*. Rockville, MD.
- Sudak, H., Maxim, K., & Carpenter, M. (2008). Suicide and stigma: a review of the literature and personal reflections. *Acad Psychiatry*, 32(2), 136-142. doi: 10.1176/appi.ap.32.2.136



- Szumilas, M., & Kutcher, S. (2011). Post-suicide intervention programs: a systematic review. *Can J Public Health*, 102(1), 18-29.
- Townsend, E., Hawton, K., Altman, D. G., Arensman, E., Gunnell, D., Hazell, P., . . . Van Heeringen, K. (2001). The efficacy of problem-solving treatments after deliberate self-harm: meta-analysis of randomized controlled trials with respect to depression, hopelessness and improvement in problems. *Psychological Medicine*, 31(6), 979-988.
- U.S. Office of the Surgeon General, & National Action Alliance for Suicide Prevention. (2012). *2012 National Strategy for Suicide Prevention: Goals and Objectives for Action*. Washington, D.C.: HHS.
- U.S. Public Health Service. (1999). *The Surgeon General's Call to Action to Prevent Suicide*. Washington, D.C.
- Unutzer, J., Tang, L., Oishi, S., Katon, W., Williams, J. W., Jr., Hunkeler, E., . . . Langston, C. (2006). Reducing suicidal ideation in depressed older primary care patients. *J Am Geriatr Soc*, 54(10), 1550-1556.
- Visser, V. S., Comans, T. A., & Scuffham, P. A. (2014). Evaluation Of The Effectiveness Of A Community-Based Crisis Intervention Program For People Bereaved By Suicide. *Journal of Community Psychology*, 42(1), 19-28. doi: 10.1002/jcop.21586
- Wang, Y. C., Hsieh, L. Y., Wang, M. Y., Chou, C. H., Huang, M. W., & Ko, H. C. (2016). Coping Card Usage can Further Reduce Suicide Reattempt in Suicide Attempter Case Management Within 3-Month Intervention. *Suicide Life Threat Behav*, 46(1), 106-120. doi: 10.1111/sltb.12177
- Wasserman, D., Hoven, C. W., Wasserman, C., Wall, M., Eisenberg, R., Hadlaczky, G., . . . Carli, V. (2014). School-based suicide prevention programmes: The SEYLE cluster-randomised, controlled trial. *The Lancet*, 385(9977), 1536-1544. doi: 10.1016/S0140-6736(14)61213-7
- Webster-Stratton, C., & Hammond, M. (1997). Treating children with early-onset conduct problems: a comparison of child and parent training interventions. *J Consult Clin Psychol*, 65(1), 93-109.
- Webster-Stratton, C., Reid, M. J., & Hammond, M. (2001). Preventing conduct problems, promoting social competence: a parent and teacher training partnership in head start. *J Clin Child Psychol*, 30(3), 283-302. doi: 10.1207/S15374424JCCP3003\_2
- Webster-Stratton, C. H., Reid, M. J., & Beauchaine, T. (2011). Combining parent and child training for young children with ADHD. *Journal of Clinical Child & Adolescent Psychology*, 40(2), 191-203.
- Webster-Stratton, C., Jamila Reid, M., & Stoolmiller, M. (2008). Preventing conduct problems and improving school readiness: evaluation of the incredible years teacher and child training programs in high-risk schools. *Journal of child psychology and psychiatry*, 49(5), 471-488.
- Widome, R., Sieving, R. E., Harpin, S. A., & Hearst, M. O. (2008). Measuring neighborhood connection and the association with violence in young adolescents. *J Adolesc Health*, 43(5), 482-489. doi: 10.1016/j.jadohealth.2008.04.013
- Wilcox, H. C., Kellam, S. G., Brown, C. H., Poduska, J. M., Ialongo, N. S., Wang, W., & Anthony, J. C. (2008). The impact of two universal randomized first- and second-grade classroom interventions on young adult suicide ideation and attempts. *Drug Alcohol Depend*, 95 Suppl 1, S60-73.
- Wilson, W. J. (2011). *When work disappears: The world of the new urban poor*: Vintage.
- World Health Organization. (2014). *Suicide Prevention: A Global Imperative*. Geneva, Switzerland: WHO Press.
- Wyman, P. A., Brown, C. H., LoMurray, M., Schmeelk-Cone, K., Petrova, M., Yu, Q., . . . Wang, W. (2010). An outcome evaluation of the Sources of Strength suicide prevention program delivered by adolescent peer leaders in high schools. *Am J Public Health*, 100(9), 1653-1661. doi:
- Yip, P., Caine, E., Yousuf, S., Chang, S.-S., Wu, K., & Chen, Y.-Y. (2012). Means restriction for suicide prevention. *Lancet*, 379. doi: 10.1016/s0140-6736(12)60521-2

## Appendix A: Summary of Strategies and Approaches to Prevent Suicide

Strategy	Approach/Program, Practice or Policy	Best Available Evidence			Lead Sectors <sup>1</sup>
		Suicide	Suicide Attempts or Ideation	Other Risk/Protective Factors for Suicide	
Strengthen economic supports	Strengthen household financial security				
	Unemployment benefit programs	✓			Government (local, state, Federal)
	Housing stabilization policies				
	The National Neighborhood Stabilization Program			✓	Government (local, state, Federal)
Strengthen access to mental health care	Coverage of mental health conditions in health insurance policies				
	Mental Health Parity Laws	✓		✓	Government (state, Federal)  Health care
Establish protective environments	Reducing access to lethal means among persons at-risk				
	Intervening at hot spots	✓			Government (local, state, Federal)
	Safe storage practices		✓	✓	Public Health
	Organizational policies and culture				
	Together for Life	✓			Business/Labor



		Best Available Evidence			
	<i>US Air Force Suicide Prevention Program</i>	✓		✓	Government (local, state, Federal)
	Community-based policies to reduce excessive alcohol use				
	<i>Alcohol outlet density</i>	✓		✓	Government (local, state, Federal)
Promote connectedness to protect against suicide	Peer norm approaches				
	<i>Sources of Strength</i>			✓	Public Health Social Services
	Community-engagement activities				
	<i>Greening vacant urban spaces</i>			✓	Public Health
Teach coping and problem- solving skills	Social emotional learning				
	<i>Youth Aware of Mental Health Program</i>		✓		Public Health
	<i>Signs of Suicide</i>		✓	✓	Education
	<i>Good Behavior Game</i>		✓	✓	
	Parenting skill and family relationship approaches				
	<i>The Incredible Years</i>			✓	Public Health
				Education	

		Best Available Evidence			
	<i>Strengthening Families 10-14</i>			✓	
Identify and support people at-risk	Gatekeeper training				
	<i>Mental Health First Aid</i>			✓	Public Health Healthcare Social Services
	Screening combined with care management				
	<i>Henry Ford Perfect Depression Care (Pre-cursor to Zero Suicide)</i>	✓		✓	Healthcare
	Crisis Intervention				
	<i>National Suicide Prevention Lifeline</i>		✓	✓	Public Health Social Services
	<i>Applied Suicide Intervention Skills Training</i>		✓	✓	
Treatment for people at risk of suicide					
	<i>Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)</i>		✓	✓	Healthcare Social Services
	<i>Collaborative Assessment and Management of Suicidality (CAMS)</i>		✓	✓	



		Best Available Evidence			
Intervene to lessen harms and prevent future risk	<i>Dialectical Behavioral Therapy</i>		✓	✓	
	<i>Attachment-Based Family Therapy</i>		✓		
	Treatment to prevent re-attempts				
	<i>ED Brief Intervention with Follow-up Visits</i>	✓			Healthcare
	<i>Active follow-up contact approaches</i>	✓	✓		
	<i>CBT for Suicide Prevention</i>				
	Postvention				
	<i>StandBy Response Service</i>		✓		Healthcare
	Safe messaging following a suicide				
	<i>Media Guidelines</i>	✓			Public Health

<sup>1</sup>This column refers to the lead sectors well positioned to bring leadership and resources to implementation efforts. For each strategy, there are many other sectors such as non-governmental organizations that are instrumental to prevention planning and implementing the specific programmatic activities.

**Title...**

**A Technical Package to Prevent Suicide**

**Prepared by:**

**Division of Violence Prevention  
National Center for Injury Prevention and Control (NCIPC)  
Centers for Disease Control and Prevention**

**2016**



**[Title] is a publication of the National Center for Injury Prevention and Control of the Centers for Disease Control and Prevention.**

Centers for Disease Control and Prevention  
Thomas R. Frieden, MD, MPH, Director

National Center for Injury Prevention and Control  
Debra E. Houry, MD, MPH, Director

Division of Violence Prevention  
James A. Mercy, PhD, Director

*Suggested Citation:* [authors] *A Technical Package to Prevent....* Atlanta, GA: National Center for Injury Prevention and Control, Centers for Disease Control and Prevention, 2016.

## Contents



## External Reviewers

[to be inserted later]

## Acknowledgments

[to be inserted later]



## Overview

This technical package represents a select group of strategies based on the best available evidence to help communities and states sharpen their focus on prevention activities with the greatest potential to prevent suicide. Broadly, the strategies represented include those with a focus on preventing suicide from happening in the first place as well as approaches to lessen the immediate and long-term effects of suicidal behavior for individuals, families, communities, and society. Specifically, the strategies include strengthening economic supports; strengthening access to mental health care; establishing protective environments; promoting connectedness to protect against suicide; teaching coping and problem-solving skills; identifying and supporting people at-risk; and intervening to lessen harms and prevent future risk.

This package supports the National Strategy for Suicide prevention, Goal 1, “Integrate and coordinate suicide prevention activities across multiple sectors and settings.” (p.29) It also supports the National Action Alliance for Suicide Prevention’s priority (2016) “To create and disseminate a framework for comprehensive community-based suicide prevention.”

Commitment, cooperation, and leadership from numerous sectors, including public health, education, justice, health care, social services, business/labor, and government can bring about the successful implementation of this package.

### What is a Technical Package?

A technical package is a compilation of a core set of strategies to achieve and sustain substantial reductions in a specific risk factor or outcome (Frieden, 2014). Technical packages help communities and states prioritize prevention activities based on the best available evidence. This technical package has three components. The first component is the **strategy** or the preventive direction or actions to achieve the goal of preventing suicide. The second component is the **approach**. The approach includes the specific ways to advance the strategy. This can be accomplished through *programs, policies, and practices*. The approaches included come primarily from studies based in the United States. The **evidence** for each of the approaches in preventing suicide or its associated risk factors is included as the third component. This package is intended as a resource to guide and inform prevention decision-making in communities and states.

### Preventing Suicide is a Priority

Suicide, as defined by the Centers for Disease Control and Prevention (CDC), is part of a broader class of behavior called *self-directed violence*. Self-directed violence refers to behavior directed at oneself that deliberately results in injury or the *potential* for injury (Crosby, Ortega, & Melanson, 2011). Self-directed violence may be *suicidal* or *non-suicidal* in nature. For the purposes of this document, we refer only to behavior where suicide is intended.

- **Suicide** is a death caused by self-directed injurious behavior with any intent to die as a result of the behavior.
- **Suicide attempt** is defined as a *non-fatal* self-directed and potentially injurious behavior with any intent to die as a result of the behavior. A suicide attempt may or may not result in injury.

### **Suicide is highly prevalent.**

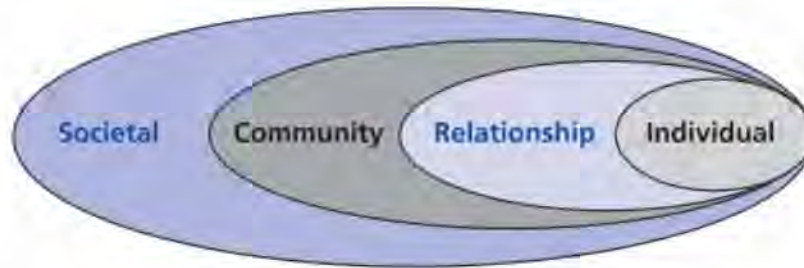
Suicide presents a major challenge to public health in the United States and worldwide. It contributes to premature death, morbidity, lost productivity, and health care costs (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014). In 2014 in the U.S., the most recent death data available, suicide was responsible for 42,773 deaths, which is approximately one suicide every 12 minutes (Centers for Disease Control and Prevention, 2016d). In 2014, suicide ranked as the tenth leading cause of death and has been among the top twelve leading causes of death since 1975 in the U.S (Centers for Disease Control and Prevention, 2016d). Overall suicide rates have increased 24% from 1999 to 2014 (Curtin, Warner, & Hedegaard, 2016). Suicide is a problem throughout the life span; it is the second leading cause of death among those aged 10–19 years, also second among persons in their 20s and 30s; it is the fourth leading cause among persons in their 40s and seventh among persons in their 50s (Centers for Disease Control and Prevention, 2016d).

Suicides reflect only a portion of the problem (Crosby, Han, Ortega, Parks, & Gfroerer, 2011). Substantially more people are hospitalized as a result of nonfatal suicidal behaviors (i.e. suicide attempts) than are fatally injured, and an even greater number are either treated in ambulatory settings (e.g., emergency departments) or not treated at all (Crosby, Han, et al., 2011). For example, during 2014, among adults aged 18 years and older, for every one suicide there were 9 adults treated in hospital emergency departments for self-harm injuries, 27 who reported making a suicide attempt, and over 227 who reported seriously considering suicide (i.e. ideation) (Ferdon et al., In press). Suicides, suicide attempts, and ideation take an immense emotional, physical, and economic toll (see p. 9) on individuals, families and communities. By one conservative estimate, for every death by suicide six people are directly impacted (i.e. survivors). Based on this figure it is estimated that there are over 13 million survivors in the U.S. and unfortunately, survivorship itself is a risk factor for suicide (Crosby & Sacks, 2002).

### **Suicide is associated with several risk and protective factors.**

Suicide, like other human behaviors, is complex with no single determining cause. Instead, suicide occurs in response to multiple biological, psychological, interpersonal, environmental and societal influences that interact with one another, often over time. The social-ecological model is a useful framework for viewing and understanding suicide risk factors identified in the literature (Dahlberg & Krug, 2002):





Some risk Factors for suicide include (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014):

- **Individual:** History of depression and other mental illnesses, alcohol and drug abuse, previous suicide attempt, violence victimization, genetic and biological determinants, hopelessness
- **Relationship:** High conflict or violent relationships, sense of isolation and lack of social support, family/loved one's history of suicide, financial and work stress
- **Community:** Inadequate community connectedness, barriers to health care (e.g., lack of access to providers and medications)
- **Societal:** Availability of lethal means of suicide, unsafe media portrayals of suicide, stigma associated with help-seeking and mental illness

It is important to recognize that the vast majority of individuals who are depressed (or who have other risk factors) do *not* die by suicide. Furthermore, the relevance of each risk factor can vary by age, race, gender, sexual orientation, residential geography, and socio-cultural and economic status (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014)

Protective factors, or those influences that guard *against* the risk for suicide, can also be found across the different levels of the social-ecological model. Protective factors identified in the literature include: effective coping and problem solving skills, moral objections to suicide, strong and supportive relationships with partners, friends, and family; connectedness to school, community and other social institutions; availability of quality and ongoing physical and mental health care, and reduced access to lethal means (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014). These protective factors can either counter a specific risk factor or guard against a number of risks associated with suicide.

### **Suicide is connected to other forms of violence.**

As indicated above, suicide is connected to other forms of violence. Suicide and other forms of violence often share some of the same root causes (Butchart, Phinney, Check, & Villaveces, 2004; Klevens, Simon, & Chen, 2012). For example, in neighborhoods where there is low social cohesion, or where residents don't support and trust each other, people are at higher risk for suicide (Desai, Dausey, &

Rosenheck, 2005) as well as perpetration of child maltreatment (Coulton, Crampton, Irwin, Spilsbury, & Korbin, 2007; Freisthler, Merritt, & LaScala, 2006), teen dating violence (Capaldi, Knoble, Shortt, & Kim, 2012), intimate partner violence (Pinchevsky & Wright, 2012), and youth violence (Sampson, Morenoff, & Gannon-Rowley, 2002). Additionally, a lack of economic opportunities and unemployment are associated with suicide (Luo, Florence, Quispe-Agnoli, Ouyang, & Crosby, 2011; Reeves et al., 2012), as well as perpetration of child maltreatment (D. Runyan, Wattam, Ikeda, Hassan, & Ramiro, 2002), intimate partner violence (Heise & Garcia-Moreno, 2002; Pinchevsky & Wright, 2012), sexual violence (Centers for Disease Control and Prevention, 2016c) and youth violence (Wilson, 2011). Other shared risk factors for suicide and violence occur at the individual level and include substance abuse, mental health problems, witnessing violence, and a lack of problem-solving skills (Centers for Disease Control and Prevention, 2016a, 2016c, 2016e; U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012).

Just as risk factors may be shared across suicide and violence, so too may protective factors overlap. For example, connectedness increases individual's and communities' resilience to suicide and other forms of violence, including connectedness to one's community (Basile, Hamburger, Swahn, & Choi, 2013; Borowsky, Hogan, & Ireland, 1997; Centers for Disease Control and Prevention, 2016b; Coulton et al., 2007; Kleiman, Riskind, Schaefer, & Weingarden, 2012; Pinchevsky & Wright, 2012; Widome, Sieving, Harpin, & Hearst, 2008), school (Basile, Espelage, Rivers, McMahon, & Simon, 2009; Capaldi et al., 2012; Carter, McGee, Taylor, & Williams, 2007; DeGue et al., 2013; Hong, Kral, Espelage, & Allen-Meares, 2012; Losel & Farrington, 2012), family (Capaldi et al., 2012; Centers for Disease Control and Prevention, 2016a; Elgar, Craig, Boyce, Morgan, & Vella-Zarb, 2009; Maimon, Browning, & Brooks-Gunn, 2010; Resnick, Ireland, & Borowsky, 2004), caring adults (Capaldi et al., 2012; Losel & Farrington, 2012; Maimon et al., 2010), and pro-social peers (Capaldi et al., 2012; Losel & Farrington, 2012).

### **The health and economic consequences of suicide are substantial.**

Suicide and suicide attempts have far-reaching consequences for individuals, families, and communities (Dunne, McIntosh, & Dunne-Maxim, 1987; Mishara, 1995; National Action Alliance for Suicide Prevention: Suicide Attempt Survivors Task Force, 2014; National Action Alliance for Suicide Prevention: Survivors of Suicide Loss Task Force, 2015). Research indicates that the health consequences of violence, including suicide, are much more extensive than injury and death. Suicide attempt survivors (i.e. those with lived experience) may suffer long-term health and mental health consequences ranging from anger, guilt, and physical impairment, depending on the means and severity of the attempt (Chapman & Dixon-Gordon, 2007). Similarly, survivors of a loved one's suicide may experience ongoing pain and suffering including complicated grief (Mitchell, Kim, Prigerson, & Mortimer-Stephens, 2004), stigma, depression, anxiety, post-traumatic stress disorder, and increased risk of suicidal ideation and suicide (Julie Cerel, McIntosh, Neimeyer, Maple, & Marshall, 2014; Sudak, Maxim, & Carpenter, 2008).



The economic toll of suicide is immense as well. The total lifetime costs associated with nonfatal injuries and deaths caused by self-directed violence in 2013 were approximately \$93.5 billion after adjusting for under-reporting of suicide (Shepard, Gurewich, Lwin, Reed, & Silverman, 2016). The overwhelming burden of these costs results from lost productivity over the life course, with the average cost per suicide being over \$1.3 million (Shepard et al., 2016).

### **Suicide can be prevented.**

Despite the myths surrounding suicide, like most public health problems, suicide is preventable (U.S. Public Health Service, 1999). And while progress will continue to be made into the future, evidence for numerous programs, practices, and policies currently exists, and many programs are ready to be implemented now. Just as suicide is not caused by a single factor, research suggests that suicide will not be prevented by any single intervention taking place in any single setting (Silverman & Maris, 1995; U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). Rather, suicide prevention is best achieved by a focus across the individual-, relationship-, family-, community, and societal-levels and across all sectors, private and public (e.g., business, public health, physical and behavioral healthcare, justice, education, labor) (National Action Alliance for Suicide Prevention, 2014; World Health Organization, 2014). According to Frieden (2014), successful public health programs also require political commitment, funding, communication, and performance monitoring.

### **Assessing the Evidence**

This technical package includes programs, practices, and policies with evidence of impact on suicide or risk or protective factors for suicide. To be considered for inclusion in the technical package, the program, practice, or policy selected had to meet at least one of these criteria: a) meta-analyses or systematic reviews showing impact on suicide; b) evidence from at least one rigorous (e.g., randomized controlled trial [RCT] or quasi-experimental design) evaluation study that found significant preventive effects on suicide; c) meta-analyses or systematic reviews showing impact on risk or protective factors for suicide, or d) evidence from at least one rigorous (e.g., RCT or quasi-experimental design) evaluation study that found significant impacts on risk or protective factors for suicide. Finally, consideration was also given to the likelihood of achieving beneficial effects on multiple forms of violence; no evidence of harmful effects on specific outcomes or with particular subgroups; and feasibility of implementation in a U.S. context if the program, policy, or practice has been evaluated in another country.

Within this technical package, some approaches do not yet have research evidence demonstrating impact on rates of suicide but instead are supported by evidence indicating impacts on risk or protective factors for suicide (e.g., help-seeking, stigma reduction, depression, connectedness). In terms of the strength of the evidence, programs that have demonstrated effects on suicidal behavior (e.g., reductions in deaths, attempts) provide a higher-level of evidence, but the evidence base is not that strong in all areas. For instance, there has been less evaluation of community engagement and



family programs on suicidal behavior. Thus, approaches in this package that have effects on risk or protective factors reflect the developmental nature of the evidence base and the use of the best available evidence at a given time.

It is also important to note that there is often significant heterogeneity among the programs, policies, or practices that fall within one approach or strategy area in terms of the nature and quality of the available evidence. Not all programs, policies, or practices that utilize the same approach (e.g., gatekeeper training) are equally effective, and even those that are effective may not work across all populations. Tailoring programs and more evaluation may be necessary to address different population groups. The examples provided are not intended to be a comprehensive list of evidence-based programs, policies, or practices for each approach, but rather illustrate models that have been shown to impact suicide or have beneficial effects on risk or protective factors for suicide. In practice, the effectiveness of the programs, policies and practices identified in this package will be strongly dependent on the quality of their implementation and the communities in which they are implemented. Implementation guidance to assist practitioners, organizations and communities will be developed separately.

### Context and Cross-Cutting Themes

The strategies and approaches that have been included in this technical package represent different levels of the social ecology, with efforts intended to impact the community and societal levels, as well individual and relationship levels. The strategies and approaches are intended to work in combination and reinforce each other to prevent suicide (see box below). The strategies are arranged in order such that those strategies hypothesized to have the greatest potential for broad public health impact on suicide are included first, followed by those that might impact more select populations (e.g., persons who have already made a suicide attempt).

Preventing Suicide	
Strategy	Approach
Strengthen economic supports	<ul style="list-style-type: none"> <li>Strengthen financial security</li> <li>Housing stabilization policies</li> </ul>
Strengthen access to mental health care	<ul style="list-style-type: none"> <li>Coverage of mental health conditions in health insurance policies</li> </ul>
Establish protective environments	<ul style="list-style-type: none"> <li>Means restriction</li> <li>Organizational policies and culture</li> <li>Community-based policies to reduce excessive alcohol use</li> </ul>
Promote connectedness to protect against suicide	<ul style="list-style-type: none"> <li>Peer norm approaches</li> <li>Community engagement activities</li> </ul>



Teach coping and problem-solving skills	<ul style="list-style-type: none"> <li>• Social-emotional learning</li> <li>• Parenting skill and family relationship approaches</li> </ul>
Identify and support people at risk	<ul style="list-style-type: none"> <li>• Gatekeeper training</li> <li>• Screening combined with care management</li> <li>• Crisis intervention</li> </ul>
Intervene to lessen harms and prevent future risk	<ul style="list-style-type: none"> <li>• Treatment for people at-risk of suicide</li> <li>• Treatment to prevent re-attempts</li> <li>• Postvention</li> <li>• Safe messaging following a suicide</li> </ul>

The example programs, policies, and practices have been implemented within particular contexts. The social and cultural context of communities is critically important to take into account when selecting strategies and approaches. Practitioners in the field may be in the best position to assess the needs and strengths of their communities and work with community members to make decisions about the combination of approaches included here that are best suited to their context.

Suicide ideation, attempts, morbidity and mortality vary by gender, race/ethnicity, age, occupation, and other important population characteristics. Barriers to disclosure, help seeking, timely access to quality care, and ongoing support are profoundly complex and may also vary by population and community characteristics. Ideally, the availability of multiple approaches tailored to the economic, cultural, and environmental context of individuals and communities are desirable as they may increase the likelihood of removing barriers to supportive and effective care and provide opportunities to develop individual and community resilience. These culturally appropriate approaches can then be included in comprehensive strategies to maximize the public health impact on reducing suicide-related morbidity and mortality among individuals and within communities.

This package includes strategies where public health agencies are well positioned to bring leadership and resources to implementation efforts. It also includes strategies where public health can serve as an important collaborator (e.g., strategies addressing community and societal level risks), but where leadership and commitment from other sectors such as business/labor or health care is critical to implement a particular policy or program (e.g., workplace policies; screening combined with care management). The role of various sectors in the implementation of a strategy or approach in preventing suicide is described further in the section on *Sector Involvement*.

In the sections that follow, the strategies and approaches with the best available evidence for preventing suicide are described.

## Strengthen Economic Supports

### Rationale

Public health research suggests that some of the biggest impacts on health come from policies developed to improve socioeconomic conditions (Frieden, 2010). Downturns in the economy and increases in unemployment and home foreclosures are associated with increased rates of suicide (Fowler, Gladden, Vagi, Barnes, & Frazier, 2015; Luo et al., 2011). Policies that strengthen financial security can help people stay in their homes, pay for necessities such as food and medical care, and get job training, among other things. In providing this support, stress and anxiety and the potential for a crisis situation may be reduced, thereby preventing suicide.

### Approaches

Economic and housing supports for individuals and families can be strengthened by improving policies that enhance financial security and stabilize housing for people, especially in times of economic need.

- **Strengthen household financial security.** Studies from the U.S. indicate that suicide rates increase during economic recessions marked by high unemployment rates, job losses, and economic instability and decrease during economic expansions and periods marked by low unemployment rates, particularly for working-age individuals 25 to 64 years old (Luo et al., 2011; Fowler et al., 2015). Policies that support financial security, such as provision of unemployment benefits, family assistance, education and training assistance, and other social welfare payments may help mitigate the risk of economic crises on suicide rates.

### Potential Outcomes

- Reduced suicide rates
- Lower foreclosure rates
- Lower eviction rates
- Reduced emotional distress

### Evidence

There is evidence that policies that strengthen household financial security and that stabilize housing can reduce suicide risk.

- **Strengthen household financial security.** Provision of *Unemployment benefits* are one means to strengthen financial security. These benefit programs provide income protection during periods of unemployment in an effort to prevent or lessen the economic hardship for those experiencing job loss and enduring unemployment. An examination of variations in U.S. *unemployment benefit programs* across states demonstrated that the impact of unemployment on suicide was offset in those states that provided greater than average unemployment



benefits (Cylus, Glymour, & Avendano, 2014). Another U.S. study examining the link between unemployment and suicide risk using monthly suicide data, length of unemployment, and job losses found that the duration of unemployment, as opposed to just the loss of job, predicted suicide risk (Classen & Dunn, 2012). Together, these results suggest that not only should state unemployment benefit programs be generous in their financial allocations, but also in their duration. Other social spending policies and programs have also shown an impact on suicide. A study by Flavin and Radcliff (2009) examined the impact of states' per capita spending on transfer payments (e.g., retirement and disability insurance benefits, income maintenance benefits, unemployment insurance compensation), medical benefits, family assistance (e.g., food and welfare programs), and total state spending on suicide rates between 1990-2000. A variety of suicide risk factors at the state level were also controlled in the analysis. What they found was that as per capita spending on total transfer payments, medical benefits, and family assistance increase there was an associated decrease in state suicide rates. Moreover, it wasn't spending in general that was associated with the reduction but spending on social programs specifically. In terms of lives saved, it was estimated that 3,000 fewer suicides would occur per year nationwide (Flavin & Radcliff, 2009). More research is needed to assess the impact of these policies in today's social and economic context, but evidence thus far is promising.

## Strengthen Access to Mental Health Care

### Rationale

Mental illness is a risk factor for suicide-- Studies suggest that up to 90% of people who die by suicide may have had a mental illness at the time of their deaths (Cavanagh, Carson, Sharpe, & Lawrie, 2003) and research on state-level suicide rates have been found to be correlated with general mental health measures such as depression (Arsenault-Lapierre, Kim, & Turecki, 2004). While most people with mental health problems do not attempt or die by suicide (Olfson, Gerhard, Huang, Crystal, & Stroup, 2015) and most people who have attempted suicide will not go on to die by suicide (Owens, 2002), assuring access to affordable mental health care for people in need is critical to suicide prevention.

### Approaches

A major approach to strengthening access to mental health care is through the provision of health insurance policies that include coverage for such services.

- **Coverage of mental health conditions in health insurance policies.** Historically, mental health care was viewed as separate from physical health care and many health insurance plans either did not provide coverage of mental health services or such services were available but not affordable--due to higher co-pays or co-insurance-- or set limits on the number of visits allowed. More recently, improvements have been made with many health insurance policies providing greater levels of mental health coverage and more provide coverage that is on par with coverage for other health concerns, i.e. mental health parity. These policies can help prevent suicide by increasing the accessibility and affordability, and ultimately the use of, needed mental health services. As more people access mental health services this helps normalize treatment seeking in the population, reduces symptoms of mental illnesses like depression and bipolar disorder, and in turn, reduce rates of suicide and suicide attempts.

### Potential Outcomes

- Increased utilization of mental health services
- Decreased symptoms of mental illnesses
- Decreased rates of suicide attempts
- Decreased rates of suicide

### Evidence

There is evidence suggesting that coverage of mental health conditions in health insurance policies can reduce risk factors associated with suicide and may directly impact suicide rates.

- **Coverage of mental health conditions in health insurance policies.** The National Survey of Drug Use and Health is a nationally representative survey of the U.S. population that provides



data on substance use, mental health conditions, and services utilization. Using data from this survey, Harris, Carpenter, and Bao (2006) found that 12 months after states enacted *mental health parity laws*, self-reported use of mental healthcare services significantly increased. Moreover, subsequent research by Lang (2013) examined state mental health laws and suicide rates between 1990 and 2004 and found that mental health parity laws, specifically, were associated with an approximate 5% reduction in suicide rates. This reduction, in the 29 states with parity laws, equated to the prevention of 592 suicides per year and a cost savings of \$1.3-3.1 million per suicide prevented (Lang, 2013).

## Establish Protective Environments

### Rationale

Prevention efforts that focus not only on individual behavior change (e.g., help-seeking, treatment interventions) but on changes to the environment (e.g., policy-level interventions, modifications to the environment) as well, increase the likelihood of success (Haddon, 1980). Protective environments may be defined in part, as those where risk factors associated with suicide are limited and where protective factors are encouraged. Examples of risk factors include easy access to lethal means, stigma related to help-seeking, and substance abuse (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). Protective factors include such things as social connectedness and access to mental health services (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). Establishing environments that address these factors where individuals live, work, and play, can help prevent suicide.

### Approaches

The current evidence suggests three promising approaches for creating environments that protect against suicide.

- **Reducing access to lethal means.** Means of suicide such as firearms, hanging/suffocation, or jumping from heights provide little opportunity for rescue and, as such, have high case fatality rates (e.g., about 85% of people who use a firearm in a suicide attempt will die from the injury). Research also indicates that 1) the interval between thinking about and attempting suicide can be as short as 5 or 10 minutes (Deisenhammer et al., 2009; Simon et al., 2001) and 2) that people tend *not* to substitute a different method when a highly lethal method is unavailable or difficult to access (Hawton, 2007; Yip et al., 2012). Therefore, increasing the time interval between the thought and the suicide attempt, for example, by making it more difficult to access lethal means, can be lifesaving. The following are examples of approaches reducing access to lethal means:
  - *Intervening at Suicide Hotspots.* Suicide hotspots, or places where suicides may take place relatively easily, include tall structures (e.g., bridges and cliffs), railway tracks, and isolated locations such as parks. Efforts to prevent suicide at these locations include erecting barriers to prevent jumping and installing signs and telephones to encourage individuals who are considering suicide, to seek help (Cox et al., 2013).
  - *Safe Storage Practices.* Safe storage of medications, firearms, and other household products can reduce the risk for suicide by separating individuals who may be vulnerable and/or impulsive from easy access to lethal means. Such practices may



include education and counseling around storing firearms--locked in a secure place (e.g., in a gun safe or lock box), preferably unloaded and separate from the ammunition--and keeping medicines in a locked cabinet or other secure location away from people who may be at risk or who have made prior attempts (Rowhani-Rahbar, Simonetti, & Rivara, 2016; C. W. Runyan et al., 2016).

- **Organizational policies and culture** that promote protective environments may be implemented in places of employment. Such policies and cultural values may promote prosocial behavior (e.g., asking for help), skill building, changing social norms, referral and access to helping services (e.g. mental health, substance abuse treatment, financial counseling), and encourage leadership support from the top down. Such policies and cultural shifts can positively impact organizational climate and morale and help prevent suicide and its related risk factors (e.g. depression, social isolation).
- **Community-based policies to reduce excessive alcohol use.** Research studies in the United States have found that greater alcohol availability is positively associated with alcohol-involved suicides (Escobedo & Ortiz, 2002; Giesbrecht et al., 2015). Policies to reduce excessive alcohol use broadly include zoning to limit alcohol outlet locations and density, taxes on alcohol, and bans on the sale of alcohol for individuals under the legal drinking age. These policies are important because acute alcohol use has been found to be associated with more than one-third of suicides and approximately 40% of suicide attempts (Cherpitel, Borges, & Wilcox, 2004).

### Potential Outcomes

- Increase in safe storage of lethal means
- Reduction in suicide attempts
- Reduction in suicide deaths
- Increase in help-seeking
- Reduction in alcohol-related suicide deaths

### Evidence

The evidence for the effectiveness of means restriction and other ways to establish protective environments is some of the strongest in the field (Zalsman et al., 2016), as described below.

- **Means restriction.** A meta-analysis examining the impact of *suicide hotspot interventions* implemented in combination or in isolation, both in the U.S. and abroad, found associated reduced rates of suicide (Cox et al., 2013; Pirkis et al., 2015). For example, after erecting a barrier on the Jacques-Cartier bridge in Canada, the suicide rate from jumping from the bridge decreased from about 10 suicide deaths per year to about 3 deaths per year (Perron, Burrows, Fournier, Perron, & Ouellet, 2013). Moreover, the reduction in suicides by jumping was

sustained even when all bridges and nearby jumping sites were considered, suggesting little to no displacement of suicides to other jumping sites (Perron et al., 2013). Further evidence for the effectiveness of bridge barriers was demonstrated by a study examining the impact of the *removal* of safety barriers from the Grafton Bridge in Auckland, New Zealand. After removal of the barrier, sadly, both the number and rate of suicide increased fivefold (Beautrais, 2001; Beautrais, Gibb, Fergusson, Horwood, & Larkin, 2009).

Another form of means reduction involves implementation of *safe storage practices*. In a case-control study of firearm-related events identified from 37 counties in Washington, Oregon, and Missouri, and from 5 trauma centers, Grossman et al. (2005) found that storing firearms unloaded, separate from ammunition, in a locked place and/or secured with a safety device was protective of suicide attempts among adolescents. Further, a recent systematic review of clinic and community-based education and counseling interventions suggested that the provision of safety devices significantly increased safe firearm storage practices compared to counseling alone or compared to the provision of economic incentives to acquire safety devices on one's own (Rowhani-Rahbar et al., 2016). Another program, *The Emergency Department Counseling on Access to Lethal Means (ED CALM)*, trained psychiatric emergency clinicians in a large children's hospital to provide lethal means counseling and safe storage boxes to parents of patients under age 18 receiving care for suicidal behavior. In a pre-post quality improvement project, Runyan et al. (2016) found that at post-test 76% (of the 55% of parents follow-up, n=114) reported that all medications in the home were locked up as compared to fewer than 10% at the time of the initial emergency department visit. Among parents who indicated the presence of guns in the home at pre-test (i.e. 67%), all (100%) reported guns were currently locked up at post-test (C. W. Runyan et al., 2016).

- **Organizational policies and culture.** *Together for Life* is a workplace program of the Montreal Police Force implemented to address suicide among officers. Policy and program components were designed to foster an organizational culture that promoted mutual support and solidarity among all members of the Force. The program included training of supervisors, managers and all units to improve competencies in identifying suicidal risk and to improve use and awareness of existing resources. The program also included an education campaign to improve awareness and help-seeking (Mishara & Martin, 2012). Police suicides were tracked over 12 years and compared to rates in the control city of Quebec. The suicide rate in the intervention group decreased significantly by 78.9% to a rate of 6.42 suicides per 100,000 population per year compared to an 11% increase in the control city (rate: 29.0 per 100,000) (Mishara & Martin, 2012).

Another example of this approach is the *United States Air Force Suicide Prevention Program (AFSPP)*. AFSPP included 11 policy and education initiatives and was designed to change the



culture of the Air Force surrounding suicide. The program uses leaders as role models and agents of change, establishes expectations for behavior related to awareness of suicide risk, develops population skills and knowledge (i.e., education and training), and investigates every suicide (i.e., outcomes measurement). The program represents a fundamental shift from viewing suicide and mental illness solely as medical problem and instead sees them as larger service-wide problems impacting the whole community (K. L. Knox, Litts, Talcott, Feig, & Caine, 2003). Using a time-series design to examine the impact of the AFSPP program on various violence-related outcomes, researchers found that the program was associated with a 33% relative risk reduction in suicide (K. L. Knox et al., 2003). The program was also associated with relative risk reductions in related outcomes including moderate and severe family violence (30% and 54%, respectively), homicide (51%), and accidental death (18%) (K. L. Knox et al., 2003). A longitudinal assessment of the program over the period 1981 to 2008 (16 years before the 1997 launch of the program and 11 years post-launch) found significantly lower rates of suicide after the program was launched than before (K. L. Knox et al., 2010). These effects were sustained over time, except in 2004, which the authors found was associated with less rigorous implementation in that year than in the other years (K. L. Knox et al., 2010).

- **Community-based policies to reduce excessive alcohol use.** While multiple policies to limit alcohol use exist, several studies on alcohol outlet *density*, specifically, suggest that measures to reduce alcohol outlet density can potentially reduce alcohol-involved suicides. Additionally, a longitudinal analysis of alcohol outlet density, suicide mortality, and hospitalizations for suicide attempts over 6 years in 581 California zip codes indicated that the density of bars, specifically, is related to suicide and suicide attempts, particularly in rural areas (Johnson, Gruenewald, & Remer, 2009).

## Promote Connectedness to Protect Against Suicide

### Rationale

Sociologist, Emile Durkheim theorized in 1897 that weak social bonds, i.e. lack of connectedness, are among the chief causes for suicidality (Durkheim, 1897/1951). *Connectedness* is the degree to which an individual or group of individuals are socially close, interrelated, or share resources with others (Centers for Disease Control and Prevention, 2009). Social connections can be formed within and between multiple levels of the social ecology (Dahlberg & Krug, 2002), for instance between individuals (e.g. peers, neighbors, co-workers), families, schools, neighborhoods, workplace, faith communities, cultural groups, and society as a whole. Related to connectedness, *social capital* refers to a sense of trust in one's community and neighborhood, social integration, and also the availability and participation in social organizations (Beyer, Layde, Hamberger, & Laud, 2015; Muennig, Cohen, Palmer, & Zhu, 2013). Many ecological cross-sectional and longitudinal studies have examined the impact of aspects of social capital on depression symptoms, depressive disorder, mental health more generally, and suicide. While the evidence is still being built the pattern is towards an inverse association between social capital measured by social trust, community/ neighborhood engagement, and improved mental health. Connectedness and social capital together can serve to protect against suicidal behaviors by decreasing isolation, encouraging adaptive coping behaviors, increasing belongingness, personal value and worth all of which helps individuals to build resilience in the face of adversity. Connectedness can also provide individuals with better access to formal supports and resources, mobilize communities to meet the needs of its members and provide collective primary prevention activities to the community as a whole (Centers for Disease Control and Prevention, 2009)

### Approaches

Promoting connectedness among individuals and within communities through modeling peer norms and enhancing community engagement can protect against suicide.

- **Peer norm approaches** seek to normalize prosocial behaviors/protective factors for suicide such as help-seeking, reaching out and talking to trusted adults, and peer connectedness. These approaches typically target youth and are delivered in school settings but can also be implemented in community settings.



- **Community engagement activities.** Community engagement is an aspect of social capital. Community engagement approaches may involve residents participating in a range of activities, including religious activities, community clean-up and greening activities, and physical exercise. These activities provide opportunities for residents to become more involved in the community and to connect with other community members, organizations, and resources, resulting in enhanced overall physical health, reduced stress, and decreased depressive symptoms, thereby reducing risk of suicide.

### Potential Outcomes

- Reduction in maladaptive coping attitudes and behaviors
- Increase in healthy coping attitudes and behaviors
- Increase in referrals for youth in distressed
- Increase help-seeking behaviors
- Positive perception of adult support

### Evidence

Current evidence suggests that peer norm approaches and community engagement can reduce risk factors associated with suicidal behaviors.

- **Peer norm approaches.** Evaluations show that programs such as *Sources of Strength* can improve school norms and beliefs about suicide that are created and disseminated by student peers. In a randomized controlled trial of *Sources of Strength* conducted with 18 high-schools (6 metropolitan, 12 rural), Wyman et al. (2010) found that the program improved peer leaders' adaptive norms regarding suicide, their connectedness to adults, and school engagement. Peer leaders were also more likely than controls to refer a suicidal friend to an adult. Among students, the intervention increased perceptions of adult support for suicidal youths and the acceptability of seeking help. Perception of adult support increased most in students with a history of suicidal ideation. Finally, trained peer leaders also reported a greater decrease in maladaptive coping attitudes compared with untrained leaders (Wyman et al., 2010).
- **Community engagement activities.** A vacant lot greening initiative was undertaken in Philadelphia between 1999 and 2008. Local residents and community members worked together to green 4,436 lots (or 7.8 million square feet) in 4 areas of the city. Researchers found significant associated reductions in community residents' self-reported stress levels and engagement in more physical exercise than residents in control vacant lot areas. Other benefits included reductions in firearm assaults and vandalism (Branas et al., 2011).

## Teach Coping and Problem-Solving Skills

### Rationale

Building life skills prepares individuals to successfully tackle every day challenges and adapt to stress and adversity. Life skills encompasses many concepts, but most often include coping and problem-solving skills, conflict resolution, and critical thinking. Life skills are important in shielding individuals from suicidal behaviors (World Health Organization, 2014). Suicide prevention programs that focus on life and social skills training are drawn from social cognitive theories (Bandura, 1986), surmising that individuals who engage in suicidal behavior is attributed to either direct learning, modeling, and environmental and individual (e.g. hopelessness) characteristics. The literature linking life skills and suicide is robust--- The inability to employ adequate coping strategies to cope with immediate stressors or identify and find solutions for problems have been characterized among suicide attempters (Pollock & Williams, 2004). Treatments that include bolstering problem skills (Goldsmith, Pellmar, Kleinman, & Bunney, 2002) and include problem-solving techniques (Ghahramanlou-Holloway, Bhar, Brown, Olsen, & Beck, 2012; Townsend et al., 2001) appear to reduce suicidal ideation and attempts more effectively. Prevention programs focused on teaching these skills target youth, parents and families and have been used with both universal and at-risk populations. While many do not target suicidal behaviors directly, these programs strive to train youth and parents important life skills to offset the underlying vulnerabilities that contribute to engaging in high risk behaviors early in life.

### Approaches

Current evidence provides support for the following two approaches:

- **Social emotional learning programs** focus on developing and strengthening communication and problem-solving skills, emotion regulation, conflict resolution, help seeking and coping skills. These approaches address a range of risk and protective factors for suicidal behavior. They provide children and youth with skills to resolve problems in relationships, school, and with peers, and help youth to address other negative influences (e.g., substance use) associated with suicide. These approaches are typically delivered to all students in a particular grade or school, although some programs also focus on groups of students considered to be at high-risk for suicide. Opportunities to practice and reinforce skills are an important part of programs that work (Herman, Borden, Reinke, & Webster-Stratton, 2011).
- **Parenting skill and family relationship programs** are designed to strengthen parenting skills, enhance positive parent-child interactions, and improve children's behavioral and emotional skills and abilities. Several parenting and family relationship programs have been shown in rigorous evaluations to improve resilience and reduce risk factors for various behaviors,



including ones closely related to suicide, such as depression, internalizing behaviors, and substance abuse (M. S. Knox, Burkhart, & Hunter, 2010).

### Potential Outcomes

- Reduction in suicide attempts and suicide ideation
- Enhanced knowledge of risk and protective factors associated with suicide
- Reduction in suicide risk behaviors (i.e., depression, anxiety, conduct problems, substance abuse)
- Improve and normalize help-seeking behavior
- Enhance social competence and emotional regulation skills
- Enhance problem-solving and conflict management skills

### Evidence

There are several programs with evidence that support teaching social, emotional and parenting skills to reduce suicidal behaviors and associated risk factors.

- **Social emotional learning programs.** The *Youth Aware of Mental Health Program (YAM)* is a program developed for teenagers that uses interactive dialogue and role-playing to teach adolescents about the risk and protective factors associated with suicide (including knowledge about depression and anxiety) and enhances their problem-solving skills for dealing with adverse life events, stress, school and other problems. The program includes 3 hours of role-play sessions and interactive workshops combined with a booklet that students can keep, educational posters displayed in classroom, and interactive lectures about mental health at the beginning and end of the program (Wasserman et al., 2014). In a cluster-randomized controlled trial of YAM conducted across 10 European Union countries and 168 schools, students participating in the YAM program were significantly less likely to have an incident suicide attempt (OR 0.45, 95%CI 0.24–0.85;  $p=0.014$ ) and severe suicidal ideation (0.50, 0.27-0.92;  $p=0.025$ ) at the 12-month follow-up compared to the control group. Additionally, related to severe suicide ideation, in the YAM group absolute risk fell by 0.50% and RR fell by 49.6% (Wasserman et al., 2014).

*Signs of Suicide (SOS)* is another school-based prevention program for students aged 13-17. The program includes guided classroom discussions about suicide and depression. As part of the program, students are screened for depression and suicide risk and referred for professional help as indicated. The program is designed to increase knowledge about suicide and risk factors associated with suicidal behavior as well as improve and normalize help-seeking behavior (Schilling, Aseltine, & James, 2016). In a randomized controlled trial, SOS was shown to reduce self-reported suicide attempts at 3-months post intervention

among participating students compared to control students. The SOS program also increased students' knowledge of how to get help for themselves or friends for depression and/or suicidal thoughts, and favorable attitudes toward help-seeking. SOS participants with a lifetime history of suicide attempt were also less likely to report planning a suicide in the 3 months following the program compared to lower-risk participants (Schilling et al., 2016).

Finally, the *Good Behavior Game (GBG)* is a classroom-based program for elementary school children aged 6-10; it represents an example of upstream suicide prevention programming. The program uses a team-based behavior management strategy that promotes good behavior by setting clear expectations for good behavior and consequences for maladaptive behavior. The goal of the GBG is to create an integrated classroom social system that is supportive of all children being able to learn with little aggressive or disruptive behavior (Wilcox et al., 2008). In an outcome evaluation of the GBG, first graders assigned to GBG reported half the adjusted odds of suicidal ideation and suicide attempts. The beneficial effect of the program was consistent for suicidal ideation regardless of whether baseline covariates were included. The GBG effect on attempts was less robust in some adjusted models including caregiver mental health. In the second cohort of GBG students, neither suicidal ideation nor suicide attempts were significantly different between GBG and the control interventions (Wilcox et al., 2008). This finding likely arose due to the lack of implementation fidelity and pointed to the need for GBG to be delivered with precision, consistency, and teacher support. GBG was also found to be associated with reduced risk of later substance abuse, a risk factor for suicide (Kellam et al., 2008).

- **Parenting skill and family relationship programs.** Parenting and family skills training approaches have shown promising impacts in preventing key risk factors associated with suicide. For example, the *Incredible Years (IY)* is a comprehensive group training program for parents, teachers and children designed to reduce conduct and substance abuse problems, two important suicide risk factors, in youth by improving protective factors such as responsive and positive parent-teacher-child interactions and relationships, emotion self-regulation and social competence (all protective factors for suicide) (Herman et al., 2011). The program includes 9- 20 sessions offered in community-based settings (e.g., religious, recreation centers, mental health treatment centers, and hospitals). Several studies have demonstrated the effect of the IY program on reducing internalizing symptoms, such as anxiety and depression, and child conduct problems (C. H. Webster-Stratton, Reid, & Beauchaine, 2011; Webster-Stratton, Jamila Reid, & Stoolmiller, 2008). The program is also associated with improved problem-solving and conflict management; these skills were maintained at 1-year follow-up (Reid, Webster-Stratton, & Hammond, 2003; C. Webster-



Stratton & Hammond, 1997; C. Webster-Stratton, Reid, & Hammond, 2001). The program demonstrated greater benefits as the dosage of the intervention increased (Herman et al., 2011).

Additionally, *Strengthening Families 10-14* is a program that involves sessions between parents, youth, and family with the goal of improving parents' skills for disciplining, managing emotions and conflict, and communicating with their children; promoting youths' interpersonal and problem-solving skills; and creating family activities to build cohesion and positive parent-child interactions. The premise of the program is that developing these skills for both parents and children will reduce internalizing behavior and adolescent substance abuse, two important risk factors for suicide (Spoth, Gyll, & Day, 2002). *Strengthening Families* has been shown to decrease externalizing behaviors, alcohol use, and drug use among youth participants and reductions in depression, alcohol use, and drug use among participating families (Spoth et al., 2002).

## Identify and Support People At-Risk

### Rationale

In order to decrease suicide, attention to people at increased or high risk is necessary as these individuals tend to experience suicidal behavior at higher than average rates. These vulnerable or disadvantaged populations include, but are not limited to, individuals with lower socio-economic status or who are living with a mental health problem; people who have attempted suicide previously, individuals who are institutionalized, have been victims of violence, or are homeless; and members of certain ethnic minority groups. Supporting these vulnerable groups requires proactive case finding along with access to, and retention in, mental health services. Finding effective ways of identifying at-risk or vulnerable groups, customizing services to make them accessible and maintaining care remain key challenges. For example, simply improving services does not guarantee that those services will be used by those most in need of them, nor will it necessarily increase the number of people who follow treatments that are recommended. People who are disadvantaged face social and economic issues that may adversely affect their ability to respond to the treatments or advice that are offered.

### Approaches

The following three approaches focus on identifying and supporting people at increased risk.

- **Gatekeeper training** is designed to train teachers, coaches, providers and others in the community to identify people who may be at risk of suicide and to respond effectively, including facilitating treatment seeking and support services. Gatekeeper training is typically implemented in schools to identify at-risk youth and within health care settings to identify adults (and youth).
- **Screening combined with care management and overall continuity of care** has been used in primary care and behavioral health care settings to assure that people who may be at high-risk of suicide are identified and receive ongoing treatment as needed, particularly after inpatient discharge and other transitions within the healthcare system so they don't 'slip through the cracks'. These approaches typically employ screening for depression and/or suicide combined with collaborative treatment planning between patients and their providers and patient follow-up.
- **Crisis intervention.** These approaches provide support and referral services, typically by connecting a person in crisis (or a friend or family member of someone at-risk) to trained volunteers and/or professional staff via telephone hotline, online chat, or text messaging. Crisis intervention approaches are intended to impact key risk factors for suicide, including feelings of



depression, hopelessness, and subsequent mental health care utilization. Like means reduction, crisis interventions can put space or time between an individual who may be considering suicide and harmful behavior.

### Potential Outcomes

- Reduction in suicide attempts
- Reduction in suicide deaths
- Increased identification of individuals at-risk for suicidal behavior
- Increased at-risk individuals in treatment
- Increased community members trained to identify at-risk individuals
- Increased referrals for health care

### Evidence

There is evidence that community gatekeeper programs are successful in reducing suicides and suicide attempts but the efforts must be maintained (Substance Abuse and Mental Health Services Administration, 2014). However, there is limited evidence for effectiveness screening programs, but at the same time, standard principles for public health screening make them promising (Pena & Caine, 2006). The number of studies evaluating crisis intervention services is limited, but a few studies do indicate that those who use the hotline services have decreased suicidal thoughts and behavior.

- **Gatekeeper training.** *Mental Health First Aid (MHFA)* is a program designed for the lay public, which consists of three weekly sessions of three hours each. Participants learn the symptoms of people in mental health crises and/or in the early stages of mental health problems (i.e., those experiencing suicidal thoughts and behavior, acute stress reaction, panic attacks and acute psychotic behavior, and depression, anxiety, and psychotic disorders), possible risk factors, and where and how to get evidence-based effective help (Kitchener & Jorm, 2004). In a randomized controlled trial of 300 participants of *MHFA*, the intervention group reported greater confidence in providing help to others, greater likelihood of advising people to seek professional help, improved concordance with health professionals about treatments, and decreased stigmatizing attitudes. Additionally, the intervention resulted in improved mental health of the participants themselves. All results were statistically significant at  $p < .05$ . (Kitchener & Jorm, 2004). Additional research rigorously evaluating *MHFA* for its impact on the first aid recipients themselves and suicidal behavior is needed (Kitchener & Jorm, 2006).
- **Screening combined with care management and overall continuity of care.** The *Henry Ford Perfect Depression Care* program was the pre-cursor to *Zero Suicide*, and its overall goal was to

eliminate suicide. More broadly, though, the aim was to completely redesign depression care delivery to achieve breakthrough improvement in quality and safety by focusing on six aims: effectiveness, safety, patient centeredness, timeliness, efficiency, and equity among patients. The program developed concrete measures to assess progress on each of these aims and began with screening and assessment of each patient for suicide risk with coordinated continuous follow-up care system wide (C. E. Coffey, 2006). An examination of the impact of the *Henry Ford Perfect Depression Care (Pre-cursor to Zero Suicide)* program found that there was a dramatic and statistically significant decrease in the rate of suicide between the baseline years prior to the intervention (1999 and 2000) to the intervention years (2002-2009). During this time period, the suicide rate fell 82% (C. E. Coffey, 2006; C. E. Coffey, Coffey, & Ahmedani, 2013). Further, suicide rates also declined among HMO members who participated in targeted suicide prevention efforts and received mental health specialty services. However, for those HMO members who accessed only general medical services as opposed to specialty mental health services, the suicide rate increased (M. Coffey, Coffey, & Ahmedani, 2015).

- **Crisis intervention.** In an evaluation of the effectiveness of the National Suicide Prevention Lifeline (NSPL) to prevent suicide, 1,085 suicidal individuals who called the hotline completed a standard risk assessment for suicide, and 380 of those completed a follow-up assessment between 1 and 52 days after the initial assessment. Researchers found that over half of the initial sample were seriously considering suicide when they called, and they had a plan for their suicide. Researchers also found that participants experienced significant decreases in suicidality over the course of the telephone session, and that levels of hopelessness and psychological pain continued to decrease after their initial call (Gould, Kalafat, Harrismunfakh, & Kleinman, 2007).

In another study, this time employing a randomized controlled trial, Gould, Cross, Pisani, Munfakh, and Kleinman (2013) assessed the impact of the *Applied Suicide Intervention Skills Training (ASIST)*, a widely implemented gatekeeper training program that helps hotline counselors, emergency workers, and other gatekeepers to identify and connect with suicidal individuals, understand their reasoning for living and dying, and assist with safely connecting those in need to available resources. The training was evaluated across the NSPL network of hotlines over the period 2008-2009. Using data from 1,410 suicidal individuals who called 17 Lifeline centers, researchers found that compared to callers who spoke to counselors that received the usual care training, individuals who spoke with counselors trained in ASIST were significantly more likely to feel less depressed, less suicidal, less overwhelmed, and more hopeful by the end of their call to the hotline. Counselors trained in ASIST were also more skilled at keeping callers on the phone longer and establishing a connection with them.



However, training in ASIST did not result in more comprehensive suicide risk assessments than usual care training (Gould et al., 2013).

## Intervene to Lessen Harms and Prevent Future Risk

### Rationale

Individuals who have experienced mental health challenges, suicidal ideation, and/or who have made suicide attempts and/or have engaged in non-suicidal self-injury are at increased risk of suicide (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). Risk of suicide can also increase among those who have lost a friend, family member, co-worker, or other acquaintance to suicide (Pitman, Osborn, King, & Erlangsen, 2014). Exposure to sensationalized or uninformed reporting regarding on suicide may heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to suicide contagion (Etzersdorfer & Sonneck, 1998; Niederkrotenthaler & Sonneck, 2007).

### Approaches

A broad array of approaches to lessen harms and reduce future risk of suicide among those at increased risk include the provision of mental health care and improved continuity of care, improving linkage to care through active post-discharge planning and follow-up that decreases barriers to ongoing therapeutic support, increasing connectedness to supportive others, addressing bereavement, and framing communications to emphasize resilience, decrease negative affect, and to prevent contagion.

- **Treatment for people at-risk of suicide** typically includes various forms of psychotherapy delivered by licensed providers to help individuals with mental health problems and other risk factors for suicide with problem-solving, impulsivity and emotion regulation.
- **Treatment to prevent re-attempts.** These approaches typically include follow-up contact and use diverse modalities (e.g., home visits, mail, telephone, e-mail) to engage recent suicide attempt survivors in continued treatment to prevent re-attempts. Treatment may focus on improved coping skills, mindfulness, and other emotional regulation skills, and may include case management home visits to increase adherence to treatment and continuity of care; and one-on-one interpersonal therapy and/or group therapy. Approaches that engage and connect attempters to peers and providers are especially important because many attempters do not present to aftercare; 12%-25% reattempt within a year, and 3%-9% of attempt survivors die by suicide within 1 to 5 years of their initial attempt (Inagaki et al., 2015)
- **Postvention** approaches are implemented *after* a suicide has taken place and may include debriefing sessions, counseling, and/or bereavement support groups for surviving friends and family members/loved ones. These programs have not typically been evaluated for their impact on suicide or suicidal behavior but may reduce survivors' guilt, feelings of depression, and complicated grief (Szumilas & Kutcher, 2011).



- **Safe messaging following a suicide.** The manner in which information on a recent suicide is communicated to the public (e.g. school assemblies, mass media, social media) can heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to suicide contagion. Therefore, responsible and safe reporting may help prevent suicide and/or suicide contagion.

### Potential Outcomes

- Reduction in mental health-related sequelae
- Increase connectedness
- Improved coping skills
- Improved messaging following suicide
- Reduction in re-attempts

### Evidence

The evidence addressing strategies to lesson harm and prevent future risk of suicide includes the evaluation of effects of specific approaches on risk and protective factors as well as suicide-related mortality. However, because the evaluation of suicide-related mortality requires large sample sizes and extended follow-up, much of the evidence in this area primarily focuses on risk and protective factors.

- **Treatment for people at-risk of suicide.**

**Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)** is a program that aims to prevent suicide among older primary care patients by reducing suicide ideation and depression in primary care settings. IMPACT facilitates the development of a therapeutic alliance, a personalized treatment plan that includes patient preferences, as well as proactive follow-up (biweekly during an acute phase and monthly during continuation phase) by a depression care manager (Hunkeler et al., 2006). The program has been shown to significantly improve quality of life, and to reduce functional impairment, depression and suicidal ideation over 24-months of follow-up (Hunkeler et al., 2006; Unutzer et al., 2006) relative to patients who received care as usual.

**Collaborative Assessment and Management of Suicidality (CAMS)** is a therapeutic framework for suicide-specific assessment and treatment of patient's suicide risk. This flexible approach can be used across treatment settings and clinician theoretical orientations and involves the clinician and patient working together in an interactive assessment process to develop patient-

specific treatment plans. CAMS sessions are collaborative and involve constant patient about what is and is not working with the ultimate goal of enhancing the therapeutic alliance and increasing treatment motivation in the suicidal patient. CAMS been tested and supported in 6 correlational studies (Jobes, 2012), in a variety of inpatient and outpatient settings and in one RCT with several additional RCTs under way. CAMS has been associated with significant improvements in suicidal ideation, overall symptom distress, and feelings of hopelessness at 12 month follow-up among a community-based sample of suicidal outpatients. (Comtois et al., 2011).

**Dialectical Behavioral Therapy (DBT)** is a multicomponent therapy for individuals at high risk for suicide and who may struggle with impulsivity and emotional regulation. The components of DBT include individual therapy, group skills training, between-session telephone coaching and a therapist consultation team. In a randomized controlled trial of women with recent suicidal or self-injurious behavior, those receiving DBT were half as likely to make a suicide attempt at two-year follow-up than women receiving community treatment (23% vs 46%), required less hospitalization for suicide ideation, and had lower medical risk across all suicide attempts and self-injurious acts combined (Linehan et al., 2006).

**Attachment-Based Family Therapy (ABFT)** is a program for adolescents aged 12-18 and is designed to treat clinically diagnosed major depressive disorder, eliminate suicidal ideation, and reduce dispositional anxiety (Diamond et al., 2010). A randomized controlled trial of ABFT found that suicidal adolescents assigned to ABFT experienced significantly greater improvement in suicidal ideation over 24 weeks of follow-up than did adolescents assigned to enhanced usual care (-4.37 vs. -2.34;  $p = .001$ ;  $d=0.97$ ). Additionally, a higher percentage of ABFT participants reported no suicidal ideation in the week prior to assessment at 12 weeks than did adolescents receiving enhanced usual care (69.2% vs. 34.6%;  $p = .01$ ; OR= 4.25) and at 24 weeks (82.1% vs. 46.2%;  $p = .006$ ; OR=5.37) (Diamond et al., 2010).

- **Treatment to prevent re-attempts.**

**Emergency Department Brief Intervention with Follow-up Visits** is a program that involves a one-hour discharge information session that addresses suicidal behavior, distress, risk and protective factors, alternatives to suicidal behavior, and referral options, combined with nine follow-up contacts over 18-months (at 1, 2, 4, 7, 11 weeks and 4, 6, 12, 18 months). Follow-up contacts are either conducted by phone or through home visits according to a specific time line for up to 18-months. A randomized controlled trial that enrolled suicide attempters from eight hospital emergency departments in five culturally different sites found that a brief intervention combined with 9 follow-up visits over 18-months was associated with significantly fewer deaths



from suicide relative to a treatment-as-usual group (0.2% versus 2.2%, respectively;  $\chi^2 = 13.83$ ,  $P < 0.001$ ) (Fleischmann et al., 2008).

**Active follow-up contact approaches** such as postcards, letters, and telephone calls, are intended to increase a patient's sense of connectedness with health care providers and decrease isolation. These approaches include expression of care and support and typically invite patients to reconnect with their provider. Contacts are made periodically (e.g., monthly or every few months in the first 12 months post-discharge with some programs continuing contact for 2 or more years). These approaches have been found in a meta-analysis conducted by Inagaki et al. (2015) to reduce reattempts by approximately 17% for up to 12 months post-discharge, however, the long-term effects of these approaches on reattempts has not yet been demonstrated. Also, because the number of trials and associated sample sizes included in this meta-analysis were small, it was not possible to determine the effect of active contact and follow-up approaches on death by suicide. In a randomized controlled trial of post-crisis suicide prevention long-term follow-up contact approach, Motto and Bostrom (2001) found that patients who refused ongoing care but who were randomized to be contacted by letter four times per year had a lower rate of suicide over two years of follow-up than did patients in the control group who received no further contact. Other studies have also shown post-crisis letters and coping cards to be protective against suicide ideation and attempts (Hassanian-Moghaddam, Sarjami, Kolahi, & Carter, 2011; Wang et al., 2016).

**Cognitive Behavior Therapy for Suicide Prevention (CBT-SP)** is a strategy that uses a risk reduction, relapse prevention approach that includes an analysis of proximal risk factors and stressors (e.g., relationship problems, school or work-related difficulties) leading up to and following the suicidal event; safety plan development; skill building; and psychoeducation. *CBT-SP* also has family skill modules focused on family support and communication patterns as well as improving the family's problem solving skills. A randomized controlled trial found of *CBT-SP* found that 10-session outpatient cognitive therapy designed to prevent repeat suicide attempts resulted in a 50% reduction in the likelihood of a suicide reattempt among adults who had been admitted to an emergency department for a suicide attempt relative to treatment as usual (Brown et al., 2005).

- **Postvention** programs such as *StandBy Response Service* are implemented with the goal of providing support to survivors of suicide. *StandBy* provides clients with face-to-face outreach and telephone support through a professional crisis response team. Site coordinators develop customized case management plans, referring clients to other existing community services matched to their needs (Visser, Comans, & Scuffham, 2014). In a study by Visser et al. (2014), *StandBy* clients were significantly less likely to be at high risk for suicidality than a suicide bereaved comparison group who had not had contact with the *StandBy* program (48% and 64%

respectively,  $p = 0.005$ ). Additionally, research suggests that active postvention approaches in which outreach to suicide survivors occurs at the scene of a suicide is associated with intake into treatment sooner, greater attendance at support group meetings, and attendance at more meetings compared to passive postvention (versus passive approaches where survivors self-refer for services) (J. Cerel & Campbell, 2008).

- **Safe messaging following a suicide.** *Media guidelines* for reporting on suicides can help assure that stories on suicide are communicated in a safe and effective way. Reports that are both inclusive of suicide prevention messages, stories of hope and resilience, risk and protective factors, and links to helping resources (e.g., hotline) and that avoid sensationalizing events or reducing suicide to one cause can help reduce the likelihood of suicide contagion. The most compelling evidence supporting the effect of *media guidelines* on reduction in suicides comes from Austria. After a sharp increase in suicides on the Viennese subway, media guidelines were introduced and an interrupted time series design was used to evaluate the national impact of the guidelines on subsequent suicides. Changes in the quality and quantity of media reporting resulted in a reduction of 81 suicides annually (95% confidence interval: -149 to -13;  $t = -2.32$ ,  $df = 54$ ,  $p < 0.024$ ) in the Viennese subway system (Niederkrotenthaler & Sonneck, 2007)



## Sector Involvement

Public health can play an important and unique role in addressing suicide. Public health agencies, which typically place prevention at the forefront of efforts and work to create broad population-level impact, can bring critical leadership and resources to bear on this problem. For example, these agencies can serve as a convener, bringing together partners and stakeholders to plan, prioritize, and coordinate suicide prevention efforts. Public health agencies are also well positioned to collect and disseminate data, implement preventive measures, evaluate programs, and track progress. Although public health can play a leadership role in preventing suicide, the strategies and approaches outlined in this technical package cannot be accomplished by the public health sector alone.

Other sectors vital to implementing this package include, but are not limited to, education, government (local, state, and federal), social services, health services, business/labor, justice, housing, media, and organizations that comprise the civil society sector such as faith-based organizations, youth-serving organizations, foundations, and other non-governmental organizations. Collectively, these sectors can make a difference in preventing suicide by impacting the various contexts and underlying risks that contribute to suicide.

The strategies and approaches described in this technical package are summarized in Appendix A along with the relevant sectors that are well positioned to lead implementation efforts.

[I can write the text specific to the strategies and approaches. I've done this for the other TPs and am happy to do the same here. This is the section where we distinguish the strategies where public health is best positioned to lead from those where leadership is necessary from other sectors and how public health can assist, etc.]

Regardless of strategy, action by many sectors will be necessary for the successful implementation of this package. In this regard, all sectors can play an important and influential role in creating safe and protective environments where individuals who are at high risk of suicide can easily access the mental healthcare and services they need.



## Monitoring and Evaluation

Monitoring and evaluation are necessary components of the public health approach to prevention. It is important to have timely and reliable data to monitor the extent of the problem and to evaluate the impact of prevention efforts. Data are necessary for program implementation; planning, implementation, and assessment all rely on accurate measurement of the problem.

Surveillance data helps researchers and practitioners track changes in the burden of suicide.

Surveillance systems exist at the federal, state, and local levels. It is important to assess the availability of surveillance data and data systems across these levels to identify and address gaps in the systems. CDC's National Vital Statistics System and the National Violent Death Reporting System (NVDRS) are examples of surveillance systems that provide data on deaths from suicide. NVDRS, for example, is a state-based surveillance system that combines data from death certificates, law enforcement reports, and coroner or medical examiner reports to provide detailed information on the circumstances of violent deaths, including suicide, which can assist communities in guiding prevention approaches (Blair, Fowler, Jack, & Crosby, 2016). The National Electronic Injury Surveillance System-All Injury Program (NEISS-AIP) provides nationally representative data about all types and causes of nonfatal injuries treated in U.S. hospital emergency departments, and can be used to assess national rates of, and trends in, self-harm injuries by cause (e.g., falls, poisoning, etc.), age, race/ethnicity, sex, disposition (where the injured person goes when released from the Emergency Department (<http://www.cdc.gov/injury/wisqars/nonfatal.html>)).

In addition to information on deaths and nonfatal injuries, there are also surveillance systems that provide national, state, and some local estimates of suicidal behavior. The Youth Risk Behavior Surveillance System (YRBSS) collects information from a nationally representative sample of 9-12 grade students and is a key resource in monitoring health-risk behaviors among youth, including whether youth have seriously considered attempting suicide, attempted suicide, made a plan, or required treatment by a doctor or nurse for a suicide attempt that resulted in an injury, poisoning, or overdose (Brener et al., 2013). The YRBSS data are obtained from a national school-based survey conducted by CDC as well as school-based state, territorial, tribal, and large urban school district survey conducted by education and health agencies. The National Survey on Drug Use and Health (NSDUH) is an annual nationwide survey of individuals aged 12 years and older that provides national and state-level estimates of drug use and mental health-related issues, including suicide ideation and suicide attempts (<https://nsduhweb.rti.org/respweb/homepage.cfm>).

It is also important at all levels (local, state, and federal) to address gaps in responses, track progress of prevention efforts and evaluate the impact of those efforts, including the impact of this technical package. Evaluation data, produced through program implementation and monitoring, is essential to provide information on what does and does not work to reduce rates of suicide and its associated risk



and protective factors. Theories of change and logic models that identify short, intermediate, and long-term outcomes are an important part of program evaluation.

The evidence-base for suicide prevention has advanced greatly over the last few decades. However, additional research is needed to understand the impact of prevention programs on preventing suicide, as opposed to merely examining the effectiveness of programs to impact risk factors associated with suicide. More research is also needed to examine the effectiveness of upstream and community-level strategies to prevent suicide at the population level. Lastly, it will be important for researchers to test the effectiveness of combinations of the strategies and approaches included in this package. Most existing evaluations focus on approaches implemented in isolation. However, there is potential to understand the synergistic effects within a comprehensive prevention approach. Additional research is needed to understand the extent to which combinations of strategies and approaches result in greater reductions in suicide than individual programs, practices, or policies.

## Conclusion

Suicide is a serious public health problem whose rates have been on the rise for more than a decade and whose costs stretch well into the billions of dollars each year. And while suicide is a rare outcome statistically, its human impact has a ripple effect that is far-reaching. Each of us likely interacts with suicide survivors, those with lived experience, and those with thoughts of suicide, on a daily basis—at home, at work, and in our communities. Suicide and suicide attempts are therefore public health issues of societal concern. Fortunately, like many public health problems, suicide is preventable, and fortunately more is being done to prevent suicide than ever before, as evidenced by the work of the National Action Alliance for Suicide Prevention, the release of the first world report on suicide, more timely surveillance data, and critical mention in the President’s FY17 budget, to name just a few examples. Unfortunately and unlike most other public health problems, suicide still struggles against stigma, shame, and secrecy related to help-seeking, mental illness, being a survivor, or someone with lived experience; misplaced fear of asking someone about their risk of suicide (versus the fear and consequence of not asking), and fear of taking up certain strategies known to be effective but perhaps unpopular; misinformation about suicide preventability, and disproportionate funding given the public health burden. Suicide also struggles against the right degree of awareness where too much information, for example by well-meaning reporters and others, may actually do harm.

In an effort to continue pushing the field and society further towards prevention, this technical package includes strategies and approaches that ideally would be used in a comprehensive fashion, in combination—in a multi-level, multi-sectoral way. This technical package includes strategies and approaches targeting upstream prevention, e.g., social emotional learning for children and youth, as well as strategies focused more downstream, e.g., cognitive behavioral treatment to prevent re-

attempts. It includes universal, selective, and indicated strategies, or strategies that focus on the whole population regardless of risk to strategies that focus on those groups at highest risk. Importantly, this technical package extends the bounds of the typical prevention strategies to consider approaches at the outer levels of the social ecology, e.g., policies to stabilize housing and community engagement initiatives. In short, care and attention has been paid to all aspects of suicide prevention.

While the evidence base continues to be built, the collection of programs, policies, and practices laid out here are available for implementation now. And in keeping with good public health practice, the intent is that monitoring and evaluation will play a key role in that implementation. Moreover, as new evidence becomes available, this technical package can be refined to reflect the current state of the science.

In closing, and in keeping with a message of resilience as spoken by those with lived experience, ‘hope, help, and healing is possible.’



## References

(See last 7 pages after Appendix—EndNote put them there because it thought the Appendix/table was part of the regular text; Didn't want to cut and paste table for fear it'd get de-formatted)

## Appendix A: Summary of Strategies and Approaches to Prevent Suicide

Strategy	Approach/Program, Practice or Policy	Best Available Evidence			Lead Sectors <sup>1</sup>
		Suicide	Suicide Attempts or Ideation	Other Risk/Protective Factors for Suicide	
Strengthen economic supports	Strengthen financial security				
	Unemployment benefit programs	X			Government (local, state, Federal)
	Housing stabilization policies				
	The National Neighborhood Stabilization Program			X	Government (local, state, Federal)
Strengthen access to mental health care	Coverage of mental health conditions in health insurance policies				
	Mental Health Parity Laws	X		X	Healthcare  Government (local, state, Federal)
Establish protective environments	Means restriction				
	Intervening at hot spots	X			Government (local, state, Federal)
	Safe storage practices		X (attempts)	X (Safe storage of firearms and medication)	Government (local, state, Federal)
	Organizational policies and culture				



		Best Available Evidence			
	<i>Together for Life</i>	X			Business/Labor
	<i>US Air Force Suicide Prevention Program</i>	X		X (family violence)	Government (local, state, Federal)  Business/Labor
	Community-based policies to reduce excessive alcohol use				
	<i>Alcohol outlet density</i>	X		X	Government (local, state, Federal)
Promote connectedness to protect against suicide	Peer norm approaches				
	<i>Sources of Strength</i>			X	Public Health Social Services
	Community-engagement activities				
	<i>Greening vacant urban spaces</i>			X	Public Health
Teach coping and problem-solving skills	Social emotional learning				
	<i>Youth Aware of Mental Health Program</i>		X		Public Health Social Services
	<i>Signs of Suicide</i>		X	X	
	<i>Good Behavior Game</i>		X	X	
	Parenting skill and family relationship approaches				
	<i>The Incredible Years</i>			X	Public Health Social Services

		Best Available Evidence			
	Strengthening Families 10-14			X	
Identify and support people at-risk	Gatekeeper training				
	Mental Health First Aid			X	Public Health Healthcare Social Services
	Screening combined with care management				
	Henry Ford Perfect Depression Care (Pre-cursor to Zero Suicide)	X		X	Healthcare
	Crisis Intervention				
	National Suicide Prevention Lifeline		X	X	Public Health Social Services
	Applied Suicide Intervention Skills Training		X	X	
Intervene to lessen harms and prevent future risk	Treatment for people at risk of suicide				
	Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)		X	X	Healthcare Social Services
	Collaborative Assessment and Management of Suicidality (CAMS)		X	X	
	Dialectical Behavioral Therapy		X	X	
	Attachment-Based Family Therapy		X		
	Treatment to prevent re-attempts				



		Best Available Evidence			
	<i>ED Brief Intervention with Follow-up Visits</i>	X			Healthcare
	<i>Active follow-up contact approaches</i>	X	X		
	<i>CBT for Suicide Prevention</i>				
	Postvention				
	<i>StandBy Response Service</i>		X		Healthcare
	Safe messaging following a suicide				
	<i>Media Guidelines</i>	X			Public Health

<sup>1</sup>This column refers to the lead sectors well positioned to bring leadership and resources to implementation efforts. For each strategy, there are many other sectors such as non-governmental organizations that are instrumental to prevention planning and implementing the specific programmatic activities.

## REFERENCES

- Arsenault-Lapierre, G., Kim, C., & Turecki, G. (2004). Psychiatric diagnoses in 3275 suicides: a meta-analysis. *BMC Psychiatry*, 4, 37. doi: 10.1186/1471-244X-4-37
- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*: Prentice-Hall, Inc.
- Basile, K. C., Espelage, D. L., Rivers, I., McMahon, P. M., & Simon, T. R. (2009). The theoretical and empirical links between bullying behavior and male sexual violence perpetration. *Aggression and violent behavior*, 14(5), 336-347.
- Basile, K. C., Hamburger, M. E., Swahn, M. H., & Choi, C. (2013). Sexual violence perpetration by adolescents in dating versus same-sex peer relationships: differences in associated risk and protective factors. *Western Journal of Emergency Medicine*, 14(4), 329.
- Beautrais, A. L. (2001). Effectiveness of barriers at suicide jumping sites: A case study. *Aust NZ J Psychiat*, 35. doi: 10.1080/0004867010060501
- Beautrais, A. L., Gibb, S. J., Fergusson, D. M., Horwood, L. J., & Larkin, G. L. (2009). Removing bridge barriers stimulates suicides: An unfortunate natural experiment. *Aust NZ J Psychiat*, 43. doi: 10.1080/00048670902873714
- Beyer, K. M., Layde, P. M., Hamberger, L. K., & Laud, P. W. (2015). Does neighborhood environment differentiate intimate partner femicides from other femicides? *Violence Against Women*, 21(1), 49-64. doi: 10.1177/1077801214564075
- Blair, J. M., Fowler, K. A., Jack, S. P., & Crosby, A. E. (2016). The National Violent Death Reporting System: overview and future directions. *Inj Prev*, 22 Suppl 1, i6-i11. doi: 10.1136/injuryprev-2015-041819
- Borowsky, I. W., Hogan, M., & Ireland, M. (1997). Adolescent sexual aggression: risk and protective factors. *Pediatrics*, 100(6), E7.
- Branas, C. C., Cheney, R. A., MacDonald, J. M., Tam, V. W., Jackson, T. D., & Ten Have, T. R. (2011). A difference-in-differences analysis of health, safety, and greening vacant urban space. *Am J Epidemiol*, 174(11), 1296-1306. doi: 10.1093/aje/kwr273
- Brown, G. K., Ten Have, T., Henriques, G. R., Xie, S. X., Hollander, J. E., & Beck, A. T. (2005). Cognitive therapy for the prevention of suicide attempts: a randomized controlled trial. *JAMA*, 294(5), 563-570. doi: 10.1001/jama.294.5.563
- Butchart, A., Phinney, A., Check, P., & Villaveces, A. (2004). *Preventing Violence: A Guide to Implementing the Recommendations of the World Report on Violence and Health*. Geneva, Switzerland: World Health Organization.
- Capaldi, D. M., Knoble, N. B., Shortt, J. W., & Kim, H. K. (2012). A Systematic Review of Risk Factors for Intimate Partner Violence. *Partner Abuse*, 3(2), 231-280. doi: 10.1891/1946-6560.3.2.231
- Carter, M., McGee, R., Taylor, B., & Williams, S. (2007). Health outcomes in adolescence: associations with family, friends and school engagement. *J Adolesc*, 30(1), 51-62. doi: 10.1016/j.adolescence.2005.04.002
- Cavanagh, J. T., Carson, A. J., Sharpe, M., & Lawrie, S. M. (2003). Psychological autopsy studies of suicide: a systematic review. *Psychol Med*, 33(3), 395-405.
- Centers for Disease Control and Prevention. (2009). Strategic direction for the prevention of suicidal behavior: Promoting individual, family, and community connectedness to prevent suicidal behavior. from Available at: [http://www.cdc.gov/ViolencePrevention/pdf/Suicide\\_Strategic\\_Direction\\_Full\\_version-a.pdf](http://www.cdc.gov/ViolencePrevention/pdf/Suicide_Strategic_Direction_Full_version-a.pdf)
- Centers for Disease Control and Prevention. (2016a). Child Maltreatment: Risk and Protective Factors. from Available at: <http://www.cdc.gov/violenceprevention/childmaltreatment/riskprotectivefactors.html>
- Centers for Disease Control and Prevention. (2016b). Elder Maltreatment: Risk and Protective Factors. from Available at: <http://www.cdc.gov/ViolencePrevention/eldermaltreatment/riskprotectivefactors.html>.
- Centers for Disease Control and Prevention. (2016c). Sexual Violence: Risk and Protective Factors. from Available at: <http://www.cdc.gov/ViolencePrevention/sexualviolence/riskprotectivefactors.html>



- Centers for Disease Control and Prevention. (2016d). Web-Based Injury Statistics Query and Reporting System (WISQARS). Retrieved June 3, 2016 Available at: <http://www.cdc.gov/injury/wisqars/index.html>
- Centers for Disease Control and Prevention. (2016e). Youth Violence: Risk and Protective Factors. from Available at: <http://www.cdc.gov/violenceprevention/youthviolence/riskprotectivefactors.html>
- Cerel, J., & Campbell, F. R. (2008). Suicide survivors seeking mental health services: a preliminary examination of the role of an active postvention model. *Suicide Life Threat Behav*, 38(1), 30-34. doi: 10.1521/suli.2008.38.1.30
- Cerel, J., McIntosh, J. L., Neimeyer, R. A., Maple, M., & Marshall, D. (2014). The Continuum of "Survivorship": Definitional Issues in the Aftermath of Suicide. *Suicide and life-threatening behavior*, 44(6), 591-600. doi: 10.1111/sltb.12093
- Chapman, A. L., & Dixon-Gordon, K. L. (2007). Emotional antecedents and consequences of deliberate self-harm and suicide attempts. *Suicide Life Threat Behav*, 37(5), 543-552. doi: 10.1521/suli.2007.37.5.543
- Cheripitel, C. J., Borges, G. L. G., & Wilcox, H. C. (2004). Acute alcohol use and suicidal behavior: A review of the literature. *Alcoholism: Clinical and Experimental Research*, 28(5 SUPPL.), 18S-28S.
- Classen, T. J., & Dunn, R. A. (2012). The effect of job loss and unemployment duration on suicide risk in the United States: a new look using mass-layoffs and unemployment duration. *Health Econ*, 21(3), 338-350. doi: 10.1002/hec.1719
- Coffey, C. E. (2006). Pursuing perfect depression care. *Psychiatr Serv*, 57(10), 1524-1526. doi: 10.1176/ps.2006.57.10.1524
- Coffey, C. E., Coffey, M. J., & Ahmedani, B. K. (2013). An update on perfect depression care. *Psychiatr Serv*, 64(4), 396. doi: 10.1176/appi.PS.640422
- Coffey, M., Coffey, C., & Ahmedani, B. K. (2015). Suicide in a health maintenance organization population. *JAMA Psychiatry*, 72(3), 294-296. doi: 10.1001/jamapsychiatry.2014.2440
- Comtois, K. A., Jobes, D. A., S. O'Connor, S., Atkins, D. C., Janis, K., E. Chesson, C., . . . Yuodelis-Flores, C. (2011). Collaborative assessment and management of suicidality (CAMS): feasibility trial for next-day appointment services. *Depress Anxiety*, 28(11), 963-972. doi: 10.1002/da.20895
- Coulton, C. J., Crampton, D. S., Irwin, M., Spilsbury, J. C., & Korbin, J. E. (2007). How neighborhoods influence child maltreatment: a review of the literature and alternative pathways. *Child Abuse Negl*, 31(11-12), 1117-1142. doi: 10.1016/j.chiabu.2007.03.023
- Cox, G. R., Owens, C., Robinson, J., Nicholas, A., Lockley, A., Williamson, M., . . . Pirkis, J. (2013). Interventions to reduce suicides at suicide hotspots: a systematic review. *BMC Public Health*, 13(1), 1-12. doi: 10.1186/1471-2458-13-214
- Crosby, A. E., Han, B., Ortega, L., Parks, S. E., & Gfroerer, J. (2011). Suicidal Thoughts and Behaviors Among Adults Aged ≥18 Years — United States, 2008–2009. *MMWR*, 60(No. SS-13), 1-22.
- Crosby, A. E., Ortega, L., & Melanson, C. (2011). Self-directed Violence Surveillance: Uniform Definitions and Recommended Data Elements, Version 1.0. Atlanta, GA: Centers for Disease Control and Prevention, National Center for Injury Prevention and Control.
- Crosby, A. E., & Sacks, J. J. (2002). Exposure to suicide: incidence and association with suicidal ideation and behavior: United States, 1994. *Suicide Life Threat Behav*, 32(3), 321-328.
- Curtin, S. C., Warner, M., & Hedegaard, H. (2016). *Increase in suicide in the United States, 1999-2014*. ( ). Hyattsville, MD: National Center for Health Statistics Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/25116188>.
- Cylus, J., Glymour, M. M., & Avendano, M. (2014). Do generous unemployment benefit programs reduce suicide rates? A state fixed-effect analysis covering 1968-2008. *Am J Epidemiol*, 180(1), 45-52. doi: 10.1093/aje/kwu106
- Dahlberg, L. L., & Krug, E. G. (2002). Violence-a global public health problem. In E. Krug, L. L. Dahlberg, J. A. Mercy, A. B. Zwi, & R. Lozano (Eds.), *World Report on Violence and Health* (pp. 1-56). Geneva, Switzerland: World Health Organization.

- DeGue, S., Massetti, G. M., Holt, M. K., Tharp, A. T., Valle, L. A., Matjasko, J. L., & Lippy, C. (2013). Identifying links between sexual violence and youth violence perpetration: New opportunities for sexual violence prevention. *Psychology of violence*, 3(2), 140.
- Deisenhammer, E. A., Ing, C. M., Strauss, R., Kemmler, G., Hinterhuber, H., & Weiss, E. M. (2009). The duration of the suicidal process: how much time is left for intervention between consideration and accomplishment of a suicide attempt? *J Clin Psychiatry*, 70(1), 19-24.
- Desai, R. A., Dausey, D. J., & Rosenheck, R. A. (2005). Mental health service delivery and suicide risk: the role of individual patient and facility factors. *Am J Psychiatry*, 162(2), 311-318. doi: 10.1176/appi.ajp.162.2.311
- Diamond, G. S., Wintersteen, M. B., Brown, G. K., Diamond, G. M., Gallop, R., Shelef, K., & Levy, S. (2010). Attachment-based family therapy for adolescents with suicidal ideation: a randomized controlled trial. *J Am Acad Child Adolesc Psychiatry*, 49(2), 122-131.
- Dunne, E. J., McIntosh, J. L., & Dunne-Maxim, K. (Eds.). (1987). *Suicide and its aftermath: Understanding and counseling the survivors*. New York: Norton.
- Durkheim, E. (1897/1951). *Suicide: A study in sociology* (JA Spaulding & G. Simpson, trans.). Glencoe, IL: Free Press. (Original work published 1897).
- Elgar, F. J., Craig, W., Boyce, W., Morgan, A., & Vella-Zarb, R. (2009). Income inequality and school bullying: multilevel study of adolescents in 37 countries. *J Adolesc Health*, 45(4), 351-359. doi: 10.1016/j.jadohealth.2009.04.004
- Escobedo, L. G., & Ortiz, M. (2002). The relationship between liquor outlet density and injury and violence in New Mexico. *Accid Anal Prev*, 34(5), 689-694.
- Etzersdorfer, E., & Sonneck, G. (1998). Preventing suicide by influencing mass-media reporting: The Viennese experience, 1980-1996. *Arch Suicide Res*, 4.
- Ferdon, C., Crosby, A. E., Caine, E. D., Hindman J., Reed, G. A., & Iskander, J. (In press). CDC Public Health Grand Rounds: Preventing Suicide through a Comprehensive Public Health Approach. *MMWR*.
- Flavin, P., & Radcliff, B. (2009). Public policies and suicide rates in the American states. *Social Indicators Research*, 90(2), 195-209.
- Fleischmann, A., Bertolote, J. M., Wasserman, D., De Leo, D., Bolhari, J., Botega, N. J., . . . Thanh, H. T. (2008). Effectiveness of brief intervention and contact for suicide attempters: a randomized controlled trial in five countries. *Bulletin of the World Health Organization*, 86(9), 703-709. doi: S0042-96862008000900014 [pii]
- Fowler, K. A., Gladden, R. M., Vagi, K. J., Barnes, J., & Frazier, L. (2015). Increase in suicides associated with home eviction and foreclosure during the US housing crisis: findings from 16 National Violent Death Reporting System States, 2005-2010. *Am J Public Health*, 105(2), 311-316. doi: 10.2105/AJPH.2014.301945
- Freisthler, B., Merritt, D. H., & LaScala, E. A. (2006). Understanding the ecology of child maltreatment: a review of the literature and directions for future research. *Child Maltreat*, 11(3), 263-280. doi: 10.1177/1077559506289524
- Frieden, T. R. (2010). A framework for public health action: the health impact pyramid. *Am J Public Health*, 100(4), 590-595. doi: 10.2105/AJPH.2009.185652
- Frieden, T. R. (2014). Six components necessary for effective public health program implementation. *Am J Public Health*, 104(1), 17-22. doi: 10.2105/AJPH.2013.301608
- Ghahramanlou-Holloway, M., Bhar, S., Brown, G., Olsen, C., & Beck, A. T. (2012). Changes in problem-solving appraisal after cognitive therapy for the prevention of suicide. *Psychological Medicine*, 42(06), 1185-1193.
- Giesbrecht, N., Huguette, N., Ogden, L., Kaplan, M. S., McFarland, B. H., Caetano, R., . . . Nolte, K. B. (2015). Acute alcohol use among suicide decedents in 14 US states: impacts of off-premise and on-premise alcohol outlet density. *Addiction*, 110(2), 300-307. doi: 10.1111/add.12762
- Goldsmith, S. K., Pellmar, T. C., Kleinman, A. M., & Bunney, W. E. (2002). *Reducing suicide: A national imperative*: National Academies Press.



- Gould, M. S., Cross, W., Pisani, A. R., Munfakh, J. L., & Kleinman, M. (2013). Impact of Applied Suicide Intervention Skills Training on the National Suicide Prevention Lifeline. *Suicide Life Threat Behav*, 43(6), 676-691. doi: 10.1111/sltb.12049
- Gould, M. S., Kalafat, J., Harrismunfakh, J. L., & Kleinman, M. (2007). An evaluation of crisis hotline outcomes. Part 2: Suicidal callers. *Suicide Life Threat Behav*, 37(3), 338-352. doi: 10.1521/suli.2007.37.3.338
- Grossman, D. C., Mueller, B. A., Riedy, C., Dowd, M. D., Villaveces, A., Prodzinski, J., . . . Harruff, R. (2005). Gun storage practices and risk of youth suicide and unintentional firearm injuries. *JAMA*, 293(6), 707-714. doi: 10.1001/jama.293.6.707
- Haddon, W. (1980). Advances in the epidemiology of injuries as a basis for public policy. *Public Health Reports*, 95(5), 411-421.
- Harris, K. M., Carpenter, C., & Bao, Y. (2006). The effects of state parity laws on the use of mental health care. *Med Care*, 44(6), 499-505. doi: 10.1097/01.mlr.0000215813.16211.00
- Hassanian-Moghaddam, H., Sarjami, S., Kolahi, A. A., & Carter, G. L. (2011). Postcards in Persia: randomised controlled trial to reduce suicidal behaviours 12 months after hospital-treated self-poisoning. *British Journal of Psychiatry*, 198(4), 309-316.
- Hawton, K. (2007). Restricting access to methods of suicide: Rationale and evaluation of this approach to suicide prevention. *Crisis*, 28. doi: 10.1027/0227-5910.28.s1.4
- Heise, L., & Garcia-Moreno, C. (2002). Violence by Intimate Partners. In E. Krug, L. L. Dahlberg, J. A. Mercy, A. B. Zwi, & R. Lozano (Eds.), *World Report on Violence and Health* (pp. 87-121). Geneva, Switzerland: World Health Organization.
- Herman, K. C., Borden, L. A., Reinke, W. M., & Webster-Stratton, C. (2011). The Impact of the Incredible Years Parent, Child, and Teacher Training Programs on Children's Co-Occurring Internalizing Symptoms. *Sch Psychol Q*, 26(3), 189-201. doi: 10.1037/a0025228
- Hong, J. S., Kral, M. J., Espelage, D. L., & Allen-Meares, P. (2012). The social ecology of adolescent-initiated parent abuse: a review of the literature. *Child Psychiatry Hum Dev*, 43(3), 431-454. doi: 10.1007/s10578-011-0273-y
- Hunkeler, E. M., Katon, W., Tang, L., Williams, J. W., Jr., Kroenke, K., Lin, E. H., . . . Unutzer, J. (2006). Long term outcomes from the IMPACT randomised trial for depressed elderly patients in primary care. *BMJ*, 332(7536), 259-263. doi: 10.1136/bmj.38683.710255.BE
- Inagaki, M., Kawashima, Y., Kawanishi, C., Yonemoto, N., Sugimoto, T., Furuno, T., . . . Yamada, M. (2015). Interventions to prevent repeat suicidal behavior in patients admitted to an emergency department for a suicide attempt: a meta-analysis. *J Affect Disord*, 175, 66-78. doi: 10.1016/j.jad.2014.12.048
- Jobes, D. A. (2012). The Collaborative Assessment and Management of Suicidality (CAMS): an evolving evidence-based clinical approach to suicidal risk. *Suicide Life Threat Behav*, 42(6), 640-653. doi: 10.1111/j.1943-278X.2012.00119.x
- Johnson, F. W., Gruenewald, P. J., & Remer, L. G. (2009). Suicide and alcohol: do outlets play a role? *Alcohol Clin Exp Res*, 33(12), 2124-2133. doi: 10.1111/j.1530-0277.2009.01052.x
- Kellam, S. G., Brown, C. H., Poduska, J. M., Ialongo, N. S., Wang, W., Toyinbo, P., . . . Wilcox, H. C. (2008). Effects of a universal classroom behavior management program in first and second grades on young adult behavioral, psychiatric, and social outcomes. *Drug Alcohol Depend*, 95 Suppl 1, S5-S28. doi: 10.1016/j.drugalcdep.2008.01.004
- Kitchener, B. A., & Jorm, A. F. (2004). Mental health first aid training in a workplace setting: a randomized controlled trial [ISRCTN13249129]. *BMC Psychiatry*, 4, 23. doi: 10.1186/1471-244X-4-23
- Kitchener, B. A., & Jorm, A. F. (2006). Mental health first aid training: review of evaluation studies. *Aust N Z J Psychiatry*, 40(1), 6-8. doi: 10.1111/j.1440-1614.2006.01735.x
- Kleiman, E. M., Riskind, J. H., Schaefer, K. E., & Weingarden, H. (2012). The moderating role of social support on the relationship between impulsivity and suicide risk. *Crisis*, 33(5), 273-279. doi: 10.1027/0227-5910/a000136

- Klevens, J., Simon, T. R., & Chen, J. (2012). Are the perpetrators of violence one and the same? Exploring the co-occurrence of perpetration of physical aggression in the United States. *J Interpers Violence*, 27(10), 1987-2002. doi: 10.1177/0886260511431441
- Knox, K. L., Litts, D. A., Talcott, G. W., Feig, J. C., & Caine, E. D. (2003). Risk of suicide and related adverse outcomes after exposure to a suicide prevention programme in the US Air Force: cohort study. *BMJ*, 327(7428), 1376.
- Knox, K. L., Pflanz, S., Talcott, G. W., Campise, R. L., Lavigne, J. E., Bajorska, A., . . . Caine, E. D. (2010). The US Air Force suicide prevention program: implications for public health policy. *Am J Public Health*, 100(12), 2457-2463. doi: 10.2105/ajph.2009.159871
- Knox, M. S., Burkhart, K., & Hunter, K. E. (2010). ACT against violence parents raising safe kids program: Effects on maltreatment-related parenting behaviors and beliefs. *Journal of Family Issues*.
- Lang, M. (2013). The impact of mental health insurance laws on state suicide rates. *Health Econ*, 22(1), 73-88. doi: 10.1002/hec.1816
- Linehan, M. M., Comtois, K. A., Murray, A. M., Brown, M. Z., Gallop, R. J., Heard, H. L., . . . Lindenboim, N. (2006). Two-year randomized controlled trial and follow-up of dialectical behavior therapy vs therapy by experts for suicidal behaviors and borderline personality disorder. *Arch Gen Psychiatry*, 63(7), 757-766. doi: 10.1001/archpsyc.63.7.757
- Losel, F., & Farrington, D. P. (2012). Direct protective and buffering protective factors in the development of youth violence. *Am J Prev Med*, 43(2 Suppl 1), S8-S23. doi: 10.1016/j.amepre.2012.04.029
- Luo, F., Florence, C. S., Quispe-Agnoli, M., Ouyang, L., & Crosby, A. E. (2011). Impact of business cycles on US suicide rates, 1928-2007. *Am J Public Health*, 101(6), 1139-1146. doi: 10.2105/ajph.2010.300010
- Maimon, D., Browning, C. R., & Brooks-Gunn, J. (2010). Collective efficacy, family attachment, and urban adolescent suicide attempts. *J Health Soc Behav*, 51(3), 307-324. doi: 10.1177/0022146510377878
- Mishara, B. L. (Ed.). (1995). *The Impact of Suicide*. New York: Springer.
- Mishara, B. L., & Martin, N. (2012). Effects of a comprehensive police suicide prevention program. *Crisis: Journal of Crisis Intervention & Suicide*, 33(3), 162-168.
- Mitchell, A. M., Kim, Y., Prigerson, H. G., & Mortimer-Stephens, M. (2004). Complicated grief in survivors of suicide. *Crisis*, 25(1), 12-18. doi: 10.1027/0227-5910.25.1.12
- Motto, J. A., & Bostrom, A. G. (2001). A randomized controlled trial of postcrisis suicide prevention. *Psychiatr Serv*, 52(6), 828-833.
- Muennig, P., Cohen, A. K., Palmer, A., & Zhu, W. (2013). The relationship between five different measures of structural social capital, medical examination outcomes, and mortality. *Soc Sci Med*, 85, 18-26. doi: 10.1016/j.socscimed.2013.02.007
- National Action Alliance for Suicide Prevention. (2014). Research Prioritization Task Force.(2014). *A prioritized research agenda for suicide prevention: An action plan to save lives*.
- National Action Alliance for Suicide Prevention. (2016). Action Alliance Priorities. Retrieved July 12, 2016, from <http://actionallianceforsuicideprevention.org/priorities>
- National Action Alliance for Suicide Prevention: Suicide Attempt Survivors Task Force. (2014). *The Way Forward: Pathways to hope, recovery, and wellness with insights from lived experience*. Washington, D.C. : Author.
- National Action Alliance for Suicide Prevention: Survivors of Suicide Loss Task Force. (2015). *Responding to Grief, Trauma, and Distress After a Suicide: U.S. National Guidelines*. Washington, D.C. : Author.
- Niederkrotenthaler, T., & Sonneck, G. (2007). Assessing the impact of media guidelines for reporting on suicides in Austria: Interrupted time series analysis. *Aust N Z J Psychiatry*, 41. doi: 10.1080/00048670701266680
- Olfson, M., Gerhard, T., Huang, C., Crystal, S., & Stroup, T. S. (2015). Premature Mortality Among Adults With Schizophrenia in the United States. *JAMA Psychiatry*, 72(12), 1172-1181. doi: 10.1001/jamapsychiatry.2015.1737
- Owens, D. (2002). Fatal and non-fatal repetition of self-harm: Systematic review. *British Journal of Psychiatry*, 181(3), 193-199.



- Pena, J. B., & Caine, E. D. (2006). Screening as an approach for adolescent suicide prevention. *Suicide Life Threat Behav*, 36(6), 614-637. doi: 10.1521/suli.2006.36.6.614
- Perron, S., Burrows, S., Fournier, M., Perron, P. A., & Ouellet, F. (2013). Installation of a bridge barrier as a suicide prevention strategy in Montreal, Quebec, Canada. *Am J Public Health*, 103(7), 1235-1239. doi: 10.2105/ajph.2012.301089
- Pinchevsky, G. M., & Wright, E. M. (2012). The impact of neighborhoods on intimate partner violence and victimization. *Trauma Violence Abuse*, 13(2), 112-132. doi: 10.1177/1524838012445641
- Pirkis, J., Too, L. S., Spittal, M. J., Krysinaka, K., Robinson, J., & Cheung, Y. T. D. (2015). Interventions to reduce suicides at suicide hotspots: a systematic review and meta-analysis. *The Lancet Psychiatry*, 2(11), 994-1001. doi: [http://dx.doi.org/10.1016/S2215-0366\(15\)00266-7](http://dx.doi.org/10.1016/S2215-0366(15)00266-7)
- Pitman, A., Osborn, D., King, M., & Erlangsen, A. (2014). Effects of suicide bereavement on mental health and suicide risk. *Lancet Psychiatry*, 1, 86-94.
- Pollock, L. R., & Williams, J. M. (2004). Problem-solving in suicide attempters. *Psychol Med*, 34(1), 163-167.
- Reeves, A., Stuckler, D., McKee, M., Gunnell, D., Chang, S. S., & Basu, S. (2012). Increase in state suicide rates in the USA during economic recession. *Lancet*, 380(9856), 1813-1814. doi: 10.1016/S0140-6736(12)61910-2
- Reid, M. J., Webster-Stratton, C., & Hammond, M. (2003). Follow-up of children who received the Incredible Years intervention for oppositional-defiant disorder: Maintenance and prediction of 2-year outcome. *Behavior Therapy*, 34(4), 471-491.
- Resnick, M. D., Ireland, M., & Borowsky, I. (2004). Youth violence perpetration: what protects? What predicts? Findings from the National Longitudinal Study of Adolescent Health. *J Adolesc Health*, 35(5), 424 e421-410. doi: 10.1016/j.jadohealth.2004.01.011
- Rowhani-Rahbar, A., Simonetti, J. A., & Rivara, F. P. (2016). Effectiveness of Interventions to Promote Safe Firearm Storage. *Epidemiol Rev*, 38(1), 111-124. doi: 10.1093/epirev/mxv006
- Runyan, C. W., Becker, A., Brandspiegel, S., Barber, C., Trudeau, A., & Novins, D. (2016). Lethal Means Counseling for Parents of Youth Seeking Emergency Care for Suicidality. *West J Emerg Med*, 17(1), 8-14. doi: 10.5811/westjem.2015.11.28590
- Runyan, D., Wattam, C., Ikeda, R., Hassan, F., & Ramiro, L. (2002). Child abuse and neglect by parents and other caregivers. In E. Krug, L. L. Dahlberg, J. A. Mercy, A. B. Zwi, & R. Lozano (Eds.), *World Report on Violence and Health* (pp. 59-86). Geneva, Switzerland: World Health Organization.
- Sampson, R. J., Morenoff, J. D., & Gannon-Rowley, T. (2002). Assessing "Neighborhood Effects": Social Processes and New Directions in Research. *Annual Review of Sociology*, 28, 443-478.
- Schilling, E. A., Aseltine, R. H., Jr., & James, A. (2016). The SOS Suicide Prevention Program: Further Evidence of Efficacy and Effectiveness. *Prev Sci*, 17(2), 157-166. doi: 10.1007/s11121-015-0594-3
- Shepard, D. S., Gurewich, D., Lwin, A. K., Reed, G. A., Jr., & Silverman, M. M. (2016). Suicide and Suicidal Attempts in the United States: Costs and Policy Implications. *Suicide Life Threat Behav*, 46(3), 352-362. doi: 10.1111/sltb.12225
- Silverman, M. M., & Maris, R. W. (1995). The prevention of suicidal behaviors: An overview. *Suicide and life-threatening behavior*, 25(1), 10-21.
- Simon, O. R., Swann, A. C., Powell, K. E., Potter, L. B., Kresnow, M. J., & O'Carroll, P. W. (2001). Characteristics of impulsive suicide attempts and attempters. *Suicide Life Threat Behav*, 32(1 Suppl), 49-59.
- Spoth, R. L., Gyll, M., & Day, S. X. (2002). Universal family-focused interventions in alcohol-use disorder prevention: cost-effectiveness and cost-benefit analyses of two interventions. *J Stud Alcohol*, 63(2), 219-228.
- Substance Abuse and Mental Health Services Administration. (2014). *Report to Congress: Garrett Lee Smith Suicide Prevention Program*. Rockville, MD.
- Sudak, H., Maxim, K., & Carpenter, M. (2008). Suicide and stigma: a review of the literature and personal reflections. *Acad Psychiatry*, 32(2), 136-142. doi: 10.1176/appi.ap.32.2.136

- Szumilas, M., & Kutcher, S. (2011). Post-suicide intervention programs: a systematic review. *Can J Public Health*, 102(1), 18-29.
- Townsend, E., Hawton, K., Altman, D. G., Arensman, E., Gunnell, D., Hazell, P., . . . Van Heeringen, K. (2001). The efficacy of problem-solving treatments after deliberate self-harm: meta-analysis of randomized controlled trials with respect to depression, hopelessness and improvement in problems. *Psychological Medicine*, 31(6), 979-988.
- U.S. Office of the Surgeon General, & National Action Alliance for Suicide Prevention. (2012). *2012 National Strategy for Suicide Prevention: Goals and Objectives for Action*. Washington, D.C.: HHS.
- U.S. Public Health Service. (1999). *The Surgeon General's Call to Action to Prevent Suicide*. Washington, D.C.
- Unutzer, J., Tang, L., Oishi, S., Katon, W., Williams, J. W., Jr., Hunkeler, E., . . . Langston, C. (2006). Reducing suicidal ideation in depressed older primary care patients. *J Am Geriatr Soc*, 54(10), 1550-1556.
- Visser, V. S., Comans, T. A., & Scuffham, P. A. (2014). Evaluation Of The Effectiveness Of A Community-Based Crisis Intervention Program For People Bereaved By Suicide. *Journal of Community Psychology*, 42(1), 19-28. doi: 10.1002/jcop.21586
- Wang, Y. C., Hsieh, L. Y., Wang, M. Y., Chou, C. H., Huang, M. W., & Ko, H. C. (2016). Coping Card Usage can Further Reduce Suicide Reattempt in Suicide Attempter Case Management Within 3-Month Intervention. *Suicide Life Threat Behav*, 46(1), 106-120. doi: 10.1111/sltb.12177
- Wasserman, D., Hoven, C. W., Wasserman, C., Wall, M., Eisenberg, R., Hadlaczky, G., . . . Carli, V. (2014). School-based suicide prevention programmes: The SEYLE cluster-randomised, controlled trial. *The Lancet*, 385(9977), 1536-1544. doi: 10.1016/S0140-6736(14)61213-7
- Webster-Stratton, C., & Hammond, M. (1997). Treating children with early-onset conduct problems: a comparison of child and parent training interventions. *J Consult Clin Psychol*, 65(1), 93-109.
- Webster-Stratton, C., Reid, M. J., & Hammond, M. (2001). Preventing conduct problems, promoting social competence: a parent and teacher training partnership in head start. *J Clin Child Psychol*, 30(3), 283-302. doi: 10.1207/S15374424JCCP3003\_2
- Webster-Stratton, C. H., Reid, M. J., & Beauchaine, T. (2011). Combining parent and child training for young children with ADHD. *Journal of Clinical Child & Adolescent Psychology*, 40(2), 191-203.
- Webster-Stratton, C., Jamila Reid, M., & Stoolmiller, M. (2008). Preventing conduct problems and improving school readiness: evaluation of the incredible years teacher and child training programs in high-risk schools. *Journal of child psychology and psychiatry*, 49(5), 471-488.
- Widome, R., Sieving, R. E., Harpin, S. A., & Hearst, M. O. (2008). Measuring neighborhood connection and the association with violence in young adolescents. *J Adolesc Health*, 43(5), 482-489. doi: 10.1016/j.jadohealth.2008.04.013
- Wilcox, H. C., Kellam, S. G., Brown, C. H., Poduska, J. M., Ialongo, N. S., Wang, W., & Anthony, J. C. (2008). The impact of two universal randomized first- and second-grade classroom interventions on young adult suicide ideation and attempts. *Drug Alcohol Depend*, 95 Suppl 1, S60-73.
- Wilson, W. J. (2011). *When work disappears: The world of the new urban poor*: Vintage.
- World Health Organization. (2014). *Suicide Prevention: A Global Imperative*. Geneva, Switzerland: WHO Press.
- Wyman, P. A., Brown, C. H., LoMurray, M., Schmeelk-Cone, K., Petrova, M., Yu, Q., . . . Wang, W. (2010). An outcome evaluation of the Sources of Strength suicide prevention program delivered by adolescent peer leaders in high schools. *Am J Public Health*, 100(9), 1653-1661. doi:
- Yip, P., Caine, E., Yousuf, S., Chang, S.-S., Wu, K., & Chen, Y.-Y. (2012). Means restriction for suicide prevention. *Lancet*, 379. doi: 10.1016/s0140-6736(12)60521-2



**Comment [A]:** Should we add relationships? Keep the levels the same as the SEM or is this ok?

**Policies, Programs, and Practices to Support  
Individuals, Families, & Communities:**

**A Technical Package to Prevent Suicide**

**Prepared by:**

Deb Stone, ScD, MSW, MPH  
Kristin Holland, PhD, MPH  
Brad Bartholow, PhD  
Alex Crosby, MD, MPH  
Shane Davis, PhD  
Natalie Wilkins, PhD

**Division of Violence Prevention  
National Center for Injury Prevention and Control (NCIPC)  
Centers for Disease Control and Prevention**

**2016**

*Policies, Programs, and Practices to Support Individuals, Families, & Communities:*  
*A Technical Package to Prevent Suicide* is a publication of the National Center for Injury Prevention  
and Control of the Centers for Disease Control and Prevention.

Centers for Disease Control and Prevention  
Thomas R. Frieden, MD, MPH, Director

National Center for Injury Prevention and Control  
Debra E. Houry, MD, MPH, Director

Division of Violence Prevention  
James A. Mercy, PhD, Director

*Suggested Citation:* Stone, D.M., Holland, K.M., Bartholow, B., Crosby, A.E., Davis, S., and Wilkins, N.  
Policies, Programs, and Practices to Support Individuals, Families, and Communities: *A Technical  
Package to Prevent Suicide*. Atlanta, GA: National Center for Injury Prevention and Control, Centers for  
Disease Control and Prevention, 2016.



## Contents

Acknowledgements.....	
External Reviewers.....	
Overview of Technical Package.....	
Strengthen Economic Supports.....	
Strengthen Access to Mental Health Care.....	
Create Protective Environments.....	
Promote Connectedness.....	
Teach Coping and Problem-Solving Skills.....	
Identify and Support People At Risk.....	
Intervene to Lessen Harms and Prevent Future Risk.....	
Sector Involvement.....	
Monitoring and Evaluation.....	
Conclusion.....	
References.....	
Appendix.....	

## External Reviewers

[to be inserted later]



## Acknowledgments

[to be inserted later]

Please include Helen Singer, MPH

## Overview

This technical package represents a select group of strategies based on the best available evidence to help communities and states sharpen their focus on prevention activities with the greatest potential to prevent suicide. These strategies include strengthening economic supports; strengthening access to mental health care; creating protective environments; promoting connectedness to protect against suicide; teaching coping and problem-solving skills; identifying and supporting people at-risk; and intervening to lessen harms and prevent future risk. The strategies represented in this package include those with a focus on preventing suicide from happening in the first place as well as approaches to lessen the immediate and long-term harms of suicidal behavior for individuals, families, communities, and society. The strategies in the technical package support the goals and objectives of the National Strategy for Suicide Prevention and the National Action Alliance for Suicide Prevention's priority to strengthen community-based prevention. Commitment, cooperation, and leadership from numerous sectors, including public health, education, justice, health care, social services, business/labor, and government can bring about the successful implementation of this package.

### What is a Technical Package?

A technical package is a compilation of a core set of strategies to achieve and sustain substantial reductions in a specific risk factor or outcome (Frieden, 2014). Technical packages help communities and states prioritize prevention activities based on the best available evidence. This technical package has three components. The first component is the **strategy** or the preventive direction or actions to achieve the goal of preventing suicide. The second component is the **approach**. The approach includes the specific ways to advance the strategy. This can be accomplished through *programs, policies, and practices*. The approaches included come primarily from studies based in the United States. The **evidence** for each of the approaches in preventing suicide or its associated risk factors is included as the third component. This package is intended as a resource to guide and inform prevention decision-making in communities and states.

### Preventing Suicide is a Priority

Suicide, as defined by the Centers for Disease Control and Prevention (CDC), is part of a broader class of behavior called *self-directed violence*. Self-directed violence refers to behavior directed at oneself that deliberately results in injury or the *potential* for injury (Crosby, Ortega, & Melanson, 2011). Self-directed violence may be *suicidal* or *non-suicidal* in nature. For the purposes of this document, we refer only to behavior where suicide is intended:

- **Suicide** is a death caused by self-directed injurious behavior with any intent to die as a result of the behavior.



- **Suicide attempt** is defined as a *non-fatal* self-directed and potentially injurious behavior with any intent to die as a result of the behavior. A suicide attempt may or may not result in injury.

**Suicide is highly prevalent.** Suicide presents a major challenge to public health in the United States and worldwide. It contributes to premature death, morbidity, lost productivity, and health care costs (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014). In 2014 (the most recent year of available death data), suicide was responsible for 42,773 deaths in the U.S., which is approximately one suicide every 12 minutes (Centers for Disease Control and Prevention, 2016d). In 2014, suicide ranked as the 10th leading cause of death and has been among the top 12 leading causes of death since 1975 in the U.S (Centers for Disease Control and Prevention, 2016d). Overall suicide rates have increased 24% from 1999 to 2014 (Curtin, Warner, & Hedegaard, 2016). Suicide is a problem throughout the life span; it is the second leading cause of death among those aged 10–19 years, also second among persons in their 20s and 30s; it is the fourth leading cause among persons in their 40s and seventh among persons in their 50s (Centers for Disease Control and Prevention, 2016d).

Suicides reflect only a portion of the problem (Crosby, Han, Ortega, Parks, & Gfroerer, 2011). Substantially more people are hospitalized as a result of nonfatal suicidal behavior (i.e. suicide attempts) than are fatally injured, and an even greater number are either treated in ambulatory settings (e.g., emergency departments) or not treated at all (Crosby, Han, et al., 2011). For example, during 2014, among adults aged 18 years and older, for every one suicide there were 9 adults treated in hospital emergency departments for self-harm injuries, 27 who reported making a suicide attempt, and over 227 who reported seriously considering suicide (i.e. ideation) (Ferdon et al., In press).

**Suicide is associated with several risk and protective factors.** Suicide, like other human behaviors, is complex with no single determining cause. Instead, suicide occurs in response to multiple biological, psychological, interpersonal, environmental and societal influences that interact with one another, often over time. The social-ecological model-- encompassing multiple levels of focus from the individual, relationship, community, and societal-- is a useful framework for viewing and understanding suicide risk factors identified in the literature (Dahlberg & Krug, 2002). Risk and protective factors for suicide exist at each level. For example, risk factors include:

- **Individual level:** History of depression and other mental illnesses, alcohol and drug abuse, previous suicide attempt, violence victimization, genetic and biological determinants, hopelessness
- **Relationship level:** High conflict or violent relationships, sense of isolation and lack of social support, family/loved one's history of suicide, financial and work stress
- **Community level:** Inadequate community connectedness, barriers to health care (e.g., lack of access to providers and medications)

- **Societal level:** Availability of lethal means of suicide, unsafe media portrayals of suicide, stigma associated with help-seeking and mental illness (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014).

It is important to recognize that the vast majority of individuals who are depressed or who have other risk factors noted, do *not* die by suicide. Furthermore, the relevance of each risk factor can vary by age, race, gender, sexual orientation, residential geography, and socio-cultural and economic status (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014).

Protective factors, or those influences that guard *against* the risk for suicide, can also be found across the different levels of the social-ecological model. Protective factors identified in the literature include: effective coping and problem solving skills, moral objections to suicide, strong and supportive relationships with partners, friends, and family; connectedness to school, community and other social institutions; availability of quality and ongoing physical and mental health care, and reduced access to lethal means (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014). These protective factors can either counter a specific risk factor or guard against a number of risks associated with suicide.

**Suicide is connected to other forms of violence.** Suicide and other forms of violence often share some of the same root causes (Butchart, Phinney, Check, & Villaveces, 2004; Klevens, Simon, & Chen, 2012). For example, in neighborhoods where there is low social cohesion, or where residents don't support and trust each other, people are at higher risk for suicide (Desai, Dausey, & Rosenheck, 2005) as well as perpetration of child maltreatment (Coulton, Crampton, Irwin, Spilsbury, & Korbin, 2007; Freisthler, Merritt, & LaScala, 2006), teen dating violence (Capaldi, Noble, Shortt, & Kim, 2012), intimate partner violence (Pinchevsky & Wright, 2012), and youth violence (Sampson, Morenoff, & Gannon-Rowley, 2002). Additionally, a lack of economic opportunities and unemployment are associated with suicide (Luo, Florence, Quispe-Agnoli, Ouyang, & Crosby, 2011; Reeves et al., 2012), as well as perpetration of child maltreatment (D. Runyan, Wattam, Ikeda, Hassan, & Ramiro, 2002), intimate partner violence (Heise & Garcia-Moreno, 2002; Pinchevsky & Wright, 2012), sexual violence (Centers for Disease Control and Prevention, 2016c) and youth violence (Wilson, 2011). Other shared risk factors for suicide and violence occur at the individual level and include substance abuse, mental health problems, witnessing violence, and a lack of problem-solving skills (Centers for Disease Control and Prevention, 2016a, 2016c, 2016e; U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012).

Just as risk factors may be shared across suicide and violence, so too may protective factors overlap. For example, connectedness increases individual's and communities' resilience to suicide and other forms of violence, including connectedness to one's community (Basile, Hamburger, Swahn, & Choi, 2013; Borowsky, Hogan, & Ireland, 1997; Centers for Disease Control and Prevention, 2016b; Coulton et al.,



2007; Kleiman, Riskind, Schaefer, & Weingarden, 2012; Pinchevsky & Wright, 2012; Widome, Sieving, Harpin, & Hearst, 2008), school (Basile, Espelage, Rivers, McMahon, & Simon, 2009; Capaldi et al., 2012; Carter, McGee, Taylor, & Williams, 2007; DeGue et al., 2013; Hong, Kral, Espelage, & Allen-Meares, 2012; Losel & Farrington, 2012), family (Capaldi et al., 2012; Centers for Disease Control and Prevention, 2016a; Elgar, Craig, Boyce, Morgan, & Vella-Zarb, 2009; Maimon, Browning, & Brooks-Gunn, 2010; Resnick, Ireland, & Borowsky, 2004), caring adults (Capaldi et al., 2012; Losel & Farrington, 2012; Maimon et al., 2010), and pro-social peers (Capaldi et al., 2012; Losel & Farrington, 2012).

**The health and economic consequences of suicide are substantial.** Suicide and suicide attempts have far-reaching consequences for individuals, families, and communities (Dunne, McIntosh, & Dunne-Maxim, 1987; Mishara, 1995; National Action Alliance for Suicide Prevention: Suicide Attempt Survivors Task Force, 2014; National Action Alliance for Suicide Prevention: Survivors of Suicide Loss Task Force, 2015). By one conservative estimate, for every death by suicide six people are directly impacted (i.e. survivors). Based on this figure it is estimated that there are over 13 million survivors in the U.S. and unfortunately, survivorship itself is a risk factor for suicide (Crosby & Sacks, 2002). Research indicates that the health consequences of violence, including suicide, are also much more extensive than injury and death. Suicide attempt survivors (i.e. those with lived experience) may suffer long-term health and mental health consequences ranging from anger, guilt, and physical impairment, depending on the means and severity of the attempt (Chapman & Dixon-Gordon, 2007). Similarly, survivors of a loved one's suicide may experience ongoing pain and suffering including complicated grief (Mitchell, Kim, Prigerson, & Mortimer-Stephens, 2004), stigma, depression, anxiety, post-traumatic stress disorder, and increased risk of suicidal ideation and suicide (Julie Cerel, McIntosh, Neimeyer, Maple, & Marshall, 2014; Sudak, Maxim, & Carpenter, 2008).

The economic toll of suicide is immense as well. The total lifetime costs associated with nonfatal injuries and deaths caused by self-directed violence in 2013 were approximately \$93.5 billion after adjusting for under-reporting of suicide (Shepard, Gurewich, Lwin, Reed, & Silverman, 2016). The overwhelming burden of these costs results from lost productivity over the life course, with the average cost per suicide being over \$1.3 million (Shepard et al., 2016).

**Suicide can be prevented.** Despite the myths surrounding suicide, like most public health problems, suicide is preventable (U.S. Public Health Service, 1999). And while progress will continue to be made into the future, evidence for numerous programs, practices, and policies currently exists, and many programs are ready to be implemented now. Just as suicide is not caused by a single factor, research suggests that suicide will not be prevented by any single intervention taking place in any single setting (Silverman & Maris, 1995; U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). Rather, suicide prevention is best achieved by a focus across the individual-, relationship-, family-, community, and societal-levels and across all sectors, private and public (e.g.,

business, public health, physical and behavioral healthcare, justice, education, labor) (National Action Alliance for Suicide Prevention, 2014; World Health Organization, 2014).

### **Assessing the Evidence**

This technical package includes programs, practices, and policies with evidence of impact on suicide or risk or protective factors for suicide. To be considered for inclusion in the technical package, the program, practice, or policy selected had to meet at least one of these criteria: a) meta-analyses or systematic reviews showing impact on suicide; b) evidence from at least one rigorous (e.g., randomized controlled trial [RCT] or quasi-experimental design) evaluation study that found significant preventive effects on suicide; c) meta-analyses or systematic reviews showing impact on risk or protective factors for suicide, or d) evidence from at least one rigorous (e.g., RCT or quasi-experimental design) evaluation study that found significant impacts on risk or protective factors for suicide. Finally, consideration was also given to the likelihood of achieving beneficial effects on multiple forms of violence; no evidence of harmful effects on specific outcomes or with particular subgroups; and feasibility of implementation in a U.S. context if the program, policy, or practice has been evaluated in another country.

Within this technical package, some approaches do not yet have research evidence demonstrating impact on rates of suicide but instead are supported by evidence indicating impacts on risk or protective factors for suicide (e.g., help-seeking, stigma reduction, depression, connectedness). In terms of the strength of the evidence, programs that have demonstrated effects on suicidal behavior (e.g., reductions in deaths, attempts) provide a higher-level of evidence, but the evidence base is not that strong in all areas. For instance, there has been less evaluation of community engagement and family programs on suicidal behavior. Thus, approaches in this package that have effects on risk or protective factors reflect the developmental nature of the evidence base and the use of the best available evidence at a given time.

It is also important to note that there is often significant heterogeneity among the programs, policies, or practices that fall within one approach or strategy area in terms of the nature and quality of the available evidence. Not all programs, policies, or practices that utilize the same approach (e.g., gatekeeper training) are equally effective, and even those that are effective may not work across all populations. Tailoring programs and more evaluation may be necessary to address different population groups. The examples provided are not intended to be a comprehensive list of evidence-based programs, policies, or practices for each approach, but rather illustrate models that have been shown to impact suicide or have beneficial effects on risk or protective factors for suicide. In practice, the effectiveness of the programs, policies and practices identified in this package will be strongly dependent on the quality of their implementation and the communities in which they are implemented. Implementation guidance to assist practitioners, organizations and communities will be developed separately.



### Context and Cross-Cutting Themes

The strategies and approaches that have been included in this technical package represent different levels of the social ecology, with efforts intended to impact the community and societal levels, as well individual and relationship levels. The strategies and approaches are intended to work in combination and reinforce each other to prevent suicide (see box below). The strategies are arranged in order such that those strategies hypothesized to have the greatest potential for broad public health impact on suicide are included first, followed by those that might impact more select populations (e.g., persons who have already made a suicide attempt).

**Comment [A]:** Can we just call this Promote Connectedness so it's more consistent with other strategy titles? Not sure why we have to say to protect against suicide.

Preventing Suicide	
Strategy	Approach
Strengthen economic supports	<ul style="list-style-type: none"><li>Strengthen household financial security</li><li>Housing stabilization policies</li></ul>
Strengthen access to mental health care	<ul style="list-style-type: none"><li>Coverage of mental health conditions in health insurance policies</li></ul>
Create protective environments	<ul style="list-style-type: none"><li>Reducing access to lethal means among persons at-risk of suicide</li><li>Organizational policies and culture</li><li>Community-based policies to reduce excessive alcohol use</li></ul>
Promote connectedness to protect against suicide	<ul style="list-style-type: none"><li>Peer norm approaches</li><li>Community engagement activities</li></ul>
Teach coping and problem-solving skills	<ul style="list-style-type: none"><li>Social-emotional learning</li><li>Parenting skill and family relationship approaches</li></ul>
Identify and support people at risk	<ul style="list-style-type: none"><li>Gatekeeper training</li><li>Screening combined with care management</li><li>Crisis intervention</li></ul>
Intervene to lessen harms and prevent future risk	<ul style="list-style-type: none"><li>Treatment for people at-risk of suicide</li><li>Treatment to prevent re-attempts</li><li>Postvention</li><li>Safe messaging following a suicide</li></ul>

The example programs, policies, and practices have been implemented within particular contexts. The social and cultural context of communities is critically important to take into account when selecting strategies and approaches. Practitioners in the field may be in the best position to assess the needs and strengths of their communities and work with community members to make decisions about the combination of approaches included here that are best suited to their context.

Suicide ideation, attempts, morbidity and mortality vary by gender, race/ethnicity, age, occupation, and other important population characteristics. Barriers to disclosure, help seeking, timely access to quality care, and ongoing support are profoundly complex and may also vary by population and community characteristics. Ideally, the availability of multiple approaches tailored to the economic, cultural, and environmental context of individuals and communities are desirable as they may increase the likelihood of removing barriers to supportive and effective care and provide opportunities to develop individual and community resilience. These culturally appropriate approaches can then be included in comprehensive strategies to maximize the public health impact on reducing suicide-related morbidity and mortality among individuals and within communities.

This package includes strategies where public health agencies are well positioned to bring leadership and resources to implementation efforts. It also includes strategies where public health can serve as an important collaborator (e.g., strategies addressing community and societal level risks), but where leadership and commitment from other sectors such as business/labor or health care is critical to implement a particular policy or program (e.g., workplace policies; screening combined with care management). The role of various sectors in the implementation of a strategy or approach in preventing suicide is described further in the section on *Sector Involvement*.

In the sections that follow, the strategies and approaches with the best available evidence for preventing suicide are described.



## Strengthen Economic Supports

### Rationale

Studies from the U.S. indicate that suicide rates increase during economic recessions marked by high unemployment rates, job losses, and economic instability and decrease during economic expansions and periods marked by low unemployment rates, particularly for working-age individuals 25 to 64 years old (Luo et al., 2011; Fowler et al., 2015). Economic and financial strain, such as job loss, long periods of unemployment, reduced income, difficulty covering medical, food, and housing expenses, and even the anticipation of such financial stress, increase an individual's risk for suicide and how buffering these risks can potentially protect against suicide (Stack & Wasserman, 2007). Public health research suggests that some of the biggest impacts on health come from efforts directed at improving the socioeconomic conditions of individuals and families (Frieden, 2010). Strengthening economic support systems can help people stay in their homes or obtain affordable housing, pay for necessities such as food and medical care, and get job training, among other things. In providing this support, stress and anxiety and the potential for a crisis situation may be reduced, thereby preventing suicide.

### Approaches

Economic supports for individuals and families can be strengthened by targeting household financial security and ensuring stability in housing during periods of economic stress

- **Strengthening household financial security** can reduce the risk of suicide by providing individuals with the financial means to cover basic expenses and lessen the stress and hardship associated with a job loss or other unanticipated financial problems. The provision of unemployment benefits, livable wages, Temporary Assistance to Needy Families (TANF), medical benefits, and retirement and disability insurance to help cover the cost of necessities or to offset costs in the event of disability are examples of ways to strengthen household financial security.
- **Housing stabilization policies** aim to keep people in their homes and provide housing options for those in need during times of financial insecurity. This may occur through programs that provide affordable housing such as through government subsidies or through other options available to potential homebuyers such as loan modification programs, move-out planning, or financial counseling services that help minimize the risk or impact of foreclosures and eviction.

### Potential Outcomes

- Reduced suicide rates
- Lower foreclosure rates
- Lower eviction rates



- Reduced emotional distress

## Evidence

There is evidence suggesting that strengthening household financial security and stabilizing housing can reduce suicide risk.

- **Strengthen household financial security.** An examination of variations in U.S. *unemployment benefit programs* across states demonstrated that the impact of unemployment on suicide was offset in those states that provided greater than average unemployment benefits (Cylus, Glymour, & Avendano, 2014). Another U.S. study examining the link between unemployment and suicide risk using monthly suicide data, length of unemployment, and job losses found that the duration of unemployment, as opposed to just the loss of job, predicted suicide risk (Classen & Dunn, 2012). Together, these results suggest that not only should state unemployment benefit programs be generous in their financial allocations, but also in their duration. Other measures to strengthen household financial security (e.g., transfer payments related to retirement and disability insurance, unemployment insurance compensation, medical benefits, and other forms of family assistance) have also shown an impact on suicide. A study by Flavin and Radcliff (2009) examined the impact of states' per capita spending on transfer payments, medical benefits, and family assistance and total state spending on suicide rates between 1990-2000, controlling for a number of suicide risk factors (e.g., residential mobility, divorce rate, unemployment rate) at the state level. As per capita spending on total transfer payments, medical benefits, and family assistance increased there was an associated decrease in state suicide rates. Moreover, it wasn't spending in general that was associated with the reduction but spending on these types of assistance. In terms of lives saved, Flavin & Radcliff calculated the cost of reducing a state's suicide rate by a full point for the years studied. At the national level, an estimated 3,000 fewer suicides would occur per year nationwide if every state increased their per capita spending on these types of assistance by \$45 per year (Flavin & Radcliff, 2009).
- **Housing stabilization policies.** The *National Neighborhood Stabilization Program* was designed to help neighborhoods suffering from high rates of foreclosure and abandonment by slowing the deterioration of the neighborhoods and providing affordable housing options for low, moderate, and middle-income homebuyers. This program also offers financial assistance to eligible individuals for the purchase of a new home. Although this program has not been rigorously evaluated for its impact on suicide outcomes, it addresses foreclosure and eviction, which are risk factors for suicide. A longitudinal analysis of annual data on suicides and foreclosures demonstrated that as the proportion of foreclosed properties increased in U.S. states, so did the state suicide rate, particularly among working-aged adults (Houle & Light, 2014). Another study of data from 16 U.S. states participating in the National Violent Death Reporting System found



that suicides precipitated by home foreclosures and evictions increased more than 100% from 2005 (before the housing crisis began) to 2010 (after it had peaked; Fowler, Gladden, Vagi, Barnes, and Frazier (2015)). Most of these suicides occurred prior to the actual loss of the decedent's home. These findings suggest that integrating suicide prevention resources, messaging, and referrals into financial, foreclosure, and move-out planning and counseling services may help to prevent suicide.

## Strengthen Access to Mental Health Care

### Rationale

While most people with mental health problems do not attempt or die by suicide (Olfson, Gerhard, Huang, Crystal, & Stroup, 2015; Owens, 2002), and risk conferred by mental illnesses differ (Arsenault-Lapierre, Kim, & Turecki, 2004; E. C. Harris & Barraclough, 1997; Tyrer, Reed, & Crawford, 2015), previous research indicates that mental illness is an important risk factor for suicide (E. C. Harris & Barraclough, 1998; World Health Organization, 2014). Studies suggest that up to 90% of people who die by suicide may have had a mental illness at the time of their deaths (Arsenault-Lapierre et al., 2004; Cavanagh, Carson, Sharpe, & Lawrie, 2003; Isometsa, 2001). State-level suicide rates have also been found to be correlated with general mental health measures such as depression (Lang, 2013; Mark, Shern, Bagalman, & Cao, 2007). Findings from the National Comorbidity Survey indicate that relatively few people in the U.S. with mental health disorders receive treatment for those conditions (Kessler et al., 2005). Lack of access to mental health care is one of the contributing factors related to the underuse of mental health services (Cunningham, 2009). Identifying ways to improve access to timely, affordable, and quality mental health care for people in need is a critical component to suicide prevention (World Health Organization, 2014). Apart from the treatment benefits, it can also serve to normalize help-seeking behavior and increase the use of such services.

### Approaches

One approach to strengthening access to mental health care is through the provision of mental health coverage in health insurance policies.

- **Coverage of mental health conditions in health insurance policies.** Federal and state laws include provisions for equal coverage of mental health services in health insurance plans that is on par with coverage for other health concerns (i.e., mental health parity). Benefits and services covered include such things as the number of visits, co-pays, deductibles, inpatient/outpatient services, prescription drugs, and hospitalizations. If a state has a stronger mental health parity law than the federal parity law, then insurance plans regulated by the state must follow the state parity law. Federal parity replaces the state law only in cases where the state law prevents the application of the federal parity law (e.g., includes coverage for some mental health conditions but not others). Equal coverage does not necessarily imply good coverage as health insurance plans vary in the extent to which benefits and services are offered to address various health conditions. Rather it helps to ensure that mental health services are covered on par with other health concerns.

### Potential Outcomes

- Increased utilization of mental health services



- Decreased symptoms of mental illnesses
- Decreased rates of suicide attempts
- Decreased rates of suicide

## Evidence

There is evidence suggesting that coverage of mental health conditions in health insurance policies can reduce risk factors associated with suicide and may directly impact suicide rates.

- **Coverage of mental health conditions in health insurance policies.** The National Survey of Drug Use and Health is a nationally representative survey of the U.S. population that provides data on substance use, mental health conditions, and services utilization. Using data from this survey, K. M. Harris, Carpenter, and Bao (2006) found that 12 months after states enacted *mental health parity laws*, self-reported use of mental healthcare services significantly increased. Moreover, subsequent research by Lang (2013) examined state mental health laws and suicide rates between 1990 and 2004 and found that mental health parity laws, specifically, were associated with an approximate 5% reduction in suicide rates. This reduction, in the 29 states with parity laws, equated to the prevention of 592 suicides per year and a cost savings of \$1.3-3.1 million per suicide prevented (Lang, 2013).

## Create Protective Environments

### Rationale

**Comment [A]:** Not sure if the additions I made to the rationale are too duplicative of info below. If so, go ahead and delete.

Prevention efforts that focus not only on individual behavior change (e.g., help-seeking, treatment interventions) but on changes to the environment can increase the likelihood of positive behavioral and health outcomes (Haddon, 1980). Creating environments that address risk and protective factors where individuals live, work, and play, can help prevent suicide (Dahlberg & Krug, 2002; U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). For example, rates of suicide and suicide attempts are elevated in certain occupational groups (Han et al., 2016; McIntosh et al., 2016), therefore, changes to the organizational culture in these occupations, by way of implementation of supportive policies or even physical modifications to the workplace environment, can demonstrate that good health and mental health are valued and that stigma and other risk factors for suicide, are not (K. L. Knox et al., 2010; National Action Alliance for Suicide Prevention Workplace Task Force, 2015). Similarly, changing the availability of and access to common suicide risk factors in the environment such as bridges, alcohol, medications, or firearms, can reduce suicide rates, particularly in times of crisis (Beautrais, Gibb, Fergusson, Horwood, & Larkin, 2009; Crosby, Espitia-Hardeman, Ortega, & Lozano, 2013; Kaplan et al., 2013; Miller, Warren, Hemenway, & Azrael, 2015; C. W. Runyan et al., 2016).

### Approaches

The current evidence suggests three promising approaches for creating environments that protect against suicide.

- **Reducing access to lethal means among persons at-risk of suicide.** Means of suicide such as firearms, hanging/suffocation, or jumping from heights provide little opportunity for rescue and, as such, have high case fatality rates (e.g., about 85% of people who use a firearm in a suicide attempt will die from the injury). Research also indicates that 1) the interval between thinking about and attempting suicide can be as short as 5 or 10 minutes (Deisenhammer et al., 2009; Simon et al., 2001) and 2) that people tend *not* to substitute a different method when a highly lethal method is unavailable or difficult to access (Hawton, 2007; Yip et al., 2012). Therefore, increasing the time interval between the thought and the suicide attempt, for example, by making it more difficult to access lethal means, can be lifesaving. The following are examples of approaches reducing access to lethal means for persons at-risk of suicide:
  - *Intervening at Suicide Hotspots.* Suicide hotspots, or places where suicides may take place relatively easily, include tall structures (e.g., bridges and cliffs), railway tracks, and isolated locations such as parks. Efforts to prevent suicide at these locations include



erecting barriers to prevent jumping and installing signs and telephones to encourage individuals who are considering suicide, to seek help (Cox et al., 2013).

- *Safe Storage Practices.* Safe storage of medications, firearms, and other household products can reduce the risk for suicide by separating individuals who may be vulnerable and/or impulsive from easy access to lethal means. Such practices may include education and counseling around storing firearms--locked in a secure place (e.g., in a gun safe or lock box), unloaded and separate from the ammunition--and keeping medicines in a locked cabinet or other secure location away from people who may be at risk or who have made prior attempts (Rowhani-Rahbar, Simonetti, & Rivara, 2016; C. W. Runyan et al., 2016).
- **Organizational policies and culture** that promote protective environments may be implemented in places of employment. Such policies and cultural values may promote prosocial behavior (e.g., asking for help), skill building, changing social norms, referral and access to helping services (e.g. mental health, substance abuse treatment, financial counseling), and encourage leadership support from the top down. Such policies and cultural shifts can positively impact organizational climate and morale and help prevent suicide and its related risk factors (e.g. depression, social isolation) (National Action Alliance for Suicide Prevention Workplace Task Force, 2015).
- **Community-based policies to reduce excessive alcohol use.** Research studies in the United States have found that greater alcohol availability is positively associated with alcohol-involved suicides (Escobedo & Ortiz, 2002; Giesbrecht et al., 2015). Policies to reduce excessive alcohol use broadly include zoning to limit alcohol outlet locations and density, taxes on alcohol, and bans on the sale of alcohol for individuals under the legal drinking age. These policies are important because acute alcohol use has been found to be associated with more than one-third of suicides and approximately 40% of suicide attempts (Cherpitel, Borges, & Wilcox, 2004).

### Potential Outcomes

- Increase in safe storage of means
- Reduction in suicide attempts
- Reduction in suicide deaths
- Increase in help-seeking
- Reduction in alcohol-related suicide deaths

### Evidence

The evidence for the effectiveness of means restriction and other ways to establish protective environments is some of the strongest in the field (Zalsman et al., 2016), as described below.

- **Reducing access to lethal means among persons at-risk of suicide.** A meta-analysis examining the impact of *suicide hotspot interventions* implemented in combination or in isolation, both in the U.S. and abroad, found associated reduced rates of suicide (Cox et al., 2013; Pirkis et al., 2015). For example, after erecting a barrier on the Jacques-Cartier bridge in Canada, the suicide rate from jumping from the bridge decreased from about 10 suicide deaths per year to about 3 deaths per year (Perron, Burrows, Fournier, Perron, & Ouellet, 2013). Moreover, the reduction in suicides by jumping was sustained even when all bridges and nearby jumping sites were considered, suggesting little to no displacement of suicides to other jumping sites (Perron et al., 2013). Further evidence for the effectiveness of bridge barriers was demonstrated by a study examining the impact of the *removal* of safety barriers from the Grafton Bridge in Auckland, New Zealand. After removal of the barrier, sadly, both the number and rate of suicide increased fivefold (Beautrais, 2001; Beautrais et al., 2009).

Another form of means reduction involves implementation of *safe storage practices*. In a case-control study of firearm-related events identified from 37 counties in Washington, Oregon, and Missouri, and from 5 trauma centers, Grossman et al. (2005) found that storing firearms unloaded, separate from ammunition, in a locked place and/or secured with a safety device was protective of suicide attempts among adolescents. Further, a recent systematic review of clinic and community-based education and counseling interventions suggested that the provision of safety devices significantly increased safe firearm storage practices compared to counseling alone or compared to the provision of economic incentives to acquire safety devices on one's own (Rowhani-Rahbar et al., 2016).

Another program, *The Emergency Department Counseling on Access to Lethal Means (ED CALM)*, trained psychiatric emergency clinicians in a large children's hospital to provide lethal means counseling and safe storage boxes to parents of patients under age 18 receiving care for suicidal behavior. In a pre-post quality improvement project, Runyan et. al (2016) found that at post-test 76% (of the 55% of parents followed up, n=114) reported that all medications in the home were locked up as compared to fewer than 10% at the time of the initial emergency department visit. Among parents who indicated the presence of guns in the home at pre-test (i.e. 67%), all (100%) reported guns were currently locked up at post-test (C. W. Runyan et al., 2016).

- **Organizational policies and culture.** *Together for Life* is a workplace program of the Montreal Police Force implemented to address suicide among officers. Policy and program components were designed to foster an organizational culture that promoted mutual support and solidarity among all members of the Force. The program included training of supervisors, managers and all units to improve competencies in identifying suicidal risk and to improve use and awareness of existing resources. The program also included an education campaign to improve awareness and help-seeking (Mishara & Martin, 2012). Police suicides were tracked over 12 years and



compared to rates in the control city of Quebec. The suicide rate in the intervention group decreased significantly by 78.9% to a rate of 6.42 suicides per 100,000 population per year compared to an 11% increase in the control city (rate: 29.0 per 100,000) (Mishara & Martin, 2012).

Another example of this approach is the *United States Air Force Suicide Prevention Program (AFSPP)*. AFSPP included 11 policy and education initiatives and was designed to change the culture of the Air Force surrounding suicide. The program uses leaders as role models and agents of change, establishes expectations for behavior related to awareness of suicide risk, develops population skills and knowledge (i.e., education and training), and investigates every suicide (i.e., outcomes measurement). The program represents a fundamental shift from viewing suicide and mental illness solely as medical problem and instead sees them as larger service-wide problems impacting the whole community (K. L. Knox, Litts, Talcott, Feig, & Caine, 2003). Using a time-series design to examine the impact of the AFSPP program on various violence-related outcomes, researchers found that the program was associated with a 33% relative risk reduction in suicide (K. L. Knox et al., 2003). The program was also associated with relative risk reductions in related outcomes including moderate and severe family violence (30% and 54%, respectively), homicide (51%), and accidental death (18%) (K. L. Knox et al., 2003). A longitudinal assessment of the program over the period 1981 to 2008 (16 years before the 1997 launch of the program and 11 years post-launch) found significantly lower rates of suicide after the program was launched than before (K. L. Knox et al., 2010). These effects were sustained over time, except in 2004, which the authors found was associated with less rigorous implementation in that year than in the other years (K. L. Knox et al., 2010).

- **Community-based policies to reduce excessive alcohol use.** While multiple policies to limit alcohol use exist, several studies on alcohol outlet *density*, specifically, suggest that measures to reduce alcohol outlet density can potentially reduce alcohol-involved suicides. Additionally, a longitudinal analysis of alcohol outlet density, suicide mortality, and hospitalizations for suicide attempts over 6 years in 581 California zip codes indicated that the density of bars, specifically, is related to suicide and suicide attempts, particularly in rural areas (Johnson, Gruenewald, & Remer, 2009).

## Promote Connectedness to Protect Against Suicide

### Rationale

Sociologist, Emile Durkheim theorized in 1897 that weak social bonds, i.e. lack of connectedness, are among the chief causes for suicidality (Durkheim, 1897/1951). *Connectedness* is the degree to which an individual or group of individuals are socially close, interrelated, or share resources with others (Centers for Disease Control and Prevention, 2009). Social connections can be formed within and between multiple levels of the social ecology (Dahlberg & Krug, 2002), for instance between individuals (e.g. peers, neighbors, co-workers), families, schools, neighborhoods, workplace, faith communities, cultural groups, and society as a whole. Related to connectedness, *social capital* refers to a sense of trust in one's community and neighborhood, social integration, and also the availability and participation in social organizations (Beyer, Layde, Hamberger, & Laud, 2015; Muennig, Cohen, Palmer, & Zhu, 2013). Many ecological cross-sectional and longitudinal studies have examined the impact of aspects of social capital on depression symptoms, depressive disorder, mental health more generally, and suicide. While the evidence is still being built the pattern is towards an inverse association between social capital measured by social trust, community/ neighborhood engagement, and improved mental health. Connectedness and social capital together can serve to protect against suicidal behaviors by decreasing isolation, encouraging adaptive coping behaviors, increasing belongingness, personal value and worth all of which helps individuals to build resilience in the face of adversity. Connectedness can also provide individuals with better access to formal supports and resources, mobilize communities to meet the needs of its members and provide collective primary prevention activities to the community as a whole (Centers for Disease Control and Prevention, 2009).

### Approaches

Promoting connectedness among individuals and within communities through modeling peer norms and enhancing community engagement can protect against suicide.

- **Peer norm approaches** seek to normalize prosocial behaviors/protective factors for suicide such as help-seeking, reaching out and talking to trusted adults, and peer connectedness. These approaches typically target youth and are delivered in school settings but can also be implemented in community settings.



- **Community engagement activities.** Community engagement is an aspect of social capital. Community engagement approaches may involve residents participating in a range of activities, including religious activities, community clean-up and greening activities, and physical exercise. These activities provide opportunities for residents to become more involved in the community and to connect with other community members, organizations, and resources, resulting in enhanced overall physical health, reduced stress, and decreased depressive symptoms, thereby reducing risk of suicide.

### Potential Outcomes

- Reduction in maladaptive coping attitudes and behaviors
- Increase in healthy coping attitudes and behaviors
- Increase in referrals for youth in distressed
- Increase help-seeking behaviors
- Positive perception of adult support

### Evidence

Current evidence suggests that peer norm approaches and community engagement can reduce risk factors associated with suicidal behaviors.

- **Peer norm approaches.** Evaluations show that programs such as *Sources of Strength* can improve school norms and beliefs about suicide that are created and disseminated by student peers. In a randomized controlled trial of *Sources of Strength* conducted with 18 high-schools (6 metropolitan, 12 rural), Wyman et al. (2010) found that the program improved peer leaders' adaptive norms regarding suicide, their connectedness to adults, and school engagement. Peer leaders were also more likely than controls to refer a suicidal friend to an adult. Among students, the intervention increased perceptions of adult support for suicidal youths and the acceptability of seeking help. Perception of adult support increased most in students with a history of suicidal ideation. Finally, trained peer leaders also reported a greater decrease in maladaptive coping attitudes compared with untrained leaders (Wyman et al., 2010).
- **Community engagement activities.** A vacant lot greening initiative was undertaken in Philadelphia between 1999 and 2008. Local residents and community members worked together to green 4,436 lots (or 7.8 million square feet) in 4 areas of the city. Researchers found significant associated reductions in community residents' self-reported stress levels and engagement in more physical exercise than residents in control vacant lot areas. Other benefits included reductions in firearm assaults and vandalism (Branas et al., 2011).

## Teach Coping and Problem-Solving Skills

### Rationale

Building life skills prepares individuals to successfully tackle every day challenges and adapt to stress and adversity. Life skills encompasses many concepts, but most often include coping and problem-solving skills, conflict resolution, and critical thinking. Life skills are important in shielding individuals from suicidal behaviors (World Health Organization, 2014). Suicide prevention programs that focus on life and social skills training are drawn from social cognitive theories (Bandura, 1986), surmising that individuals who engage in suicidal behavior is attributed to either direct learning, modeling, and environmental and individual (e.g. hopelessness) characteristics. The literature linking life skills and suicide is robust--- The inability to employ adequate coping strategies to cope with immediate stressors or identify and find solutions for problems have been characterized among suicide attempters (Pollock & Williams, 2004). Treatments that include bolstering problem skills (Goldsmith, Pellmar, Kleinman, & Bunney, 2002) and include problem-solving techniques (Ghahramanlou-Holloway, Bhar, Brown, Olsen, & Beck, 2012; Townsend et al., 2001) appear to reduce suicidal ideation and attempts more effectively. Prevention programs focused on teaching these skills target youth, parents and families and have been used with both universal and at-risk populations. While many do not target suicidal behaviors directly, these programs strive to train youth and parents important life skills to offset the underlying vulnerabilities that contribute to engaging in high risk behaviors early in life.

### Approaches

Current evidence provides support for the following two approaches:

- **Social emotional learning programs** focus on developing and strengthening communication and problem-solving skills, emotion regulation, conflict resolution, help seeking and coping skills. These approaches address a range of risk and protective factors for suicidal behavior. They provide children and youth with skills to resolve problems in relationships, school, and with peers, and help youth to address other negative influences (e.g., substance use) associated with suicide. These approaches are typically delivered to all students in a particular grade or school, although some programs also focus on groups of students considered to be at high-risk for suicide. Opportunities to practice and reinforce skills are an important part of programs that work (Herman, Borden, Reinke, & Webster-Stratton, 2011).
- **Parenting skill and family relationship programs** are designed to strengthen parenting skills, enhance positive parent-child interactions, and improve children's behavioral and emotional skills and abilities. Several parenting and family relationship programs have been shown in rigorous evaluations to improve resilience and reduce risk factors for various behaviors, including



ones closely related to suicide, such as depression, internalizing behaviors, and substance abuse (M. S. Knox, Burkhart, & Hunter, 2010).

### Potential Outcomes

- Reduction in suicide attempts and suicide ideation
- Enhanced knowledge of risk and protective factors associated with suicide
- Reduction in suicide risk behaviors (i.e., depression, anxiety, conduct problems, substance abuse)
- Improve and normalize help-seeking behavior
- Enhance social competence and emotional regulation skills
- Enhance problem-solving and conflict management skills

### Evidence

There are several programs with evidence that support teaching social, emotional and parenting skills to reduce suicidal behaviors and associated risk factors.

- **Social emotional learning programs.** The *Youth Aware of Mental Health Program (YAM)* is a program developed for teenagers that uses interactive dialogue and role-playing to teach adolescents about the risk and protective factors associated with suicide (including knowledge about depression and anxiety) and enhances their problem-solving skills for dealing with adverse life events, stress, school and other problems. The program includes 3 hours of role-play sessions and interactive workshops combined with a booklet that students can keep, educational posters displayed in classroom, and interactive lectures about mental health at the beginning and end of the program (Wasserman et al., 2014). In a cluster-randomized controlled trial of YAM conducted across 10 European Union countries and 168 schools, students participating in the YAM program were significantly less likely to have an incident suicide attempt (OR 0.45, 95%CI 0.24–0.85;  $p=0.014$ ) and severe suicidal ideation (0.50, 0.27-0.92;  $p=0.025$ ) at the 12-month follow-up compared to the control group. Additionally, related to severe suicide ideation, in the YAM group absolute risk fell by 0.50% and RR fell by 49.6% (Wasserman et al., 2014).

*Signs of Suicide (SOS)* is another school-based prevention program for students aged 13-17. The program includes guided classroom discussions about suicide and depression. As part of the program, students are screened for depression and suicide risk and referred for professional help as indicated. The program is designed to increase knowledge about suicide and risk factors associated with suicidal behavior as well as improve and normalize help-seeking behavior (Schilling, Aseltine, & James, 2016). In a randomized controlled trial, SOS was shown to reduce self-reported suicide attempts at 3-months post intervention among

participating students compared to control students. The SOS program also increased students' knowledge of how to get help for themselves or friends for depression and/or suicidal thoughts, and favorable attitudes toward help-seeking. SOS participants with a lifetime history of suicide attempt were also less likely to report planning a suicide in the 3 months following the program compared to lower-risk participants (Schilling et al., 2016).

Finally, the *Good Behavior Game (GBG)* is a classroom-based program for elementary school children aged 6-10; it represents an example of upstream suicide prevention programming. The program uses a team-based behavior management strategy that promotes good behavior by setting clear expectations for good behavior and consequences for maladaptive behavior. The goal of the GBG is to create an integrated classroom social system that is supportive of all children being able to learn with little aggressive or disruptive behavior (Wilcox et al., 2008). In an outcome evaluation of the GBG, first graders assigned to GBG reported half the adjusted odds of suicidal ideation and suicide attempts. The beneficial effect of the program was consistent for suicidal ideation regardless of whether baseline covariates were included. The GBG effect on attempts was less robust in some adjusted models including caregiver mental health. In the second cohort of GBG students, neither suicidal ideation nor suicide attempts were significantly different between GBG and the control interventions (Wilcox et al., 2008). This finding likely arose due to the lack of implementation fidelity and pointed to the need for GBG to be delivered with precision, consistency, and teacher support. GBG was also found to be associated with reduced risk of later substance abuse, a risk factor for suicide (Kellam et al., 2008).

- **Parenting skill and family relationship programs.** Parenting and family skills training approaches have shown promising impacts in preventing key risk factors associated with suicide. For example, the *Incredible Years (IY)* is a comprehensive group training program for parents, teachers and children designed to reduce conduct and substance abuse problems, two important suicide risk factors, in youth by improving protective factors such as responsive and positive parent-teacher-child interactions and relationships, emotion self-regulation and social competence (all protective factors for suicide) (Herman et al., 2011). The program includes 9- 20 sessions offered in community-based settings (e.g., religious, recreation centers, mental health treatment centers, and hospitals). Several studies have demonstrated the effect of the IY program on reducing internalizing symptoms, such as anxiety and depression, and child conduct problems (C. H. Webster-Stratton, Reid, & Beauchaine, 2011; Webster-Stratton, Jamila Reid, & Stoolmiller, 2008). The program is also associated with improved problem-solving and conflict management; these skills were maintained at 1-year follow-up (Reid, Webster-Stratton, & Hammond, 2003; C. Webster-Stratton & Hammond,



1997; C. Webster-Stratton, Reid, & Hammond, 2001). The program demonstrated greater benefits as the dosage of the intervention increased (Herman et al., 2011).

Additionally, *Strengthening Families 10-14* is a program that involves sessions between parents, youth, and family with the goal of improving parents' skills for disciplining, managing emotions and conflict, and communicating with their children; promoting youths' interpersonal and problem-solving skills; and creating family activities to build cohesion and positive parent-child interactions. The premise of the program is that developing these skills for both parents and children will reduce internalizing behavior and adolescent substance abuse, two important risk factors for suicide (Spoth, Gyll, & Day, 2002). *Strengthening Families* has been shown to decrease externalizing behaviors, alcohol use, and drug use among youth participants and reductions in depression, alcohol use, and drug use among participating families (Spoth et al., 2002).

## Identify and Support People At-Risk

### Rationale

In order to decrease suicide, attention to people at increased or high risk is necessary as these individuals tend to experience suicidal behavior at higher than average rates. These vulnerable or disadvantaged populations include, but are not limited to, individuals with lower socio-economic status or who are living with a mental health problem; people who have attempted suicide previously, individuals who are institutionalized, have been victims of violence, or are homeless; and members of certain ethnic minority groups. Supporting these vulnerable groups requires proactive case finding along with access to, and retention in, mental health services. Finding effective ways of identifying at-risk or vulnerable groups, customizing services to make them accessible and maintaining care remain key challenges. For example, simply improving services does not guarantee that those services will be used by those most in need of them, nor will it necessarily increase the number of people who follow treatments that are recommended. People who are disadvantaged face social and economic issues that may adversely affect their ability to respond to the treatments or advice that are offered.

### Approaches

The following three approaches focus on identifying and supporting people at increased risk.

- **Gatekeeper training** is designed to train teachers, coaches, providers and others in the community to identify people who may be at risk of suicide and to respond effectively, including facilitating treatment seeking and support services. Gatekeeper training is typically implemented in schools to identify at-risk youth and within health care settings to identify adults (and youth).
- **Screening combined with care management and overall continuity of care** has been used in primary care and behavioral health care settings to assure that people who may be at high-risk of suicide are identified and receive ongoing treatment as needed, particularly after inpatient discharge and other transitions within the healthcare system so they don't 'slip through the cracks'. These approaches typically employ screening for depression and/or suicide combined with collaborative treatment planning between patients and their providers and patient follow-up.
- **Crisis intervention.** These approaches provide support and referral services, typically by connecting a person in crisis (or a friend or family member of someone at-risk) to trained volunteers and/or professional staff via telephone hotline, online chat, or text messaging. Crisis intervention approaches are intended to impact key risk factors for suicide, including feelings of depression, hopelessness, and subsequent mental health care utilization. Like means reduction,



crisis interventions can put space or time between an individual who may be considering suicide and harmful behavior.

### Potential Outcomes

- Reduction in suicide attempts
- Reduction in suicide deaths
- Increased identification of individuals at-risk for suicidal behavior
- Increased at-risk individuals in treatment
- Increased community members trained to identify at-risk individuals
- Increased referrals for health care

### Evidence

There is evidence that community gatekeeper programs are successful in reducing suicides and suicide attempts but the efforts must be maintained (Substance Abuse and Mental Health Services Administration, 2014). However, there is limited evidence for effectiveness screening programs, but at the same time, standard principles for public health screening make them promising (Pena & Caine, 2006). The number of studies evaluating crisis intervention services is limited, but a few studies do indicate that those who use the hotline services have decreased suicidal thoughts and behavior.

- **Gatekeeper training.** One example of gatekeeper training is the *Mental Health First Aid (MHFA)* program. This program is designed for the lay public and consists of three weekly sessions of three hours each. Participants learn the symptoms of people in mental health crises and/or in the early stages of mental health problems (i.e., those experiencing suicidal thoughts and behavior, acute stress reaction, panic attacks and acute psychotic behavior, and depression, anxiety, and psychotic disorders), possible risk factors, and where and how to get evidence-based effective help (Kitchener & Jorm, 2004). In a randomized controlled trial of 300 participants of *MHFA*, the intervention group reported greater confidence in providing help to others, greater likelihood of advising people to seek professional help, improved concordance with health professionals about treatments, and decreased stigmatizing attitudes. Additionally, the intervention resulted in improved mental health of the participants themselves. All results were statistically significant at  $p < .05$ . (Kitchener & Jorm, 2004). Additional research rigorously evaluating *MHFA* for its impact on the first aid recipients themselves and suicidal behavior is needed (Kitchener & Jorm, 2006).

Gatekeeper training has also been a core part of all *Garret Lee Smith (GLS) Suicide Prevention Program* which is in place in 49 states and 48 tribes. A multi-site evaluation assessed the

connection between community gatekeeper training and a reduction of suicide attempts and deaths by comparing the change in suicide mortality rates and nonfatal suicidal behavior among the population aged 10-24 in counties implementing *GLS* trainings, with the trajectory observed in similar counties that did not implement these trainings. Counties implementing *GLS* trainings had significantly lower youth suicide rates the year following the training implementation (-1.07,  $p=.03$ ) (Walrath, Garraza, Reid, Goldston, & McKeon, 2015) This finding represents a decrease of 1 suicide death per 100,000 10 to 24 year olds or the avoidance of approximately 237 deaths in this age group between 2007 and 2010. Counties implementing *GLS* program activities also had significantly lower suicide attempt rates among youths 16 to 23 years of age in the year following implementation of the *GLS* program than did similar counties that did not implement *GLS* program activities (4.9 fewer attempts per 1000 youths [95% CI, 1.8-8.0 fewer attempts per 1000 youths];  $p = .003$ ; (Godoy Garraza, Walrath, Goldston, Reid, & McKeon, 2015)). More than 79 000 suicide attempts may have been averted during the period studied following implementation of the *GLS* program.

- **Screening combined with care management and overall continuity of care.** The *Henry Ford Perfect Depression Care* program was the pre-cursor to *Zero Suicide*, and its overall goal was to eliminate suicide. More broadly, though, the aim was to completely redesign depression care delivery to achieve breakthrough improvement in quality and safety by focusing on six aims: effectiveness, safety, patient centeredness, timeliness, efficiency, and equity among patients. The program developed concrete measures to assess progress on each of these aims and began with screening and assessment of each patient for suicide risk with coordinated continuous follow-up care system wide (C. E. Coffey, 2006). An examination of the impact of the *Henry Ford Perfect Depression Care (Pre-cursor to Zero Suicide)* program found that there was a dramatic and statistically significant decrease in the rate of suicide between the baseline years prior to the intervention (1999 and 2000) to the intervention years (2002-2009). During this time period, the suicide rate fell 82% (C. E. Coffey, 2006; C. E. Coffey, Coffey, & Ahmedani, 2013). Further, suicide rates also declined among HMO members who participated in targeted suicide prevention efforts and received mental health specialty services. However, for those HMO members who accessed only general medical services as opposed to specialty mental health services, the suicide rate increased (M. Coffey, Coffey, & Ahmedani, 2015).
- **Crisis intervention.** Suicide prevention hotlines are one way to provide crisis intervention. In an evaluation of the effectiveness of the *National Suicide Prevention Lifeline (NSPL)* to prevent suicide, 1,085 suicidal individuals who called the hotline completed a standard risk assessment for suicide, and 380 of those completed a follow-up assessment between 1 and 52 days after the initial assessment. Researchers found that over half of the initial sample were seriously considering suicide when they called, and they had a plan for their suicide. Researchers also



found that participants experienced significant decreases in suicidality over the course of the telephone session, and that levels of hopelessness and psychological pain continued to decrease after their initial call (Gould, Kalafat, Harrismunfakh, & Kleinman, 2007).

In another study, this time employing a randomized controlled trial, Gould, Cross, Pisani, Munfakh, and Kleinman (2013) assessed the impact of the *Applied Suicide Intervention Skills Training (ASIST)*, a widely implemented training program that helps hotline counselors, emergency workers, and other gatekeepers to identify and connect with suicidal individuals, understand their reasoning for living and dying, and assist with safely connecting those in need to available resources. The training was evaluated across the NSPL network of hotlines over the period 2008-2009. Using data from 1,410 suicidal individuals who called 17 Lifeline centers, researchers found that compared to callers who spoke to counselors that received the usual care training, individuals who spoke with counselors trained in *ASIST* were significantly more likely to feel less depressed, less suicidal, less overwhelmed, and more hopeful by the end of their call to the hotline. Counselors trained in *ASIST* were also more skilled at keeping callers on the phone longer and establishing a connection with them. However, training in *ASIST* did not result in more comprehensive suicide risk assessments than usual care training (Gould et al., 2013).

## Intervene to Lessen Harms and Prevent Future Risk

### Rationale

Individuals who have experienced mental health challenges, suicidal ideation, and/or who have made suicide attempts and/or have engaged in non-suicidal self-injury are at increased risk of suicide (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). Risk of suicide can also increase among those who have lost a friend, family member, co-worker, or other acquaintance to suicide (Pitman, Osborn, King, & Erlangsen, 2014). Exposure to sensationalized or uninformed reporting regarding on suicide may heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to suicide contagion (Etzersdorfer & Sonneck, 1998; Niederkrotenthaler & Sonneck, 2007).

### Approaches

A broad array of approaches to lesson harms and reduce future risk of suicide among those at increased risk include the provision of mental health care and improved continuity of care, improving linkage to care through active post-discharge planning and follow-up that decreases barriers to ongoing therapeutic support, increasing connectedness to supportive others, addressing bereavement, and framing communications to emphasize resilience, decrease negative affect, and to prevent contagion.

- **Treatment for people at-risk of suicide** typically includes various forms of psychotherapy delivered by licensed providers to help individuals with mental health problems and other risk factors for suicide with problem-solving, impulsivity and emotion regulation.
- **Treatment to prevent re-attempts.** These approaches typically include follow-up contact and use diverse modalities (e.g., home visits, mail, telephone, e-mail) to engage recent suicide attempt survivors in continued treatment to prevent re-attempts. Treatment may focus on improved coping skills, mindfulness, and other emotional regulation skills, and may include case management home visits to increase adherence to treatment and continuity of care; and one-on-one interpersonal therapy and/or group therapy. Approaches that engage and connect attempters to peers and providers are especially important because many attempters do not present to aftercare; 12%-25% reattempt within a year, and 3%-9% of attempt survivors die by suicide within 1 to 5 years of their initial attempt (Inagaki et al., 2015)
- **Postvention** approaches are implemented *after* a suicide has taken place and may include debriefing sessions, counseling, and/or bereavement support groups for surviving friends and family members/loved ones. These programs have not typically been evaluated for their impact on suicide or suicidal behavior but may reduce survivors' guilt, feelings of depression, and complicated grief (Szumilas & Kutcher, 2011).



- **Safe messaging following a suicide.** The manner in which information on a recent suicide is communicated to the public (e.g. school assemblies, mass media, social media) can heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to suicide contagion. Therefore, responsible and safe reporting may help prevent suicide and/or suicide contagion.

#### Potential Outcomes

- Reduction in mental health-related sequelae
- Increase connectedness
- Improved coping skills
- Improved messaging following suicide
- Reduction in re-attempts

#### Evidence

The evidence addressing strategies to lesson harm and prevent future risk of suicide includes the evaluation of effects of specific approaches on risk and protective factors as well as suicide-related mortality. However, because the evaluation of suicide-related mortality requires large sample sizes and extended follow-up, much of the evidence in this area primarily focuses on risk and protective factors.

- **Treatment for people at-risk of suicide.** There are a number of treatments with evidence of impact on risk and protective factors for suicide. One example is the *Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)* program. IMPACT aims to prevent suicide among older primary care patients by reducing suicide ideation and depression in primary care settings. It facilitates the development of a therapeutic alliance, a personalized treatment plan that includes patient preferences, as well as proactive follow-up (biweekly during an acute phase and monthly during continuation phase) by a depression care manager (Hunkeler et al., 2006). The program has been shown to significantly improve quality of life, and to reduce functional impairment, depression and suicidal ideation over 24-months of follow-up (Hunkeler et al., 2006; Unutzer et al., 2006) relative to patients who received care as usual.

Another example is *Collaborative Assessment and Management of Suicidality (CAMS)*, which is a therapeutic approach for suicide-specific assessment and treatment of patient's suicide risk. This flexible approach can be used across treatment settings and clinician theoretical orientations and involves the clinician and patient working together in an interactive assessment process to develop patient-specific treatment plans. CAMS sessions are collaborative and involve constant

**Comment [A]:** The write-up of the evidence for this strategy needs to follow the format used in the other sections of the TP. I modified the write-up for the first approach to illustrate the format. You will need to do something similar for the second approach.

patient about what is and is not working with the ultimate goal of enhancing the therapeutic alliance and increasing treatment motivation in the suicidal patient. CAMS been tested and supported in 6 correlational studies (Jobes, 2012), in a variety of inpatient and outpatient settings and in one RCT with several additional RCTs under way. CAMS has been associated with significant improvements in suicidal ideation, overall symptom distress, and feelings of hopelessness at 12 month follow-up among a community-based sample of suicidal outpatients. (Comtois et al., 2011).

Other examples include *Dialectical Behavioral Therapy (DBT)* and *Attachment-Based Family Therapy (ABFT)*. DBT is a multicomponent therapy for individuals at high risk for suicide and who may struggle with impulsivity and emotional regulation. The components of DBT include individual therapy, group skills training, between-session telephone coaching and a therapist consultation team. In a randomized controlled trial of women with recent suicidal or self-injurious behavior, those receiving DBT were half as likely to make a suicide attempt at two-year follow-up than women receiving community treatment (23% vs 46%), required less hospitalization for suicide ideation, and had lower medical risk across all suicide attempts and self-injurious acts combined (Linehan et al., 2006).

ABFT is a program for adolescents aged 12-18 and is designed to treat clinically diagnosed major depressive disorder, eliminate suicidal ideation, and reduce dispositional anxiety (Diamond et al., 2010). A randomized controlled trial of ABFT found that suicidal adolescents assigned to ABFT experienced significantly greater improvement in suicidal ideation over 24 weeks of follow-up than did adolescents assigned to enhanced usual care (-4.37 vs. -2.34;  $p = .001$ ;  $d=0.97$ ). Additionally, a higher percentage of ABFT participants reported no suicidal ideation in the week prior to assessment at 12 weeks than did adolescents receiving enhanced usual care (69.2% vs. 34.6%;  $p = .01$ ; OR= 4.25) and at 24 weeks (82.1% vs. 46.2%;  $p = .006$ ; OR=5.37) (Diamond et al., 2010).

- **Treatment to prevent re-attempts.** Several strategies that aim to prevent re-attempts among those at risk for suicide have demonstrated impact on reducing suicidal behavior. For example, *Emergency Department Brief Intervention with Follow-up Visits* is a program that involves a one-hour discharge information session that addresses suicidal behavior, distress, risk and protective factors, alternatives to suicidal behavior, and referral options, combined with nine follow-up contacts over 18-months (at 1, 2, 4, 7, 11 weeks and 4, 6, 12, 18 months). Follow-up contacts are either conducted by phone or through home visits according to a specific time line for up to 18-months. A randomized controlled trial that enrolled suicide attempters from eight hospital emergency departments in five culturally different sites found that a brief intervention combined with 9 follow-up visits over 18-months was associated with significantly fewer deaths from



suicide relative to a treatment-as-usual group (0.2% versus 2.2%, respectively;  $\chi^2 = 13.83$ ,  $P < 0.001$ ) (Fleischmann et al., 2008).

Another example of treatment to prevent re-attempts involves active follow-up contact approaches such as postcards, letters, and telephone calls, are intended to increase a patient's sense of connectedness with health care providers and decrease isolation. These approaches include expression of care and support and typically invite patients to reconnect with their provider. Contacts are made periodically (e.g., monthly or every few months in the first 12 months post-discharge with some programs continuing contact for 2 or more years). These approaches have been found in a meta-analysis conducted by Inagaki et al. (2015) to reduce reattempts by approximately 17% for up to 12 months post-discharge, however, the long-term effects of these approaches on reattempts has not yet been demonstrated. Also, because the number of trials and associated sample sizes included in this meta-analysis were small, it was not possible to determine the effect of active contact and follow-up approaches on death by suicide. In a randomized controlled trial of post-crisis suicide prevention long-term follow-up contact approach, Motto and Bostrom (2001) found that patients who refused ongoing care but who were randomized to be contacted by letter four times per year had a lower rate of suicide over two years of follow-up than did patients in the control group who received no further contact. Other studies have also shown post-crisis letters and coping cards to be protective against suicide ideation and attempts (Hassanian-Moghaddam, Sarjami, Kolahi, & Carter, 2011; Wang et al., 2016).

Finally, *Cognitive Behavior Therapy for Suicide Prevention (CBT-SP)* is an example of a therapeutic approach to prevent re-attempts. It uses a risk reduction, relapse prevention approach that includes an analysis of proximal risk factors and stressors (e.g., relationship problems, school or work-related difficulties) leading up to and following the suicidal event; safety plan development; skill building; and psychoeducation. *CBT-SP* also has family skill modules focused on family support and communication patterns as well as improving the family's problem solving skills. A randomized controlled trial found of *CBT-SP* found that 10-session outpatient cognitive therapy designed to prevent repeat suicide attempts resulted in a 50% reduction in the likelihood of a suicide reattempt among adults who had been admitted to an emergency department for a suicide attempt relative to treatment as usual (Brown et al., 2005).

- **Postvention** programs are implemented with the goal of providing support to survivors of suicide to reduce their own risk of suicide. One example of a postvention program, *StandBy Response Service (StandBy)*, provides clients with face-to-face outreach and telephone support through a professional crisis response team. Site coordinators develop customized case management plans, referring clients to other existing community services matched to their needs (Visser, Comans, &



Scuffham, 2014). In a study by Visser et al. (2014), *StandBy* clients were significantly less likely to be at high risk for suicidality than a suicide bereaved comparison group who had not had contact with the *StandBy* program (48% and 64% respectively,  $p = 0.005$ ). Additionally, research suggests that active postvention approaches in which outreach to suicide survivors occurs at the scene of a suicide is associated with intake into treatment sooner, greater attendance at support group meetings, and attendance at more meetings compared to passive postvention (versus passive approaches where survivors self-refer for services) (J. Cerel & Campbell, 2008).

- **Safe messaging following a suicide.** One way to ensure safe messaging following a suicide is to encourage that reporters adhere to *media guidelines for reporting on suicides*. Such guidelines can help assure that stories on suicide are communicated in an effective way that reduces risk to others who may be vulnerable. Reports that are both inclusive of suicide prevention messages, stories of hope and resilience, risk and protective factors, and links to helping resources (e.g., hotline) and that avoid sensationalizing events or reducing suicide to one cause can help reduce the likelihood of suicide contagion. The most compelling evidence supporting the effect of *media guidelines* on reduction in suicides comes from Austria. After a sharp increase in suicides on the Viennese subway, media guidelines were introduced and an interrupted time series design was used to evaluate the national impact of the guidelines on subsequent suicides. Changes in the quality and quantity of media reporting resulted in a reduction of 81 suicides annually (95% confidence interval: -149 to -13;  $t = -2.32$ ,  $df = 54$ ,  $p < 0.024$ ) in the Viennese subway system (Niederkrötenenthaler & Sonneck, 2007)



## Sector Involvement

Public health can play an important and unique role in addressing suicide. Public health agencies, which typically place prevention at the forefront of efforts and work to create broad population-level impact, can bring critical leadership and resources to bear on this problem. For example, these agencies can serve as a convener, bringing together partners and stakeholders to plan, prioritize, and coordinate suicide prevention efforts. Public health agencies are also well positioned to collect and disseminate data, implement preventive measures, evaluate programs, and track progress. Although public health can play a leadership role in preventing suicide, the strategies and approaches outlined in this technical package cannot be accomplished by the public health sector alone.

Other sectors vital to implementing this package include, but are not limited to, education, government (local, state, and federal), social services, health services, business/labor, justice, housing, media, and organizations that comprise the civil society sector such as faith-based organizations, youth-serving organizations, foundations, and other non-governmental organizations. Collectively, these sectors can make a difference in preventing suicide by impacting the various contexts and underlying risks that contribute to suicide.

The strategies and approaches described in this technical package are summarized in Appendix A along with the relevant sectors that are well positioned to lead implementation efforts.

[Linda to insert text specific to the strategies and approaches]

Regardless of strategy, action by many sectors will be necessary for the successful implementation of this package. In this regard, all sectors can play an important and influential role in creating safe and protective environments where individuals who are at high risk of suicide can easily access the mental healthcare and services they need.

## Monitoring and Evaluation

Monitoring and evaluation are necessary components of the public health approach to prevention. It is important to have timely and reliable data to monitor the extent of the problem and to evaluate the impact of prevention efforts. Data are necessary for program implementation; planning, implementation, and assessment all rely on accurate measurement of the problem.

Surveillance data helps researchers and practitioners track changes in the burden of suicide. Surveillance systems exist at the federal, state, and local levels. It is important to assess the availability of surveillance data and data systems across these levels to identify and address gaps in the systems. CDC's National Vital Statistics System and the National Violent Death Reporting System (NVDRS) are examples of surveillance systems that provide data on deaths from suicide. NVDRS, for example, is a state-based surveillance system that combines data from death certificates, law enforcement reports, and coroner or medical examiner reports to provide detailed information on the circumstances of violent deaths, including suicide, which can assist communities in guiding prevention approaches (Blair, Fowler, Jack, & Crosby, 2016). The National Electronic Injury Surveillance System-All Injury Program (NEISS-AIP) provides nationally representative data about all types and causes of nonfatal injuries treated in U.S. hospital emergency departments, and can be used to assess national rates of, and trends in, self-harm injuries by cause (e.g., falls, poisoning, etc.), age, race/ethnicity, sex, disposition (where the injured person goes when released from the Emergency Department).

In addition to information on deaths and nonfatal injuries, there are also surveillance systems that provide national, state, and some local estimates of suicidal behavior. The Youth Risk Behavior Surveillance System (YRBSS) collects information from a nationally representative sample of 9-12 grade students and is a key resource in monitoring health-risk behaviors among youth, including whether youth have seriously considered attempting suicide, attempted suicide, made a plan, or required treatment by a doctor or nurse for a suicide attempt that resulted in an injury, poisoning, or overdose (Brener et al., 2013). The YRBSS data are obtained from a national school-based survey conducted by CDC as well as school-based state, territorial, tribal, and large urban school district survey conducted by education and health agencies. The National Survey on Drug Use and Health (NSDUH) is an annual nationwide survey of individuals aged 12 years and older that provides national and state-level estimates of drug use and mental health-related issues, including suicide ideation and suicide attempts.

It is also important at all levels (local, state, and federal) to address gaps in responses, track progress of prevention efforts and evaluate the impact of those efforts, including the impact of this technical package. Evaluation data, produced through program implementation and monitoring, is essential to provide information on what does and does not work to reduce rates of suicide and its associated risk and protective factors. Theories of change and logic models that identify short, intermediate, and long-term outcomes are an important part of program evaluation.



The evidence-base for suicide prevention has advanced greatly over the last few decades. However, additional research is needed to understand the impact of prevention programs on preventing suicide, as opposed to merely examining the effectiveness of programs to impact risk factors associated with suicide. More research is also needed to examine the effectiveness of upstream and community-level strategies to prevent suicide at the population level. Lastly, it will be important for researchers to test the effectiveness of combinations of the strategies and approaches included in this package. Most existing evaluations focus on approaches implemented in isolation. However, there is potential to understand the synergistic effects within a comprehensive prevention approach. Additional research is needed to understand the extent to which combinations of strategies and approaches result in greater reductions in suicide than individual programs, practices, or policies.

## Conclusion

Suicide is a serious public health problem whose rates have been on the rise for more than a decade and whose costs stretch well into the billions of dollars each year. And while suicide is a rare outcome statistically, its human impact has a ripple effect that is far-reaching. Each of us likely interacts with suicide survivors, those with lived experience, and those with thoughts of suicide, on a daily basis—at home, at work, and in our communities. Suicide and suicide attempts are therefore public health issues of societal concern. Fortunately, like many public health problems, suicide is preventable, and fortunately more is being done to prevent suicide than ever before, as evidenced by the work of the National Action Alliance for Suicide Prevention, the release of the first world report on suicide, more timely surveillance data, and critical mention in the President’s FY17 budget, to name just a few examples. Unfortunately and unlike most other public health problems, suicide still struggles against stigma, shame, and secrecy related to help-seeking, mental illness, being a survivor, or someone with lived experience; misplaced fear of asking someone about their risk of suicide (versus the fear and consequence of not asking), and fear of taking up certain strategies known to be effective but perhaps unpopular; misinformation about suicide preventability, and disproportionate funding given the public health burden. Suicide also struggles against the right degree of awareness where too much information, for example by well-meaning reporters and others, may actually do harm.

In an effort to continue pushing the field and society further towards prevention, this technical package includes strategies and approaches that ideally would be used in a comprehensive fashion, in combination—in a multi-level, multi-sectoral way. This technical package includes strategies and approaches targeting upstream prevention, e.g., social emotional learning for children and youth, as well as strategies focused more downstream, e.g., cognitive behavioral treatment to prevent re-attempts. It includes universal, selective, and indicated strategies, or strategies that focus on the whole population regardless of risk to strategies that focus on those groups at highest risk. Importantly, this technical package extends the bounds of the typical prevention strategies to consider approaches at the outer

levels of the social ecology, e.g., policies to stabilize housing and community engagement initiatives. In short, care and attention has been paid to all aspects of suicide prevention.

While the evidence base continues to be built, the collection of programs, policies, and practices laid out here are available for implementation now. And in keeping with good public health practice, the intent is that monitoring and evaluation will play a key role in that implementation. Moreover, as new evidence becomes available, this technical package can be refined to reflect the current state of the science.

In closing, and in keeping with a message of resilience as spoken by those with lived experience, ‘hope, help, and healing is possible.’



## References

- Arsenault-Lapierre, G., Kim, C., & Turecki, G. (2004). Psychiatric diagnoses in 3275 suicides: a meta-analysis. *BMC Psychiatry*, 4, 37. doi:10.1186/1471-244X-4-37
- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*: Prentice-Hall, Inc.
- Basile, K. C., Espelage, D. L., Rivers, I., McMahon, P. M., & Simon, T. R. (2009). The theoretical and empirical links between bullying behavior and male sexual violence perpetration. *Aggression and violent behavior*, 14(5), 336-347.
- Basile, K. C., Hamburger, M. E., Swahn, M. H., & Choi, C. (2013). Sexual violence perpetration by adolescents in dating versus same-sex peer relationships: differences in associated risk and protective factors. *Western Journal of Emergency Medicine*, 14(4), 329.
- Beautrais, A. L. (2001). Effectiveness of barriers at suicide jumping sites: A case study. *Aust NZ J Psychiat*, 35. doi:10.1080/0004867010060501
- Beautrais, A. L., Gibb, S. J., Fergusson, D. M., Horwood, L. J., & Larkin, G. L. (2009). Removing bridge barriers stimulates suicides: An unfortunate natural experiment. *Aust NZ J Psychiat*, 43. doi:10.1080/00048670902873714
- Beyer, K. M., Layde, P. M., Hamberger, L. K., & Laud, P. W. (2015). Does neighborhood environment differentiate intimate partner femicides from other femicides? *Violence Against Women*, 21(1), 49-64. doi:10.1177/1077801214564075
- Blair, J. M., Fowler, K. A., Jack, S. P., & Crosby, A. E. (2016). The National Violent Death Reporting System: overview and future directions. *Inj Prev*, 22 Suppl 1, i6-i11. doi:10.1136/injuryprev-2015-041819
- Borowsky, I. W., Hogan, M., & Ireland, M. (1997). Adolescent sexual aggression: risk and protective factors. *Pediatrics*, 100(6), E7.
- Branas, C. C., Cheney, R. A., MacDonald, J. M., Tam, V. W., Jackson, T. D., & Ten Have, T. R. (2011). A difference-in-differences analysis of health, safety, and greening vacant urban space. *Am J Epidemiol*, 174(11), 1296-1306. doi:10.1093/aje/kwr273
- Brown, G. K., Ten Have, T., Henriques, G. R., Xie, S. X., Hollander, J. E., & Beck, A. T. (2005). Cognitive therapy for the prevention of suicide attempts: a randomized controlled trial. *JAMA*, 294(5), 563-570. doi:10.1001/jama.294.5.563
- Butchart, A., Phinney, A., Check, P., & Villaveces, A. (2004). *Preventing Violence: A Guide to Implementing the Recommendations of the World Report on Violence and Health*. Geneva, Switzerland: World Health Organization.
- Capaldi, D. M., Knoble, N. B., Shortt, J. W., & Kim, H. K. (2012). A Systematic Review of Risk Factors for Intimate Partner Violence. *Partner Abuse*, 3(2), 231-280. doi:10.1891/1946-6560.3.2.231
- Carter, M., McGee, R., Taylor, B., & Williams, S. (2007). Health outcomes in adolescence: associations with family, friends and school engagement. *J Adolesc*, 30(1), 51-62. doi:10.1016/j.adolescence.2005.04.002
- Cavanagh, J. T., Carson, A. J., Sharpe, M., & Lawrie, S. M. (2003). Psychological autopsy studies of suicide: a systematic review. *Psychol Med*, 33(3), 395-405.
- Centers for Disease Control and Prevention. (2009). Strategic direction for the prevention of suicidal behavior: Promoting individual, family, and community connectedness to prevent suicidal behavior. Retrieved from Available at: [http://www.cdc.gov/ViolencePrevention/pdf/Suicide\\_Strategic\\_Direction\\_Full\\_version-a.pdf](http://www.cdc.gov/ViolencePrevention/pdf/Suicide_Strategic_Direction_Full_version-a.pdf)
- Centers for Disease Control and Prevention. (2016a). Child Maltreatment: Risk and Protective Factors. Retrieved from Available at: <http://www.cdc.gov/violenceprevention/childmaltreatment/riskprotectivefactors.html>
- Centers for Disease Control and Prevention. (2016b). Elder Maltreatment: Risk and Protective Factors. Retrieved from Available at: <http://www.cdc.gov/ViolencePrevention/eldermaltreatment/riskprotectivefactors.html>

- Centers for Disease Control and Prevention. (2016c). Sexual Violence: Risk and Protective Factors. Retrieved from Available at: <http://www.cdc.gov/ViolencePrevention/sexualviolence/riskprotectivefactors.html>
- Centers for Disease Control and Prevention. (2016d). Web-Based Injury Statistics Query and Reporting System (WISQARS). Retrieved June 3, 2016 Available at: <http://www.cdc.gov/injury/wisqars/index.html>
- Centers for Disease Control and Prevention. (2016e). Youth Violence: Risk and Protective Factors. Retrieved from Available at: <http://www.cdc.gov/violenceprevention/youthviolence/riskprotectivefactors.html>
- Cerel, J., & Campbell, F. R. (2008). Suicide survivors seeking mental health services: a preliminary examination of the role of an active postvention model. *Suicide Life Threat Behav*, 38(1), 30-34. doi:10.1521/suli.2008.38.1.30
- Cerel, J., McIntosh, J. L., Neimeyer, R. A., Maple, M., & Marshall, D. (2014). The Continuum of "Survivorship": Definitional Issues in the Aftermath of Suicide. *Suicide and life-threatening behavior*, 44(6), 591-600. doi:10.1111/sltb.12093
- Chapman, A. L., & Dixon-Gordon, K. L. (2007). Emotional antecedents and consequences of deliberate self-harm and suicide attempts. *Suicide Life Threat Behav*, 37(5), 543-552. doi:10.1521/suli.2007.37.5.543
- Cherpitel, C. J., Borges, G. L. G., & Wilcox, H. C. (2004). Acute alcohol use and suicidal behavior: A review of the literature. *Alcoholism: Clinical and Experimental Research*, 28(5 SUPPL.), 18S-28S.
- Classen, T. J., & Dunn, R. A. (2012). The effect of job loss and unemployment duration on suicide risk in the United States: a new look using mass-layoffs and unemployment duration. *Health Econ*, 21(3), 338-350. doi:10.1002/hec.1719
- Coffey, C. E. (2006). Pursuing perfect depression care. *Psychiatr Serv*, 57(10), 1524-1526. doi:10.1176/ps.2006.57.10.1524
- Coffey, C. E., Coffey, M. J., & Ahmedani, B. K. (2013). An update on perfect depression care. *Psychiatr Serv*, 64(4), 396. doi:10.1176/appi.PS.640422
- Coffey, M., Coffey, C., & Ahmedani, B. K. (2015). Suicide in a health maintenance organization population. *JAMA Psychiatry*, 72(3), 294-296. doi:10.1001/jamapsychiatry.2014.2440
- Comtois, K. A., Jobes, D. A., S. O'Connor, S., Atkins, D. C., Janis, K., E. Chessen, C., . . . Yuodelis-Flores, C. (2011). Collaborative assessment and management of suicidality (CAMS): feasibility trial for next-day appointment services. *Depress Anxiety*, 28(11), 963-972. doi:10.1002/da.20895
- Coulton, C. J., Crampton, D. S., Irwin, M., Spilsbury, J. C., & Korbin, J. E. (2007). How neighborhoods influence child maltreatment: a review of the literature and alternative pathways. *Child Abuse Negl*, 31(11-12), 1117-1142. doi:10.1016/j.chiabu.2007.03.023
- Cox, G. R., Owens, C., Robinson, J., Nicholas, A., Lockley, A., Williamson, M., . . . Pirkis, J. (2013). Interventions to reduce suicides at suicide hotspots: a systematic review. *BMC Public Health*, 13(1), 1-12. doi:10.1186/1471-2458-13-214
- Crosby, A. E., Espitia-Hardeman, V., Ortega, L., & Lozano, B. (2013). Alcohol and suicide. *Alcohol: Science, Policy and Public Health*, 190.
- Crosby, A. E., Han, B., Ortega, L., Parks, S. E., & Gfroerer, J. (2011). Suicidal Thoughts and Behaviors Among Adults Aged ≥18 Years — United States, 2008–2009. *MMWR*, 60(No. SS-13), 1-22.
- Crosby, A. E., Ortega, L., & Melanson, C. (2011). *Self-directed Violence Surveillance: Uniform Definitions and Recommended Data Elements, Version 1.0*. Retrieved from Atlanta, GA:
- Cunningham, P. J. (2009). Beyond parity: primary care physicians' perspectives on access to mental health care. *Health Aff (Millwood)*, 28(3), w490-501. doi:10.1377/hlthaff.28.3.w490
- Curtin, S. C., Warner, M., & Hedegaard, H. (2016). *Increase in suicide in the United States, 1999-2014*. ( ). Hyattsville, MD: National Center for Health Statistics Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/25116188>.
- Cylus, J., Glymour, M. M., & Avendano, M. (2014). Do generous unemployment benefit programs reduce suicide rates? A state fixed-effect analysis covering 1968-2008. *Am J Epidemiol*, 180(1), 45-52. doi:10.1093/aje/kwu106



- Dahlberg, L. L., & Krug, E. G. (2002). Violence-a global public health problem. In E. Krug, L. L. Dahlberg, J. A. Mercy, A. B. Zwi, & R. Lozano (Eds.), *World Report on Violence and Health* (pp. 1-56). Geneva, Switzerland: World Health Organization.
- DeGue, S., Massetti, G. M., Holt, M. K., Tharp, A. T., Valle, L. A., Matjasko, J. L., & Lippy, C. (2013). Identifying links between sexual violence and youth violence perpetration: New opportunities for sexual violence prevention. *Psychology of violence*, 3(2), 140.
- Deisenhammer, E. A., Ing, C. M., Strauss, R., Kemmler, G., Hinterhuber, H., & Weiss, E. M. (2009). The duration of the suicidal process: how much time is left for intervention between consideration and accomplishment of a suicide attempt? *J Clin Psychiatry*, 70(1), 19-24.
- Desai, R. A., Dausey, D. J., & Rosenheck, R. A. (2005). Mental health service delivery and suicide risk: the role of individual patient and facility factors. *Am J Psychiatry*, 162(2), 311-318. doi:10.1176/appi.ajp.162.2.311
- Diamond, G. S., Wintersteen, M. B., Brown, G. K., Diamond, G. M., Gallop, R., Shelef, K., & Levy, S. (2010). Attachment-based family therapy for adolescents with suicidal ideation: a randomized controlled trial. *J Am Acad Child Adolesc Psychiatry*, 49(2), 122-131.
- Dunne, E. J., McIntosh, J. L., & Dunne-Maxim, K. (Eds.). (1987). *Suicide and its aftermath: Understanding and counseling the survivors*. New York: Norton.
- Durkheim, E. (1897/1951). *Suicide: A study in sociology* (JA Spaulding & G. Simpson, trans.). Glencoe, IL: Free Press. (Original work published 1897).
- Elgar, F. J., Craig, W., Boyce, W., Morgan, A., & Vella-Zarb, R. (2009). Income inequality and school bullying: multilevel study of adolescents in 37 countries. *J Adolesc Health*, 45(4), 351-359. doi:10.1016/j.jadohealth.2009.04.004
- Escobedo, L. G., & Ortiz, M. (2002). The relationship between liquor outlet density and injury and violence in New Mexico. *Accid Anal Prev*, 34(5), 689-694.
- Etzersdorfer, E., & Sonneck, G. (1998). Preventing suicide by influencing mass-media reporting: The Viennese experience, 1980-1996. *Arch Suicide Res*, 4.
- Ferdon, C., Crosby, A. E., Caine, E. D., Hindman J., Reed, G. A., & Iskander, J. (In press). CDC Public Health Grand Rounds: Preventing Suicide through a Comprehensive Public Health Approach. *MMWR*.
- Flavin, P., & Radcliff, B. (2009). Public policies and suicide rates in the American states. *Social Indicators Research*, 90(2), 195-209.
- Fleischmann, A., Bertolote, J. M., Wasserman, D., De Leo, D., Bolhari, J., Botega, N. J., . . . Thanh, H. T. (2008). Effectiveness of brief intervention and contact for suicide attempters: a randomized controlled trial in five countries. *Bulletin of the World Health Organization*, 86(9), 703-709. doi:S0042-96862008000900014 [pii]
- Fowler, K. A., Gladden, R. M., Vagi, K. J., Barnes, J., & Frazier, L. (2015). Increase in suicides associated with home eviction and foreclosure during the US housing crisis: findings from 16 National Violent Death Reporting System States, 2005-2010. *Am J Public Health*, 105(2), 311-316. doi:10.2105/AJPH.2014.301945
- Freisthler, B., Merritt, D. H., & LaScala, E. A. (2006). Understanding the ecology of child maltreatment: a review of the literature and directions for future research. *Child Maltreat*, 11(3), 263-280. doi:10.1177/1077559506289524
- Frieden, T. R. (2010). A framework for public health action: the health impact pyramid. *Am J Public Health*, 100(4), 590-595. doi:10.2105/AJPH.2009.185652
- Ghahramanlou-Holloway, M., Bhar, S., Brown, G., Olsen, C., & Beck, A. T. (2012). Changes in problem-solving appraisal after cognitive therapy for the prevention of suicide. *Psychological Medicine*, 42(06), 1185-1193.
- Giesbrecht, N., Huguette, N., Ogden, L., Kaplan, M. S., McFarland, B. H., Caetano, R., . . . Nolte, K. B. (2015). Acute alcohol use among suicide decedents in 14 US states: impacts of off-premise and on-premise alcohol outlet density. *Addiction*, 110(2), 300-307. doi:10.1111/add.12762

- Godoy Garraza, L., Walrath, C., Goldston, D. B., Reid, H., & McKeon, R. (2015). Effect of the Garrett Lee Smith Memorial Suicide Prevention Program on Suicide Attempts Among Youths. *JAMA Psychiatry*, 72(11), 1143-1149. doi:10.1001/jamapsychiatry.2015.1933
- Goldsmith, S. K., Pellmar, T. C., Kleinman, A. M., & Bunney, W. E. (2002). *Reducing suicide: A national imperative*: National Academies Press.
- Gould, M. S., Cross, W., Pisani, A. R., Munfakh, J. L., & Kleinman, M. (2013). Impact of Applied Suicide Intervention Skills Training on the National Suicide Prevention Lifeline. *Suicide Life Threat Behav*, 43(6), 676-691. doi:10.1111/sltb.12049
- Gould, M. S., Kalafat, J., Harrismunfakh, J. L., & Kleinman, M. (2007). An evaluation of crisis hotline outcomes. Part 2: Suicidal callers. *Suicide Life Threat Behav*, 37(3), 338-352. doi:10.1521/suli.2007.37.3.338
- Grossman, D. C., Mueller, B. A., Riedy, C., Dowd, M. D., Villaveces, A., Prodzinski, J., . . . Harruff, R. (2005). Gun storage practices and risk of youth suicide and unintentional firearm injuries. *JAMA*, 293(6), 707-714. doi:10.1001/jama.293.6.707
- Haddon, W. (1980). Advances in the epidemiology of injuries as a basis for public policy. *Public Health Reports*, 95(5), 411-421.
- Han, B., Crosby, A. E., Ortega, L. A., Parks, S. E., Compton, W. M., & Gfroerer, J. (2016). Suicidal ideation, suicide attempt, and occupations among employed adults aged 18–64years in the United States. *Comprehensive psychiatry*, 66, 176-186.
- Harris, E. C., & Barraclough, B. (1997). Suicide as an outcome for mental disorders. A meta-analysis. *Br J Psychiatry*, 170, 205-228.
- Harris, E. C., & Barraclough, B. (1998). Excess mortality of mental disorder. *Br J Psychiatry*, 173, 11-53.
- Harris, K. M., Carpenter, C., & Bao, Y. (2006). The effects of state parity laws on the use of mental health care. *Med Care*, 44(6), 499-505. doi:10.1097/01.mlr.0000215813.16211.00
- Hassanian-Moghaddam, H., Sarjami, S., Kolahi, A. A., & Carter, G. L. (2011). Postcards in Persia: randomised controlled trial to reduce suicidal behaviours 12 months after hospital-treated self-poisoning. *British Journal of Psychiatry*, 198(4), 309-316.
- Hawton, K. (2007). Restricting access to methods of suicide: Rationale and evaluation of this approach to suicide prevention. *Crisis*, 28. doi:10.1027/0227-5910.28.s1.4
- Heise, L., & Garcia-Moreno, C. (2002). Violence by Intimate Partners. In E. Krug, L. L. Dahlberg, J. A. Mercy, A. B. Zwi, & R. Lozano (Eds.), *World Report on Violence and Health* (pp. 87-121). Geneva, Switzerland: World Health Organization.
- Herman, K. C., Borden, L. A., Reinke, W. M., & Webster-Stratton, C. (2011). The Impact of the Incredible Years Parent, Child, and Teacher Training Programs on Children's Co-Occurring Internalizing Symptoms. *Sch Psychol Q*, 26(3), 189-201. doi:10.1037/a0025228
- Hong, J. S., Kral, M. J., Espelage, D. L., & Allen-Meares, P. (2012). The social ecology of adolescent-initiated parent abuse: a review of the literature. *Child Psychiatry Hum Dev*, 43(3), 431-454. doi:10.1007/s10578-011-0273-y
- Houle, J. N., & Light, M. T. (2014). The home foreclosure crisis and rising suicide rates, 2005 to 2010. *Am J Public Health*, 104(6), 1073-1079. doi:10.2105/AJPH.2013.301774
- Hunkeler, E. M., Katon, W., Tang, L., Williams, J. W., Jr., Kroenke, K., Lin, E. H., . . . Unutzer, J. (2006). Long term outcomes from the IMPACT randomised trial for depressed elderly patients in primary care. *BMJ*, 332(7536), 259-263. doi:10.1136/bmj.38683.710255.BE
- Inagaki, M., Kawashima, Y., Kawanishi, C., Yonemoto, N., Sugimoto, T., Furuno, T., . . . Yamada, M. (2015). Interventions to prevent repeat suicidal behavior in patients admitted to an emergency department for a suicide attempt: a meta-analysis. *J Affect Disord*, 175, 66-78. doi:10.1016/j.jad.2014.12.048
- Isometsa, E. T. (2001). Psychological autopsy studies--a review. *Eur Psychiatry*, 16(7), 379-385.



- Jobes, D. A. (2012). The Collaborative Assessment and Management of Suicidality (CAMS): an evolving evidence-based clinical approach to suicidal risk. *Suicide Life Threat Behav*, 42(6), 640-653. doi:10.1111/j.1943-278X.2012.00119.x
- Johnson, F. W., Gruenewald, P. J., & Remer, L. G. (2009). Suicide and alcohol: do outlets play a role? *Alcohol Clin Exp Res*, 33(12), 2124-2133. doi:10.1111/j.1530-0277.2009.01052.x
- Kaplan, M. S., McFarland, B. H., Huguet, N., Conner, K., Caetano, R., Giesbrecht, N., & Nolte, K. B. (2013). Acute alcohol intoxication and suicide: a gender-stratified analysis of the National Violent Death Reporting System. *Inj Prev*, 19(1), 38-43. doi:10.1136/injuryprev-2012-040317
- Kellam, S. G., Brown, C. H., Poduska, J. M., Ialongo, N. S., Wang, W., Toyinbo, P., . . . Wilcox, H. C. (2008). Effects of a universal classroom behavior management program in first and second grades on young adult behavioral, psychiatric, and social outcomes. *Drug Alcohol Depend*, 95 Suppl 1, S5-S28. doi:10.1016/j.drugalcdep.2008.01.004
- Kessler, R. C., Demler, O., Frank, R. G., Olfson, M., Pincus, H. A., Walters, E. E., . . . Zaslavsky, A. M. (2005). Prevalence and treatment of mental disorders, 1990 to 2003. *N Engl J Med*, 352(24), 2515-2523. doi:10.1056/NEJMsa043266
- Kitchener, B. A., & Jorm, A. F. (2004). Mental health first aid training in a workplace setting: a randomized controlled trial [ISRCTN13249129]. *BMC Psychiatry*, 4, 23. doi:10.1186/1471-244X-4-23
- Kitchener, B. A., & Jorm, A. F. (2006). Mental health first aid training: review of evaluation studies. *Aust N Z J Psychiatry*, 40(1), 6-8. doi:10.1111/j.1440-1614.2006.01735.x
- Kleiman, E. M., Riskind, J. H., Schaefer, K. E., & Weingarden, H. (2012). The moderating role of social support on the relationship between impulsivity and suicide risk. *Crisis*, 33(5), 273-279. doi:10.1027/0227-5910/a000136
- Klevens, J., Simon, T. R., & Chen, J. (2012). Are the perpetrators of violence one and the same? Exploring the co-occurrence of perpetration of physical aggression in the United States. *J Interpers Violence*, 27(10), 1987-2002. doi:10.1177/0886260511431441
- Knox, K. L., Litts, D. A., Talcott, G. W., Feig, J. C., & Caine, E. D. (2003). Risk of suicide and related adverse outcomes after exposure to a suicide prevention programme in the US Air Force: cohort study. *BMJ*, 327(7428), 1376.
- Knox, K. L., Pflanz, S., Talcott, G. W., Campise, R. L., Lavigne, J. E., Bajorska, A., . . . Caine, E. D. (2010). The US Air Force suicide prevention program: implications for public health policy. *Am J Public Health*, 100(12), 2457-2463. doi:10.2105/ajph.2009.159871
- Knox, M. S., Burkhart, K., & Hunter, K. E. (2010). ACT against violence parents raising safe kids program: Effects on maltreatment-related parenting behaviors and beliefs. *Journal of Family Issues*.
- Lang, M. (2013). The impact of mental health insurance laws on state suicide rates. *Health Econ*, 22(1), 73-88. doi:10.1002/hecl.1816
- Linehan, M. M., Comtois, K. A., Murray, A. M., Brown, M. Z., Gallop, R. J., Heard, H. L., . . . Lindenboim, N. (2006). Two-year randomized controlled trial and follow-up of dialectical behavior therapy vs therapy by experts for suicidal behaviors and borderline personality disorder. *Arch Gen Psychiatry*, 63(7), 757-766. doi:10.1001/archpsyc.63.7.757
- Losel, F., & Farrington, D. P. (2012). Direct protective and buffering protective factors in the development of youth violence. *Am J Prev Med*, 43(2 Suppl 1), S8-S23. doi:10.1016/j.amepre.2012.04.029
- Luo, F., Florence, C. S., Quispe-Agnoli, M., Ouyang, L., & Crosby, A. E. (2011). Impact of business cycles on US suicide rates, 1928-2007. *Am J Public Health*, 101(6), 1139-1146. doi:10.2105/ajph.2010.300010
- Maimon, D., Browning, C. R., & Brooks-Gunn, J. (2010). Collective efficacy, family attachment, and urban adolescent suicide attempts. *J Health Soc Behav*, 51(3), 307-324. doi:10.1177/0022146510377878
- Mark, T. L., Shern, D. L., Bagalman, J. E., & Cao, Z. (2007). Ranking America's mental health: An analysis of depression across the states. *Alexandria, VA: Mental Health America*.

- McIntosh, W. L., Spies, E., Stone, D. M., Lokey, C. N., Trudeau, A. R., & Bartholow, B. (2016). Suicide Rates by Occupational Group - 17 States, 2012. *MMWR Morb Mortal Wkly Rep*, 65(25), 641-645. doi:10.15585/mmwr.mm6525a1
- Miller, M., Warren, M., Hemenway, D., & Azrael, D. (2015). Firearms and suicide in US cities. *Inj Prev*, 21(e1), e116-119. doi:10.1136/injuryprev-2013-040969
- Mishara, B. L. (Ed.) (1995). *The Impact of Suicide*. New York: Springer.
- Mishara, B. L., & Martin, N. (2012). Effects of a comprehensive police suicide prevention program. *Crisis: Journal of Crisis Intervention & Suicide*, 33(3), 162-168.
- Mitchell, A. M., Kim, Y., Prigerson, H. G., & Mortimer-Stephens, M. (2004). Complicated grief in survivors of suicide. *Crisis*, 25(1), 12-18. doi:10.1027/0227-5910.25.1.12
- Motto, J. A., & Bostrom, A. G. (2001). A randomized controlled trial of postcrisis suicide prevention. *Psychiatr Serv*, 52(6), 828-833.
- Muennig, P., Cohen, A. K., Palmer, A., & Zhu, W. (2013). The relationship between five different measures of structural social capital, medical examination outcomes, and mortality. *Soc Sci Med*, 85, 18-26. doi:10.1016/j.socscimed.2013.02.007
- National Action Alliance for Suicide Prevention. (2014). Research Prioritization Task Force.(2014). *A prioritized research agenda for suicide prevention: An action plan to save lives*.
- National Action Alliance for Suicide Prevention Workplace Task Force. (2015). *Comprehensive Blueprint for Workplace Suicide Prevention*. Washington, D.C. : Author.
- National Action Alliance for Suicide Prevention: Suicide Attempt Survivors Task Force. (2014). *The Way Forward: Pathways to hope, recovery, and wellness with insights from lived experience*. Washington, D.C. : Author.
- National Action Alliance for Suicide Prevention: Survivors of Suicide Loss Task Force. (2015). *Responding to Grief, Trauma, and Distress After a Suicide: U.S. National Guidelines*. Washington, D.C. : Author.
- Niederkrotenthaler, T., & Sonneck, G. (2007). Assessing the impact of media guidelines for reporting on suicides in Austria: Interrupted time series analysis. *Aust N Z J Psychiatry*, 41. doi:10.1080/00048670701266680
- Olfson, M., Gerhard, T., Huang, C., Crystal, S., & Stroup, T. S. (2015). Premature Mortality Among Adults With Schizophrenia in the United States. *JAMA Psychiatry*, 72(12), 1172-1181. doi:10.1001/jamapsychiatry.2015.1737
- Owens, D. (2002). Fatal and non-fatal repetition of self-harm: Systematic review. *British Journal of Psychiatry*, 181(3), 193-199.
- Pena, J. B., & Caine, E. D. (2006). Screening as an approach for adolescent suicide prevention. *Suicide Life Threat Behav*, 36(6), 614-637. doi:10.1521/suli.2006.36.6.614
- Perron, S., Burrows, S., Fournier, M., Perron, P. A., & Ouellet, F. (2013). Installation of a bridge barrier as a suicide prevention strategy in Montreal, Quebec, Canada. *Am J Public Health*, 103(7), 1235-1239. doi:10.2105/ajph.2012.301089
- Pinchevsky, G. M., & Wright, E. M. (2012). The impact of neighborhoods on intimate partner violence and victimization. *Trauma Violence Abuse*, 13(2), 112-132. doi:10.1177/1524838012445641
- Pirkis, J., Too, L. S., Spittal, M. J., Krysinaka, K., Robinson, J., & Cheung, Y. T. D. (2015). Interventions to reduce suicides at suicide hotspots: a systematic review and meta-analysis. *The Lancet Psychiatry*, 2(11), 994-1001. doi:http://dx.doi.org/10.1016/S2215-0366(15)00266-7
- Pitman, A., Osborn, D., King, M., & Erlangsen, A. (2014). Effects of suicide bereavement on mental health and suicide risk. *Lancet Psychiatry*, 1, 86-94.
- Pollock, L. R., & Williams, J. M. (2004). Problem-solving in suicide attempters. *Psychol Med*, 34(1), 163-167.
- Reeves, A., Stuckler, D., McKee, M., Gunnell, D., Chang, S. S., & Basu, S. (2012). Increase in state suicide rates in the USA during economic recession. *Lancet*, 380(9856), 1813-1814. doi:10.1016/S0140-6736(12)61910-2
- Reid, M. J., Webster-Stratton, C., & Hammond, M. (2003). Follow-up of children who received the Incredible Years intervention for oppositional-defiant disorder: Maintenance and prediction of 2-year outcome. *Behavior Therapy*, 34(4), 471-491.



- Resnick, M. D., Ireland, M., & Borowsky, I. (2004). Youth violence perpetration: what protects? What predicts? Findings from the National Longitudinal Study of Adolescent Health. *J Adolesc Health*, 35(5), 424 e421-410. doi:10.1016/j.jadohealth.2004.01.011
- Rowhani-Rahbar, A., Simonetti, J. A., & Rivara, F. P. (2016). Effectiveness of Interventions to Promote Safe Firearm Storage. *Epidemiol Rev*, 38(1), 111-124. doi:10.1093/epirev/mxv006
- Runyan, C. W., Becker, A., Brandspigel, S., Barber, C., Trudeau, A., & Novins, D. (2016). Lethal Means Counseling for Parents of Youth Seeking Emergency Care for Suicidality. *West J Emerg Med*, 17(1), 8-14. doi:10.5811/westjem.2015.11.28590
- Runyan, D., Wattam, C., Ikeda, R., Hassan, F., & Ramiro, L. (2002). Child abuse and neglect by parents and other caregivers. In E. Krug, L. L. Dahlberg, J. A. Mercy, A. B. Zwi, & R. Lozano (Eds.), *World Report on Violence and Health* (pp. 59-86). Geneva, Switzerland: World Health Organization.
- Sampson, R. J., Morenoff, J. D., & Gannon-Rowley, T. (2002). Assessing "Neighborhood Effects": Social Processes and New Directions in Research. *Annual Review of Sociology*, 28, 443-478.
- Schilling, E. A., Aseltine, R. H., Jr., & James, A. (2016). The SOS Suicide Prevention Program: Further Evidence of Efficacy and Effectiveness. *Prev Sci*, 17(2), 157-166. doi:10.1007/s11121-015-0594-3
- Shepard, D. S., Gurewich, D., Lwin, A. K., Reed, G. A., Jr., & Silverman, M. M. (2016). Suicide and Suicidal Attempts in the United States: Costs and Policy Implications. *Suicide Life Threat Behav*, 46(3), 352-362. doi:10.1111/sltb.12225
- Silverman, M. M., & Maris, R. W. (1995). The prevention of suicidal behaviors: An overview. *Suicide and life-threatening behavior*, 25(1), 10-21.
- Simon, O. R., Swann, A. C., Powell, K. E., Potter, L. B., Kresnow, M. J., & O'Carroll, P. W. (2001). Characteristics of impulsive suicide attempts and attempters. *Suicide Life Threat Behav*, 32(1 Suppl), 49-59.
- Spoth, R. L., Gyll, M., & Day, S. X. (2002). Universal family-focused interventions in alcohol-use disorder prevention: cost-effectiveness and cost-benefit analyses of two interventions. *J Stud Alcohol*, 63(2), 219-228.
- Stack, S., & Wasserman, I. (2007). Economic strain and suicide risk: a qualitative analysis. *Suicide and life-threatening behavior*, 37(1), 103-112.
- Substance Abuse and Mental Health Services Administration. (2014). *Report to Congress: Garrett Lee Smith Suicide Prevention Program*. Rockville, MD.
- Sudak, H., Maxim, K., & Carpenter, M. (2008). Suicide and stigma: a review of the literature and personal reflections. *Acad Psychiatry*, 32(2), 136-142. doi:10.1176/appi.ap.32.2.136
- Szumilas, M., & Kutcher, S. (2011). Post-suicide intervention programs: a systematic review. *Can J Public Health*, 102(1), 18-29.
- Townsend, E., Hawton, K., Altman, D. G., Arensman, E., Gunnell, D., Hazell, P., . . . Van Heeringen, K. (2001). The efficacy of problem-solving treatments after deliberate self-harm: meta-analysis of randomized controlled trials with respect to depression, hopelessness and improvement in problems. *Psychological Medicine*, 31(6), 979-988.
- Tyrer, P., Reed, G. M., & Crawford, M. J. (2015). Classification, assessment, prevalence, and effect of personality disorder. *Lancet*, 385(9969), 717-726. doi:10.1016/S0140-6736(14)61995-4
- U.S. Office of the Surgeon General, & National Action Alliance for Suicide Prevention. (2012). *2012 National Strategy for Suicide Prevention: Goals and Objectives for Action*. Washington, D.C.: HHS.
- U.S. Public Health Service. (1999). *The Surgeon General's Call to Action to Prevent Suicide*. Washington, D.C.
- Unutzer, J., Tang, L., Oishi, S., Katon, W., Williams, J. W., Jr., Hunkeler, E., . . . Langston, C. (2006). Reducing suicidal ideation in depressed older primary care patients. *J Am Geriatr Soc*, 54(10), 1550-1556.
- Visser, V. S., Comans, T. A., & Scuffham, P. A. (2014). Evaluation Of The Effectiveness Of A Community-Based Crisis Intervention Program For People Bereaved By Suicide. *Journal of Community Psychology*, 42(1), 19-28. doi:10.1002/jcop.21586

- Walrath, C., Garraza, L. G., Reid, H., Goldston, D. B., & McKeon, R. (2015). Impact of the Garrett Lee Smith youth suicide prevention program on suicide mortality. *Am J Public Health, 105*(5), 986-993. doi:10.2105/AJPH.2014.302496
- Wang, Y. C., Hsieh, L. Y., Wang, M. Y., Chou, C. H., Huang, M. W., & Ko, H. C. (2016). Coping Card Usage can Further Reduce Suicide Reattempt in Suicide Attempter Case Management Within 3-Month Intervention. *Suicide Life Threat Behav, 46*(1), 106-120. doi:10.1111/sltb.12177
- Wasserman, D., Hoven, C. W., Wasserman, C., Wall, M., Eisenberg, R., Hadlaczky, G., . . . Carli, V. (2014). School-based suicide prevention programmes: The SEYLE cluster-randomised, controlled trial. *The Lancet, 385*(9977), 1536-1544. doi:10.1016/S0140-6736(14)61213-7
- Webster-Stratton, C., & Hammond, M. (1997). Treating children with early-onset conduct problems: a comparison of child and parent training interventions. *J Consult Clin Psychol, 65*(1), 93-109.
- Webster-Stratton, C., Reid, M. J., & Hammond, M. (2001). Preventing conduct problems, promoting social competence: a parent and teacher training partnership in head start. *J Clin Child Psychol, 30*(3), 283-302. doi:10.1207/S15374424JCCP3003\_2
- Webster-Stratton, C. H., Reid, M. J., & Beauchaine, T. (2011). Combining parent and child training for young children with ADHD. *Journal of Clinical Child & Adolescent Psychology, 40*(2), 191-203.
- Webster-Stratton, C., Jamila Reid, M., & Stoolmiller, M. (2008). Preventing conduct problems and improving school readiness: evaluation of the incredible years teacher and child training programs in high-risk schools. *Journal of child psychology and psychiatry, 49*(5), 471-488.
- Widome, R., Sieving, R. E., Harpin, S. A., & Hearst, M. O. (2008). Measuring neighborhood connection and the association with violence in young adolescents. *J Adolesc Health, 43*(5), 482-489. doi:10.1016/j.jadohealth.2008.04.013
- Wilcox, H. C., Kellam, S. G., Brown, C. H., Poduska, J. M., Ialongo, N. S., Wang, W., & Anthony, J. C. (2008). The impact of two universal randomized first- and second-grade classroom interventions on young adult suicide ideation and attempts. *Drug Alcohol Depend, 95 Suppl 1*, S60-73.
- Wilson, W. J. (2011). *When work disappears: The world of the new urban poor*: Vintage.
- World Health Organization. (2014). *Suicide Prevention: A Global Imperative*. Geneva, Switzerland: WHO Press.
- Wyman, P. A., Brown, C. H., LoMurray, M., Schmeelk-Cone, K., Petrova, M., Yu, Q., . . . Wang, W. (2010). An outcome evaluation of the Sources of Strength suicide prevention program delivered by adolescent peer leaders in high schools. *Am J Public Health, 100*(9), 1653-1661. doi:
- Yip, P., Caine, E., Yousuf, S., Chang, S.-S., Wu, K., & Chen, Y.-Y. (2012). Means restriction for suicide prevention. *Lancet, 379*. doi:10.1016/s0140-6736(12)60521-2



## Appendix A: Summary of Strategies and Approaches to Prevent Suicide

Strategy	Approach/Program, Practice or Policy	Best Available Evidence			Lead Sectors <sup>1</sup>
		Suicide	Suicide Attempts or Ideation	Other Risk/Protective Factors for Suicide	
Strengthen economic supports	Strengthen household financial security				
	Unemployment benefit programs	✓			Government (local, state, Federal)
	Housing stabilization policies				
	The National Neighborhood Stabilization Program			✓	Government (local, state, Federal)
Strengthen access to mental health care	Coverage of mental health conditions in health insurance policies				
	Mental Health Parity Laws	✓		✓	Government (state, Federal)  Health care
Establish protective environments	Reducing access to lethal means among persons at-risk				
	Intervening at hot spots	✓			Government (local, state, Federal)
	Safe storage practices		✓	✓	Public Health
	Organizational policies and culture				
	Together for Life	✓			Business/Labor

		Best Available Evidence			
	<i>US Air Force Suicide Prevention Program</i>	✓		✓	Government (local, state, Federal)
	Community-based policies to reduce excessive alcohol use				
	<i>Alcohol outlet density</i>	✓		✓	Government (local, state, Federal)
Promote connectedness to protect against suicide	Peer norm approaches				
	<i>Sources of Strength</i>			✓	Public Health Social Services
	Community-engagement activities				
	<i>Greening vacant urban spaces</i>			✓	Public Health
Teach coping and problem- solving skills	Social emotional learning				
	<i>Youth Aware of Mental Health Program</i>		✓		Public Health
	<i>Signs of Suicide</i>		✓	✓	Education
	<i>Good Behavior Game</i>		✓	✓	
	Parenting skill and family relationship approaches				
	<i>The Incredible Years</i>			✓	Public Health
				Education	



		Best Available Evidence			
	<i>Strengthening Families 10-14</i>			✓	
Identify and support people at-risk	Gatekeeper training				
	<i>Mental Health First Aid</i>			✓	Public Health Healthcare Social Services
	Screening combined with care management				
	<i>Henry Ford Perfect Depression Care (Pre-cursor to Zero Suicide)</i>	✓		✓	Healthcare
	Crisis Intervention				
	<i>National Suicide Prevention Lifeline</i>		✓	✓	Public Health Social Services
	<i>Applied Suicide Intervention Skills Training</i>		✓	✓	
Treatment for people at risk of suicide					
	<i>Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)</i>		✓	✓	Healthcare Social Services
	<i>Collaborative Assessment and Management of Suicidality (CAMS)</i>		✓	✓	

		Best Available Evidence			
Intervene to lessen harms and prevent future risk	<i>Dialectical Behavioral Therapy</i>		✓	✓	
	<i>Attachment-Based Family Therapy</i>		✓		
	Treatment to prevent re-attempts				
	<i>ED Brief Intervention with Follow-up Visits</i>	✓			Healthcare
	<i>Active follow-up contact approaches</i>	✓	✓		
	<i>CBT for Suicide Prevention</i>				
	Postvention				
	<i>StandBy Response Service</i>		✓		Healthcare
	Safe messaging following a suicide				
	<i>Media Guidelines</i>	✓			Public Health

<sup>1</sup>This column refers to the lead sectors well positioned to bring leadership and resources to implementation efforts. For each strategy, there are many other sectors such as non-governmental organizations that are instrumental to prevention planning and implementing the specific programmatic activities.



**Comment [A]:** Should we add relationships? Keep the levels the same as the SEM or is this ok?

**Policies, Programs, and Practices to Support  
Individuals, Families, & Communities:**

**A Technical Package to Prevent Suicide**

**Prepared by:**

Deb Stone, ScD, MSW, MPH  
Kristin Holland, PhD, MPH  
Brad Bartholow, PhD  
Alex Crosby, MD, MPH  
Shane Davis, PhD  
Natalie Wilkins, PhD

**Division of Violence Prevention  
National Center for Injury Prevention and Control (NCIPC)  
Centers for Disease Control and Prevention**

**2016**

*Policies, Programs, and Practices to Support Individuals, Families, & Communities:*  
*A Technical Package to Prevent Suicide* is a publication of the National Center for Injury Prevention  
and Control of the Centers for Disease Control and Prevention.

Centers for Disease Control and Prevention  
Thomas R. Frieden, MD, MPH, Director

National Center for Injury Prevention and Control  
Debra E. Houry, MD, MPH, Director

Division of Violence Prevention  
James A. Mercy, PhD, Director

*Suggested Citation:* Stone, D.M., Holland, K.M., Bartholow, B., Crosby, A.E., Davis, S., and Wilkins, N.  
Policies, Programs, and Practices to Support Individuals, Families, and Communities: *A Technical  
Package to Prevent Suicide*. Atlanta, GA: National Center for Injury Prevention and Control, Centers for  
Disease Control and Prevention, 2016.



## Contents

Acknowledgements.....	
External Reviewers.....	
Overview of Technical Package.....	
Strengthen Economic Supports.....	
Strengthen Access to Mental Health Care.....	
Create Protective Environments.....	
Promote Connectedness.....	
Teach Coping and Problem-Solving Skills.....	
Identify and Support People At Risk.....	
Intervene to Lessen Harms and Prevent Future Risk.....	
Sector Involvement.....	
Monitoring and Evaluation.....	
Conclusion.....	
References.....	
Appendix.....	

## External Reviewers

[to be inserted later]



## Acknowledgments

[to be inserted later]

Please include Helen Singer, MPH

## Overview

This technical package represents a select group of strategies based on the best available evidence to help communities and states sharpen their focus on prevention activities with the greatest potential to prevent suicide. These strategies include strengthening economic supports; strengthening access to mental health care; creating protective environments; promoting connectedness to protect against suicide; teaching coping and problem-solving skills; identifying and supporting people at-risk; and intervening to lessen harms and prevent future risk. The strategies represented in this package include those with a focus on preventing suicide from happening in the first place as well as approaches to lessen the immediate and long-term harms of suicidal behavior for individuals, families, communities, and society. The strategies in the technical package support the goals and objectives of the National Strategy for Suicide Prevention and the National Action Alliance for Suicide Prevention's priority to strengthen community-based prevention. Commitment, cooperation, and leadership from numerous sectors, including public health, education, justice, health care, social services, business/labor, and government can bring about the successful implementation of this package.

### What is a Technical Package?

A technical package is a compilation of a core set of strategies to achieve and sustain substantial reductions in a specific risk factor or outcome (Frieden, 2014). Technical packages help communities and states prioritize prevention activities based on the best available evidence. This technical package has three components. The first component is the **strategy** or the preventive direction or actions to achieve the goal of preventing suicide. The second component is the **approach**. The approach includes the specific ways to advance the strategy. This can be accomplished through *programs, policies, and practices*. The approaches included come primarily from studies based in the United States. The **evidence** for each of the approaches in preventing suicide or its associated risk factors is included as the third component. This package is intended as a resource to guide and inform prevention decision-making in communities and states.

### Preventing Suicide is a Priority

Suicide, as defined by the Centers for Disease Control and Prevention (CDC), is part of a broader class of behavior called *self-directed violence*. Self-directed violence refers to behavior directed at oneself that deliberately results in injury or the *potential* for injury (Crosby, Ortega, & Melanson, 2011). Self-directed violence may be *suicidal* or *non-suicidal* in nature. For the purposes of this document, we refer only to behavior where suicide is intended:

- **Suicide** is a death caused by self-directed injurious behavior with any intent to die as a result of the behavior.



- **Suicide attempt** is defined as a *non-fatal* self-directed and potentially injurious behavior with any intent to die as a result of the behavior. A suicide attempt may or may not result in injury.

**Suicide is highly prevalent.** Suicide presents a major challenge to public health in the United States and worldwide. It contributes to premature death, morbidity, lost productivity, and health care costs (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014). In 2014 (the most recent year of available death data), suicide was responsible for 42,773 deaths in the U.S., which is approximately one suicide every 12 minutes (Centers for Disease Control and Prevention, 2016d). In 2014, suicide ranked as the 10th leading cause of death and has been among the top 12 leading causes of death since 1975 in the U.S (Centers for Disease Control and Prevention, 2016d). Overall suicide rates have increased 24% from 1999 to 2014 (Curtin, Warner, & Hedegaard, 2016). Suicide is a problem throughout the life span; it is the second leading cause of death among those aged 10–19 years, also second among persons in their 20s and 30s; it is the fourth leading cause among persons in their 40s and seventh among persons in their 50s (Centers for Disease Control and Prevention, 2016d).

Suicides reflect only a portion of the problem (Crosby, Han, Ortega, Parks, & Gfroerer, 2011). Substantially more people are hospitalized as a result of nonfatal suicidal behavior (i.e. suicide attempts) than are fatally injured, and an even greater number are either treated in ambulatory settings (e.g., emergency departments) or not treated at all (Crosby, Han, et al., 2011). For example, during 2014, among adults aged 18 years and older, for every one suicide there were 9 adults treated in hospital emergency departments for self-harm injuries, 27 who reported making a suicide attempt, and over 227 who reported seriously considering suicide (i.e. ideation) (Ferdon et al., In press).

**Suicide is associated with several risk and protective factors.** Suicide, like other human behaviors, is complex with no single determining cause. Instead, suicide occurs in response to multiple biological, psychological, interpersonal, environmental and societal influences that interact with one another, often over time. The social-ecological model-- encompassing multiple levels of focus from the individual, relationship, community, and societal-- is a useful framework for viewing and understanding suicide risk factors identified in the literature (Dahlberg & Krug, 2002). Risk and protective factors for suicide exist at each level. For example, risk factors include:

- **Individual level:** History of depression and other mental illnesses, alcohol and drug abuse, previous suicide attempt, violence victimization, genetic and biological determinants, hopelessness
- **Relationship level:** High conflict or violent relationships, sense of isolation and lack of social support, family/loved one's history of suicide, financial and work stress
- **Community level:** Inadequate community connectedness, barriers to health care (e.g., lack of access to providers and medications)

- **Societal level:** Availability of lethal means of suicide, unsafe media portrayals of suicide, stigma associated with help-seeking and mental illness (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014).

It is important to recognize that the vast majority of individuals who are depressed or who have other risk factors noted, do *not* die by suicide. Furthermore, the relevance of each risk factor can vary by age, race, gender, sexual orientation, residential geography, and socio-cultural and economic status (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014).

Protective factors, or those influences that guard *against* the risk for suicide, can also be found across the different levels of the social-ecological model. Protective factors identified in the literature include: effective coping and problem solving skills, moral objections to suicide, strong and supportive relationships with partners, friends, and family; connectedness to school, community and other social institutions; availability of quality and ongoing physical and mental health care, and reduced access to lethal means (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014). These protective factors can either counter a specific risk factor or guard against a number of risks associated with suicide.

**Suicide is connected to other forms of violence.** Suicide and other forms of violence often share some of the same root causes (Butchart, Phinney, Check, & Villaveces, 2004; Klevens, Simon, & Chen, 2012). For example, in neighborhoods where there is low social cohesion, or where residents don't support and trust each other, people are at higher risk for suicide (Desai, Dausey, & Rosenheck, 2005) as well as perpetration of child maltreatment (Coulton, Crampton, Irwin, Spilsbury, & Korbin, 2007; Freisthler, Merritt, & LaScala, 2006), teen dating violence (Capaldi, Knoble, Shortt, & Kim, 2012), intimate partner violence (Pinchevsky & Wright, 2012), and youth violence (Sampson, Morenoff, & Gannon-Rowley, 2002). Additionally, a lack of economic opportunities and unemployment are associated with suicide (Luo, Florence, Quispe-Agnoli, Ouyang, & Crosby, 2011; Reeves et al., 2012), as well as perpetration of child maltreatment (D. Runyan, Wattam, Ikeda, Hassan, & Ramiro, 2002), intimate partner violence (Heise & Garcia-Moreno, 2002; Pinchevsky & Wright, 2012), sexual violence (Centers for Disease Control and Prevention, 2016c) and youth violence (Wilson, 2011). Other shared risk factors for suicide and violence occur at the individual level and include substance abuse, mental health problems, witnessing violence, and a lack of problem-solving skills (Centers for Disease Control and Prevention, 2016a, 2016c, 2016e; U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012).

Just as risk factors may be shared across suicide and violence, so too may protective factors overlap. For example, connectedness increases individual's and communities' resilience to suicide and other forms of violence, including connectedness to one's community (Basile, Hamburger, Swahn, & Choi, 2013; Borowsky, Hogan, & Ireland, 1997; Centers for Disease Control and Prevention, 2016b; Coulton et al.,



2007; Kleiman, Riskind, Schaefer, & Weingarden, 2012; Pinchevsky & Wright, 2012; Widome, Sieving, Harpin, & Hearst, 2008), school (Basile, Espelage, Rivers, McMahon, & Simon, 2009; Capaldi et al., 2012; Carter, McGee, Taylor, & Williams, 2007; DeGue et al., 2013; Hong, Kral, Espelage, & Allen-Meares, 2012; Losel & Farrington, 2012), family (Capaldi et al., 2012; Centers for Disease Control and Prevention, 2016a; Elgar, Craig, Boyce, Morgan, & Vella-Zarb, 2009; Maimon, Browning, & Brooks-Gunn, 2010; Resnick, Ireland, & Borowsky, 2004), caring adults (Capaldi et al., 2012; Losel & Farrington, 2012; Maimon et al., 2010), and pro-social peers (Capaldi et al., 2012; Losel & Farrington, 2012).

**The health and economic consequences of suicide are substantial.** Suicide and suicide attempts have far-reaching consequences for individuals, families, and communities (Dunne, McIntosh, & Dunne-Maxim, 1987; Mishara, 1995; National Action Alliance for Suicide Prevention: Suicide Attempt Survivors Task Force, 2014; National Action Alliance for Suicide Prevention: Survivors of Suicide Loss Task Force, 2015). By one conservative estimate, for every death by suicide six people are directly impacted (i.e. survivors). Based on this figure it is estimated that there are over 13 million survivors in the U.S. and unfortunately, survivorship itself is a risk factor for suicide (Crosby & Sacks, 2002). Research indicates that the health consequences of violence, including suicide, are also much more extensive than injury and death. Suicide attempt survivors (i.e. those with lived experience) may suffer long-term health and mental health consequences ranging from anger, guilt, and physical impairment, depending on the means and severity of the attempt (Chapman & Dixon-Gordon, 2007). Similarly, survivors of a loved one's suicide may experience ongoing pain and suffering including complicated grief (Mitchell, Kim, Prigerson, & Mortimer-Stephens, 2004), stigma, depression, anxiety, post-traumatic stress disorder, and increased risk of suicidal ideation and suicide (Julie Cerel, McIntosh, Neimeyer, Maple, & Marshall, 2014; Sudak, Maxim, & Carpenter, 2008).

The economic toll of suicide is immense as well. The total lifetime costs associated with nonfatal injuries and deaths caused by self-directed violence in 2013 were approximately \$93.5 billion after adjusting for under-reporting of suicide (Shepard, Gurewich, Lwin, Reed, & Silverman, 2016). The overwhelming burden of these costs results from lost productivity over the life course, with the average cost per suicide being over \$1.3 million (Shepard et al., 2016).

**Suicide can be prevented.** Despite the myths surrounding suicide, like most public health problems, suicide is preventable (U.S. Public Health Service, 1999). And while progress will continue to be made into the future, evidence for numerous programs, practices, and policies currently exists, and many programs are ready to be implemented now. Just as suicide is not caused by a single factor, research suggests that suicide will not be prevented by any single intervention taking place in any single setting (Silverman & Maris, 1995; U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). Rather, suicide prevention is best achieved by a focus across the individual-, relationship-, family-, community, and societal-levels and across all sectors, private and public (e.g.,

business, public health, physical and behavioral healthcare, justice, education, labor) (National Action Alliance for Suicide Prevention, 2014; World Health Organization, 2014).

### **Assessing the Evidence**

This technical package includes programs, practices, and policies with evidence of impact on suicide or risk or protective factors for suicide. To be considered for inclusion in the technical package, the program, practice, or policy selected had to meet at least one of these criteria: a) meta-analyses or systematic reviews showing impact on suicide; b) evidence from at least one rigorous (e.g., randomized controlled trial [RCT] or quasi-experimental design) evaluation study that found significant preventive effects on suicide; c) meta-analyses or systematic reviews showing impact on risk or protective factors for suicide, or d) evidence from at least one rigorous (e.g., RCT or quasi-experimental design) evaluation study that found significant impacts on risk or protective factors for suicide. Finally, consideration was also given to the likelihood of achieving beneficial effects on multiple forms of violence; no evidence of harmful effects on specific outcomes or with particular subgroups; and feasibility of implementation in a U.S. context if the program, policy, or practice has been evaluated in another country.

Within this technical package, some approaches do not yet have research evidence demonstrating impact on rates of suicide but instead are supported by evidence indicating impacts on risk or protective factors for suicide (e.g., help-seeking, stigma reduction, depression, connectedness). In terms of the strength of the evidence, programs that have demonstrated effects on suicidal behavior (e.g., reductions in deaths, attempts) provide a higher-level of evidence, but the evidence base is not that strong in all areas. For instance, there has been less evaluation of community engagement and family programs on suicidal behavior. Thus, approaches in this package that have effects on risk or protective factors reflect the developmental nature of the evidence base and the use of the best available evidence at a given time.

It is also important to note that there is often significant heterogeneity among the programs, policies, or practices that fall within one approach or strategy area in terms of the nature and quality of the available evidence. Not all programs, policies, or practices that utilize the same approach (e.g., gatekeeper training) are equally effective, and even those that are effective may not work across all populations. Tailoring programs and more evaluation may be necessary to address different population groups. The examples provided are not intended to be a comprehensive list of evidence-based programs, policies, or practices for each approach, but rather illustrate models that have been shown to impact suicide or have beneficial effects on risk or protective factors for suicide. In practice, the effectiveness of the programs, policies and practices identified in this package will be strongly dependent on the quality of their implementation and the communities in which they are implemented. Implementation guidance to assist practitioners, organizations and communities will be developed separately.



### Context and Cross-Cutting Themes

The strategies and approaches that have been included in this technical package represent different levels of the social ecology, with efforts intended to impact the community and societal levels, as well individual and relationship levels. The strategies and approaches are intended to work in combination and reinforce each other to prevent suicide (see box below). The strategies are arranged in order such that those strategies hypothesized to have the greatest potential for broad public health impact on suicide are included first, followed by those that might impact more select populations (e.g., persons who have already made a suicide attempt).

**Comment [A]:** Can we just call this Promote Connectedness so it's more consistent with other strategy titles? Not sure why we have to say to protect against suicide.

Preventing Suicide	
Strategy	Approach
Strengthen economic supports	<ul style="list-style-type: none"><li>Strengthen household financial security</li><li>Housing stabilization policies</li></ul>
Strengthen access to mental health care	<ul style="list-style-type: none"><li>Coverage of mental health conditions in health insurance policies</li></ul>
Create protective environments	<ul style="list-style-type: none"><li>Reducing access to lethal means among persons at-risk of suicide</li><li>Organizational policies and culture</li><li>Community-based policies to reduce excessive alcohol use</li></ul>
Promote connectedness to protect against suicide	<ul style="list-style-type: none"><li>Peer norm approaches</li><li>Community engagement activities</li></ul>
Teach coping and problem-solving skills	<ul style="list-style-type: none"><li>Social-emotional learning</li><li>Parenting skill and family relationship approaches</li></ul>
Identify and support people at risk	<ul style="list-style-type: none"><li>Gatekeeper training</li><li>Screening combined with care management</li><li>Crisis intervention</li></ul>
Intervene to lessen harms and prevent future risk	<ul style="list-style-type: none"><li>Treatment for people at-risk of suicide</li><li>Treatment to prevent re-attempts</li><li>Postvention</li><li>Safe messaging following a suicide</li></ul>

The example programs, policies, and practices have been implemented within particular contexts. The social and cultural context of communities is critically important to take into account when selecting strategies and approaches. Practitioners in the field may be in the best position to assess the needs and strengths of their communities and work with community members to make decisions about the combination of approaches included here that are best suited to their context.

Suicide ideation, attempts, morbidity and mortality vary by gender, race/ethnicity, age, occupation, and other important population characteristics. Barriers to disclosure, help seeking, timely access to quality care, and ongoing support are profoundly complex and may also vary by population and community characteristics. Ideally, the availability of multiple approaches tailored to the economic, cultural, and environmental context of individuals and communities are desirable as they may increase the likelihood of removing barriers to supportive and effective care and provide opportunities to develop individual and community resilience. These culturally appropriate approaches can then be included in comprehensive strategies to maximize the public health impact on reducing suicide-related morbidity and mortality among individuals and within communities.

This package includes strategies where public health agencies are well positioned to bring leadership and resources to implementation efforts. It also includes strategies where public health can serve as an important collaborator (e.g., strategies addressing community and societal level risks), but where leadership and commitment from other sectors such as business/labor or health care is critical to implement a particular policy or program (e.g., workplace policies; screening combined with care management). The role of various sectors in the implementation of a strategy or approach in preventing suicide is described further in the section on *Sector Involvement*.

In the sections that follow, the strategies and approaches with the best available evidence for preventing suicide are described.



## Strengthen Economic Supports

### Rationale

Public health research suggests that some of the biggest impacts on health come from policies developed to improve socioeconomic conditions (Frieden, 2010). Downturns in the economy and increases in unemployment and home foreclosures are associated with increased rates of suicide (Fowler, Gladden, Vagi, Barnes, & Frazier, 2015; Luo et al., 2011). Policies that strengthen economic supports can help people stay in their homes, pay for necessities such as food and medical care, and get job training, among other things. In providing this support, stress and anxiety and the potential for a crisis situation may be reduced, thereby preventing suicide.

### Approaches

Economic and housing supports for individuals and families can be strengthened by improving policies that enhance financial security and stabilize housing for people, especially in times of economic need.

- **Strengthen household financial security.** Studies from the U.S. indicate that suicide rates increase during economic recessions marked by high unemployment rates, job losses, and economic instability and decrease during economic expansions and periods marked by low unemployment rates, particularly for working-age individuals 25 to 64 years old (Luo et al., 2011; Fowler et al., 2015).

### Potential Outcomes

- Reduced suicide rates
- Lower foreclosure rates
- Lower eviction rates
- Reduced emotional distress

### Evidence

There is evidence suggesting that strengthening household financial security and stabilizing housing can reduce suicide risk.

- **Strengthen household financial security.** An examination of variations in U.S. *unemployment benefit programs* across states demonstrated that the impact of unemployment on suicide was offset in those states that provided greater than average unemployment benefits (Cylus, Glymour, & Avendano, 2014). Another U.S. study examining the link between unemployment and suicide risk using monthly suicide data, length of unemployment, and job losses found that the duration of unemployment, as opposed to just the loss of job, predicted suicide risk (Classen & Dunn, 2012). Together, these results suggest that not only should state unemployment benefit programs be generous in their financial allocations, but also in their duration. **Other measures to**

**Comment [A]:** The rationale should focus on the strategy – strengthening economic supports – and how and why that might be beneficial in reducing suicide. As part of the rationale you can talk about how suicide relates to economic factors (e.g., historical data shows that suicide rates rise during periods of economic recessions and decreases during periods of economic expansion); how economic stressors (job loss, long periods of unemployment, reduced income, difficulty covering medical, food, housing expenses, etc.) increase risk for suicide and how buffering these risks can potentially protect against suicide. You cover this a

**Comment [A]:** Statement should be more along the lines of:

“There are a number of approaches that can help strengthen economic supports and buffer against the risk for suicide.”

Or

“Economic supports for individuals and families can be strengthened by targeting household financial security and ensuring stability in housing during periods of economic stress.”

**Comment [A]:** This would be a good introductory sentence to the rationale. For the two approaches, suggest saying something along the following lines:

**Strengthening household financial security** can reduce the risk for suicide by providing individuals with the necessary means to cover basic expenses and lessen the stress and hardship associated with a job loss or other unanticipated financial problems. The provision of unemployment benefits, livable wages, Temporary Assistance to Needy Families (TANF), medical benefits, and retirement and disability insurance to help cover the costs of basic necessities or to offset costs



strengthen household financial security (e.g., transfer payments related to retirement and disability insurance, unemployment insurance compensation, medical benefits, and other forms of family assistance) have also shown an impact on suicide. A study by Flavin and Radcliff (2009) examined the impact of states' per capita spending on transfer payments, medical benefits, and family assistance and total state spending on suicide rates between 1990-2000, controlling for a number of suicide risk factors (e.g., residential mobility, divorce rate, unemployment rate) at the state level. As per capita spending on total transfer payments, medical benefits, and family assistance increased there was an associated decrease in state suicide rates. Moreover, it wasn't spending in general that was associated with the reduction but spending on these types of assistance. In terms of lives saved, Flavin & Radcliff calculated the cost of reducing a state's suicide rate by a full point for the years studied. At the national level, an estimated 3,000 fewer suicides would occur per year nationwide if every state increased their per capita spending on these types of assistance by \$45 per year (Flavin & Radcliff, 2009).

- **Housing stabilization policies.** The *National Neighborhood Stabilization Program* was designed to help neighborhoods suffering from high rates of foreclosure and abandonment by slowing the deterioration of the neighborhoods and providing affordable housing options for low, moderate, and middle-income homebuyers. This program also offers financial assistance to eligible individuals for the purchase of a new home. Although this program has not been rigorously evaluated for its impact on suicide outcomes, it addresses foreclosure and eviction, which are risk factors for suicide. A longitudinal analysis of annual data on suicides and foreclosures demonstrated that as the proportion of foreclosed properties increased in U.S. states, so did the state suicide rate, particularly among working-aged adults (Houle & Light, 2014). Another study of data from 16 U.S. states participating in the National Violent Death Reporting System found that suicides precipitated by home foreclosures and evictions increased more than 100% from 2005 (before the housing crisis began) to 2010 (after it had peaked; Fowler et al. (2015)). Most of these suicides occurred prior to the actual loss of the decedent's home. These findings suggest that integrating suicide prevention resources, messaging, and referrals into financial, foreclosure, and move-out planning and counseling services may help to prevent suicide.



## Strengthen Access to Mental Health Care

### Rationale

While most people with mental health problems do not attempt or die by suicide (Olfson, Gerhard, Huang, Crystal, & Stroup, 2015; Owens, 2002), and risk conferred by mental illnesses differ (Arsenault-Lapierre, Kim, & Turecki, 2004; E. C. Harris & Barraclough, 1997; Tyrer, Reed, & Crawford, 2015), previous research indicates that mental illness is an important risk factor for suicide (E. C. Harris & Barraclough, 1998; World Health Organization, 2014). Studies suggest that up to 90% of people who die by suicide may have had a mental illness at the time of their deaths (Arsenault-Lapierre et al., 2004; Cavanagh, Carson, Sharpe, & Lawrie, 2003; Isometsa, 2001). State-level suicide rates have also been found to be correlated with general mental health measures such as depression (Lang, 2013; Mark, Shern, Bagalman, & Cao, 2007). Findings from the National Comorbidity Survey indicate that relatively few people in the U.S. with mental health disorders receive treatment for those conditions (Kessler et al., 2005). Lack of access to mental health care is one of the contributing factors related to the underuse of mental health services (Cunningham, 2009). Identifying ways to improve access to timely, affordable, and quality mental health care for people in need is a critical component to suicide prevention (World Health Organization, 2014). Apart from the treatment benefits, it can also serve to normalize help-seeking behavior and increase the use of such services.

### Approaches

One approach to strengthening access to mental health care is through the provision of mental health coverage in health insurance policies.

- **Coverage of mental health conditions in health insurance policies.** Federal and state laws include provisions for equal coverage of mental health services in health insurance plans that is on par with coverage for other health concerns (i.e., mental health parity). Benefits and services covered include such things as the number of visits, co-pays, deductibles, inpatient/outpatient services, prescription drugs, and hospitalizations. If a state has a stronger mental health parity law than the federal parity law, then insurance plans regulated by the state must follow the state parity law. Federal parity replaces the state law only in cases where the state law prevents the application of the federal parity law (e.g., includes coverage for some mental health conditions but not others). Equal coverage does not necessarily imply good coverage as health insurance plans vary in the extent to which benefits and services are offered to address various health conditions. Rather it helps to ensure that mental health services are covered on par with other health concerns.

### Potential Outcomes

- Increased utilization of mental health services

- Decreased symptoms of mental illnesses
- Decreased rates of suicide attempts
- Decreased rates of suicide

## Evidence

There is evidence suggesting that coverage of mental health conditions in health insurance policies can reduce risk factors associated with suicide and may directly impact suicide rates.

- **Coverage of mental health conditions in health insurance policies.** The National Survey of Drug Use and Health is a nationally representative survey of the U.S. population that provides data on substance use, mental health conditions, and services utilization. Using data from this survey, K. M. Harris, Carpenter, and Bao (2006) found that 12 months after states enacted *mental health parity laws*, self-reported use of mental healthcare services significantly increased. Moreover, subsequent research by Lang (2013) examined state mental health laws and suicide rates between 1990 and 2004 and found that mental health parity laws, specifically, were associated with an approximate 5% reduction in suicide rates. This reduction, in the 29 states with parity laws, equated to the prevention of 592 suicides per year and a cost savings of \$1.3-3.1 million per suicide prevented (Lang, 2013).



## Create Protective Environments

### Rationale

**Comment [A]:** Not sure if the additions I made to the rationale are too duplicative of info below. If so, go ahead and delete.

Prevention efforts that focus not only on individual behavior change (e.g., help-seeking, treatment interventions) but on changes to the environment can increase the likelihood of positive behavioral and health outcomes (Haddon, 1980). Creating environments that address risk and protective factors where individuals live, work, and play, can help prevent suicide (Dahlberg & Krug, 2002; U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). For example, rates of suicide and suicide attempts are elevated in certain occupational groups (Han et al., 2016; McIntosh et al., 2016), therefore, changes to the organizational culture in these occupations, by way of implementation of supportive policies or even physical modifications to the workplace environment, can demonstrate that good health and mental health are valued and that stigma and other risk factors for suicide, are not (K. L. Knox et al., 2010; National Action Alliance for Suicide Prevention Workplace Task Force, 2015). Similarly, changing the availability of and access to common suicide risk factors in the environment such as bridges, alcohol, medications, or firearms, can reduce suicide rates, particularly in times of crisis (Beautrais, Gibb, Fergusson, Horwood, & Larkin, 2009; Crosby, Espitia-Hardeman, Ortega, & Lozano, 2013; Kaplan et al., 2013; Miller, Warren, Hemenway, & Azrael, 2015; C. W. Runyan et al., 2016).

### Approaches

The current evidence suggests three promising approaches for creating environments that protect against suicide.

- **Reducing access to lethal means among persons at-risk of suicide.** Means of suicide such as firearms, hanging/suffocation, or jumping from heights provide little opportunity for rescue and, as such, have high case fatality rates (e.g., about 85% of people who use a firearm in a suicide attempt will die from the injury). Research also indicates that 1) the interval between thinking about and attempting suicide can be as short as 5 or 10 minutes (Deisenhammer et al., 2009; Simon et al., 2001) and 2) that people tend *not* to substitute a different method when a highly lethal method is unavailable or difficult to access (Hawton, 2007; Yip et al., 2012). Therefore, increasing the time interval between the thought and the suicide attempt, for example, by making it more difficult to access lethal means, can be lifesaving. The following are examples of approaches reducing access to lethal means for persons at-risk of suicide:
  - *Intervening at Suicide Hotspots.* Suicide hotspots, or places where suicides may take place relatively easily, include tall structures (e.g., bridges and cliffs), railway tracks, and isolated locations such as parks. Efforts to prevent suicide at these locations include

erecting barriers to prevent jumping and installing signs and telephones to encourage individuals who are considering suicide, to seek help (Cox et al., 2013).

- *Safe Storage Practices.* Safe storage of medications, firearms, and other household products can reduce the risk for suicide by separating individuals who may be vulnerable and/or impulsive from easy access to lethal means. Such practices may include education and counseling around storing firearms--locked in a secure place (e.g., in a gun safe or lock box), unloaded and separate from the ammunition--and keeping medicines in a locked cabinet or other secure location away from people who may be at risk or who have made prior attempts (Rowhani-Rahbar, Simonetti, & Rivara, 2016; C. W. Runyan et al., 2016).
- **Organizational policies and culture** that promote protective environments may be implemented in places of employment. Such policies and cultural values may promote prosocial behavior (e.g., asking for help), skill building, changing social norms, referral and access to helping services (e.g. mental health, substance abuse treatment, financial counseling), and encourage leadership support from the top down. Such policies and cultural shifts can positively impact organizational climate and morale and help prevent suicide and its related risk factors (e.g. depression, social isolation) (National Action Alliance for Suicide Prevention Workplace Task Force, 2015).
- **Community-based policies to reduce excessive alcohol use.** Research studies in the United States have found that greater alcohol availability is positively associated with alcohol-involved suicides (Escobedo & Ortiz, 2002; Giesbrecht et al., 2015). Policies to reduce excessive alcohol use broadly include zoning to limit alcohol outlet locations and density, taxes on alcohol, and bans on the sale of alcohol for individuals under the legal drinking age. These policies are important because acute alcohol use has been found to be associated with more than one-third of suicides and approximately 40% of suicide attempts (Cherpitel, Borges, & Wilcox, 2004).

### Potential Outcomes

- Increase in safe storage of means
- Reduction in suicide attempts
- Reduction in suicide deaths
- Increase in help-seeking
- Reduction in alcohol-related suicide deaths

### Evidence

The evidence for the effectiveness of means restriction and other ways to establish protective environments is some of the strongest in the field (Zalsman et al., 2016), as described below.



- **Reducing access to lethal means among persons at-risk of suicide.** A meta-analysis examining the impact of *suicide hotspot interventions* implemented in combination or in isolation, both in the U.S. and abroad, found associated reduced rates of suicide (Cox et al., 2013; Pirkis et al., 2015). For example, after erecting a barrier on the Jacques-Cartier bridge in Canada, the suicide rate from jumping from the bridge decreased from about 10 suicide deaths per year to about 3 deaths per year (Perron, Burrows, Fournier, Perron, & Ouellet, 2013). Moreover, the reduction in suicides by jumping was sustained even when all bridges and nearby jumping sites were considered, suggesting little to no displacement of suicides to other jumping sites (Perron et al., 2013). Further evidence for the effectiveness of bridge barriers was demonstrated by a study examining the impact of the *removal* of safety barriers from the Grafton Bridge in Auckland, New Zealand. After removal of the barrier, sadly, both the number and rate of suicide increased fivefold (Beautrais, 2001; Beautrais et al., 2009).

Another form of means reduction involves implementation of *safe storage practices*. In a case-control study of firearm-related events identified from 37 counties in Washington, Oregon, and Missouri, and from 5 trauma centers, Grossman et al. (2005) found that storing firearms unloaded, separate from ammunition, in a locked place and/or secured with a safety device was protective of suicide attempts among adolescents. Further, a recent systematic review of clinic and community-based education and counseling interventions suggested that the provision of safety devices significantly increased safe firearm storage practices compared to counseling alone or compared to the provision of economic incentives to acquire safety devices on one's own (Rowhani-Rahbar et al., 2016).

Another program, *The Emergency Department Counseling on Access to Lethal Means (ED CALM)*, trained psychiatric emergency clinicians in a large children's hospital to provide lethal means counseling and safe storage boxes to parents of patients under age 18 receiving care for suicidal behavior. In a pre-post quality improvement project, Runyan et. al (2016) found that at post-test 76% (of the 55% of parents followed up, n=114) reported that all medications in the home were locked up as compared to fewer than 10% at the time of the initial emergency department visit. Among parents who indicated the presence of guns in the home at pre-test (i.e. 67%), all (100%) reported guns were currently locked up at post-test (C. W. Runyan et al., 2016).

- **Organizational policies and culture.** *Together for Life* is a workplace program of the Montreal Police Force implemented to address suicide among officers. Policy and program components were designed to foster an organizational culture that promoted mutual support and solidarity among all members of the Force. The program included training of supervisors, managers and all units to improve competencies in identifying suicidal risk and to improve use and awareness of existing resources. The program also included an education campaign to improve awareness and help-seeking (Mishara & Martin, 2012). Police suicides were tracked over 12 years and

compared to rates in the control city of Quebec. The suicide rate in the intervention group decreased significantly by 78.9% to a rate of 6.42 suicides per 100,000 population per year compared to an 11% increase in the control city (rate: 29.0 per 100,000) (Mishara & Martin, 2012).

Another example of this approach is the *United States Air Force Suicide Prevention Program (AFSPP)*. AFSPP included 11 policy and education initiatives and was designed to change the culture of the Air Force surrounding suicide. The program uses leaders as role models and agents of change, establishes expectations for behavior related to awareness of suicide risk, develops population skills and knowledge (i.e., education and training), and investigates every suicide (i.e., outcomes measurement). The program represents a fundamental shift from viewing suicide and mental illness solely as medical problem and instead sees them as larger service-wide problems impacting the whole community (K. L. Knox, Litts, Talcott, Feig, & Caine, 2003). Using a time-series design to examine the impact of the AFSPP program on various violence-related outcomes, researchers found that the program was associated with a 33% relative risk reduction in suicide (K. L. Knox et al., 2003). The program was also associated with relative risk reductions in related outcomes including moderate and severe family violence (30% and 54%, respectively), homicide (51%), and accidental death (18%) (K. L. Knox et al., 2003). A longitudinal assessment of the program over the period 1981 to 2008 (16 years before the 1997 launch of the program and 11 years post-launch) found significantly lower rates of suicide after the program was launched than before (K. L. Knox et al., 2010). These effects were sustained over time, except in 2004, which the authors found was associated with less rigorous implementation in that year than in the other years (K. L. Knox et al., 2010).

- **Community-based policies to reduce excessive alcohol use.** While multiple policies to limit alcohol use exist, several studies on alcohol outlet *density*, specifically, suggest that measures to reduce alcohol outlet density can potentially reduce alcohol-involved suicides. Additionally, a longitudinal analysis of alcohol outlet density, suicide mortality, and hospitalizations for suicide attempts over 6 years in 581 California zip codes indicated that the density of bars, specifically, is related to suicide and suicide attempts, particularly in rural areas (Johnson, Gruenewald, & Remer, 2009).



## Promote Connectedness to Protect Against Suicide

### Rationale

Sociologist, Emile Durkheim theorized in 1897 that weak social bonds, i.e. lack of connectedness, are among the chief causes for suicidality (Durkheim, 1897/1951). *Connectedness* is the degree to which an individual or group of individuals are socially close, interrelated, or share resources with others (Centers for Disease Control and Prevention, 2009). Social connections can be formed within and between multiple levels of the social ecology (Dahlberg & Krug, 2002), for instance between individuals (e.g. peers, neighbors, co-workers), families, schools, neighborhoods, workplace, faith communities, cultural groups, and society as a whole. Related to connectedness, *social capital* refers to a sense of trust in one's community and neighborhood, social integration, and also the availability and participation in social organizations (Beyer, Layde, Hamberger, & Laud, 2015; Muennig, Cohen, Palmer, & Zhu, 2013). Many ecological cross-sectional and longitudinal studies have examined the impact of aspects of social capital on depression symptoms, depressive disorder, mental health more generally, and suicide. While the evidence is still being built the pattern is towards an inverse association between social capital measured by social trust, community/ neighborhood engagement, and improved mental health. Connectedness and social capital together can serve to protect against suicidal behaviors by decreasing isolation, encouraging adaptive coping behaviors, increasing belongingness, personal value and worth all of which helps individuals to build resilience in the face of adversity. Connectedness can also provide individuals with better access to formal supports and resources, mobilize communities to meet the needs of its members and provide collective primary prevention activities to the community as a whole (Centers for Disease Control and Prevention, 2009).

### Approaches

Promoting connectedness among individuals and within communities through modeling peer norms and enhancing community engagement can protect against suicide.

- **Peer norm approaches** seek to normalize prosocial behaviors/protective factors for suicide such as help-seeking, reaching out and talking to trusted adults, and peer connectedness. These approaches typically target youth and are delivered in school settings but can also be implemented in community settings.

- **Community engagement activities.** Community engagement is an aspect of social capital. Community engagement approaches may involve residents participating in a range of activities, including religious activities, community clean-up and greening activities, and physical exercise. These activities provide opportunities for residents to become more involved in the community and to connect with other community members, organizations, and resources, resulting in enhanced overall physical health, reduced stress, and decreased depressive symptoms, thereby reducing risk of suicide.

### Potential Outcomes

- Reduction in maladaptive coping attitudes and behaviors
- Increase in healthy coping attitudes and behaviors
- Increase in referrals for youth in distressed
- Increase help-seeking behaviors
- Positive perception of adult support

### Evidence

Current evidence suggests that peer norm approaches and community engagement can reduce risk factors associated with suicidal behaviors.

- **Peer norm approaches.** Evaluations show that programs such as *Sources of Strength* can improve school norms and beliefs about suicide that are created and disseminated by student peers. In a randomized controlled trial of *Sources of Strength* conducted with 18 high-schools (6 metropolitan, 12 rural), Wyman et al. (2010) found that the program improved peer leaders' adaptive norms regarding suicide, their connectedness to adults, and school engagement. Peer leaders were also more likely than controls to refer a suicidal friend to an adult. Among students, the intervention increased perceptions of adult support for suicidal youths and the acceptability of seeking help. Perception of adult support increased most in students with a history of suicidal ideation. Finally, trained peer leaders also reported a greater decrease in maladaptive coping attitudes compared with untrained leaders (Wyman et al., 2010).
- **Community engagement activities.** A vacant lot greening initiative was undertaken in Philadelphia between 1999 and 2008. Local residents and community members worked together to green 4,436 lots (or 7.8 million square feet) in 4 areas of the city. Researchers found significant associated reductions in community residents' self-reported stress levels and engagement in more physical exercise than residents in control vacant lot areas. Other benefits included reductions in firearm assaults and vandalism (Branas et al., 2011).



## Teach Coping and Problem-Solving Skills

### Rationale

Building life skills prepares individuals to successfully tackle every day challenges and adapt to stress and adversity. Life skills encompasses many concepts, but most often include coping and problem-solving skills, conflict resolution, and critical thinking. Life skills are important in shielding individuals from suicidal behaviors (World Health Organization, 2014). Suicide prevention programs that focus on life and social skills training are drawn from social cognitive theories (Bandura, 1986), surmising that individuals who engage in suicidal behavior is attributed to either direct learning, modeling, and environmental and individual (e.g. hopelessness) characteristics. The literature linking life skills and suicide is robust--- The inability to employ adequate coping strategies to cope with immediate stressors or identify and find solutions for problems have been characterized among suicide attempters (Pollock & Williams, 2004). Treatments that include bolstering problem skills (Goldsmith, Pellmar, Kleinman, & Bunney, 2002) and include problem-solving techniques (Ghahramanlou-Holloway, Bhar, Brown, Olsen, & Beck, 2012; Townsend et al., 2001) appear to reduce suicidal ideation and attempts more effectively. Prevention programs focused on teaching these skills target youth, parents and families and have been used with both universal and at-risk populations. While many do not target suicidal behaviors directly, these programs strive to train youth and parents important life skills to offset the underlying vulnerabilities that contribute to engaging in high risk behaviors early in life.

### Approaches

Current evidence provides support for the following two approaches:

- **Social emotional learning programs** focus on developing and strengthening communication and problem-solving skills, emotion regulation, conflict resolution, help seeking and coping skills. These approaches address a range of risk and protective factors for suicidal behavior. They provide children and youth with skills to resolve problems in relationships, school, and with peers, and help youth to address other negative influences (e.g., substance use) associated with suicide. These approaches are typically delivered to all students in a particular grade or school, although some programs also focus on groups of students considered to be at high-risk for suicide. Opportunities to practice and reinforce skills are an important part of programs that work (Herman, Borden, Reinke, & Webster-Stratton, 2011).
- **Parenting skill and family relationship programs** are designed to strengthen parenting skills, enhance positive parent-child interactions, and improve children's behavioral and emotional skills and abilities. Several parenting and family relationship programs have been shown in rigorous evaluations to improve resilience and reduce risk factors for various behaviors, including



ones closely related to suicide, such as depression, internalizing behaviors, and substance abuse (M. S. Knox, Burkhart, & Hunter, 2010).

### Potential Outcomes

- Reduction in suicide attempts and suicide ideation
- Enhanced knowledge of risk and protective factors associated with suicide
- Reduction in suicide risk behaviors (i.e., depression, anxiety, conduct problems, substance abuse)
- Improve and normalize help-seeking behavior
- Enhance social competence and emotional regulation skills
- Enhance problem-solving and conflict management skills

### Evidence

There are several programs with evidence that support teaching social, emotional and parenting skills to reduce suicidal behaviors and associated risk factors.

- **Social emotional learning programs.** The *Youth Aware of Mental Health Program (YAM)* is a program developed for teenagers that uses interactive dialogue and role-playing to teach adolescents about the risk and protective factors associated with suicide (including knowledge about depression and anxiety) and enhances their problem-solving skills for dealing with adverse life events, stress, school and other problems. The program includes 3 hours of role-play sessions and interactive workshops combined with a booklet that students can keep, educational posters displayed in classroom, and interactive lectures about mental health at the beginning and end of the program (Wasserman et al., 2014). In a cluster-randomized controlled trial of YAM conducted across 10 European Union countries and 168 schools, students participating in the YAM program were significantly less likely to have an incident suicide attempt (OR 0.45, 95%CI 0.24–0.85;  $p=0.014$ ) and severe suicidal ideation (0.50, 0.27-0.92;  $p=0.025$ ) at the 12-month follow-up compared to the control group. Additionally, related to severe suicide ideation, in the YAM group absolute risk fell by 0.50% and RR fell by 49.6% (Wasserman et al., 2014).

*Signs of Suicide (SOS)* is another school-based prevention program for students aged 13-17. The program includes guided classroom discussions about suicide and depression. As part of the program, students are screened for depression and suicide risk and referred for professional help as indicated. The program is designed to increase knowledge about suicide and risk factors associated with suicidal behavior as well as improve and normalize help-seeking behavior (Schilling, Aseltine, & James, 2016). In a randomized controlled trial, SOS was shown to reduce self-reported suicide attempts at 3-months post intervention among



participating students compared to control students. The SOS program also increased students' knowledge of how to get help for themselves or friends for depression and/or suicidal thoughts, and favorable attitudes toward help-seeking. SOS participants with a lifetime history of suicide attempt were also less likely to report planning a suicide in the 3 months following the program compared to lower-risk participants (Schilling et al., 2016).

Finally, the *Good Behavior Game (GBG)* is a classroom-based program for elementary school children aged 6-10; it represents an example of upstream suicide prevention programming. The program uses a team-based behavior management strategy that promotes good behavior by setting clear expectations for good behavior and consequences for maladaptive behavior. The goal of the GBG is to create an integrated classroom social system that is supportive of all children being able to learn with little aggressive or disruptive behavior (Wilcox et al., 2008). In an outcome evaluation of the GBG, first graders assigned to GBG reported half the adjusted odds of suicidal ideation and suicide attempts. The beneficial effect of the program was consistent for suicidal ideation regardless of whether baseline covariates were included. The GBG effect on attempts was less robust in some adjusted models including caregiver mental health. In the second cohort of GBG students, neither suicidal ideation nor suicide attempts were significantly different between GBG and the control interventions (Wilcox et al., 2008). This finding likely arose due to the lack of implementation fidelity and pointed to the need for GBG to be delivered with precision, consistency, and teacher support. GBG was also found to be associated with reduced risk of later substance abuse, a risk factor for suicide (Kellam et al., 2008).

- **Parenting skill and family relationship programs.** Parenting and family skills training approaches have shown promising impacts in preventing key risk factors associated with suicide. For example, the *Incredible Years (IY)* is a comprehensive group training program for parents, teachers and children designed to reduce conduct and substance abuse problems, two important suicide risk factors, in youth by improving protective factors such as responsive and positive parent-teacher-child interactions and relationships, emotion self-regulation and social competence (all protective factors for suicide) (Herman et al., 2011). The program includes 9- 20 sessions offered in community-based settings (e.g., religious, recreation centers, mental health treatment centers, and hospitals). Several studies have demonstrated the effect of the IY program on reducing internalizing symptoms, such as anxiety and depression, and child conduct problems (C. H. Webster-Stratton, Reid, & Beauchaine, 2011; Webster-Stratton, Jamila Reid, & Stoolmiller, 2008). The program is also associated with improved problem-solving and conflict management; these skills were maintained at 1-year follow-up (Reid, Webster-Stratton, & Hammond, 2003; C. Webster-Stratton & Hammond,

1997; C. Webster-Stratton, Reid, & Hammond, 2001). The program demonstrated greater benefits as the dosage of the intervention increased (Herman et al., 2011).

Additionally, *Strengthening Families 10-14* is a program that involves sessions between parents, youth, and family with the goal of improving parents' skills for disciplining, managing emotions and conflict, and communicating with their children; promoting youths' interpersonal and problem-solving skills; and creating family activities to build cohesion and positive parent-child interactions. The premise of the program is that developing these skills for both parents and children will reduce internalizing behavior and adolescent substance abuse, two important risk factors for suicide (Spoth, Gyll, & Day, 2002). *Strengthening Families* has been shown to decrease externalizing behaviors, alcohol use, and drug use among youth participants and reductions in depression, alcohol use, and drug use among participating families (Spoth et al., 2002).



## Identify and Support People At-Risk

### Rationale

In order to decrease suicide, attention to people at increased or high risk is necessary as these individuals tend to experience suicidal behavior at higher than average rates. These vulnerable or disadvantaged populations include, but are not limited to, individuals with lower socio-economic status or who are living with a mental health problem; people who have attempted suicide previously, individuals who are institutionalized, have been victims of violence, or are homeless; and members of certain ethnic minority groups. Supporting these vulnerable groups requires proactive case finding along with access to, and retention in, mental health services. Finding effective ways of identifying at-risk or vulnerable groups, customizing services to make them accessible and maintaining care remain key challenges. For example, simply improving services does not guarantee that those services will be used by those most in need of them, nor will it necessarily increase the number of people who follow treatments that are recommended. People who are disadvantaged face social and economic issues that may adversely affect their ability to respond to the treatments or advice that are offered.

### Approaches

The following three approaches focus on identifying and supporting people at increased risk.

- **Gatekeeper training** is designed to train teachers, coaches, providers and others in the community to identify people who may be at risk of suicide and to respond effectively, including facilitating treatment seeking and support services. Gatekeeper training is typically implemented in schools to identify at-risk youth and within health care settings to identify adults (and youth).
- **Screening combined with care management and overall continuity of care** has been used in primary care and behavioral health care settings to assure that people who may be at high-risk of suicide are identified and receive ongoing treatment as needed, particularly after inpatient discharge and other transitions within the healthcare system so they don't 'slip through the cracks'. These approaches typically employ screening for depression and/or suicide combined with collaborative treatment planning between patients and their providers and patient follow-up.
- **Crisis intervention.** These approaches provide support and referral services, typically by connecting a person in crisis (or a friend or family member of someone at-risk) to trained volunteers and/or professional staff via telephone hotline, online chat, or text messaging. Crisis intervention approaches are intended to impact key risk factors for suicide, including feelings of depression, hopelessness, and subsequent mental health care utilization. Like means reduction,

crisis interventions can put space or time between an individual who may be considering suicide and harmful behavior.

### Potential Outcomes

- Reduction in suicide attempts
- Reduction in suicide deaths
- Increased identification of individuals at-risk for suicidal behavior
- Increased at-risk individuals in treatment
- Increased community members trained to identify at-risk individuals
- Increased referrals for health care

### Evidence

There is evidence that community gatekeeper programs are successful in reducing suicides and suicide attempts but the efforts must be maintained (Substance Abuse and Mental Health Services Administration, 2014). However, there is limited evidence for effectiveness screening programs, but at the same time, standard principles for public health screening make them promising (Pena & Caine, 2006). The number of studies evaluating crisis intervention services is limited, but a few studies do indicate that those who use the hotline services have decreased suicidal thoughts and behavior.

- **Gatekeeper training.** One example of gatekeeper training is the *Mental Health First Aid (MHFA)* program. This program is designed for the lay public and consists of three weekly sessions of three hours each. Participants learn the symptoms of people in mental health crises and/or in the early stages of mental health problems (i.e., those experiencing suicidal thoughts and behavior, acute stress reaction, panic attacks and acute psychotic behavior, and depression, anxiety, and psychotic disorders), possible risk factors, and where and how to get evidence-based effective help (Kitchener & Jorm, 2004). In a randomized controlled trial of 300 participants of *MHFA*, the intervention group reported greater confidence in providing help to others, greater likelihood of advising people to seek professional help, improved concordance with health professionals about treatments, and decreased stigmatizing attitudes. Additionally, the intervention resulted in improved mental health of the participants themselves. All results were statistically significant at  $p < .05$ . (Kitchener & Jorm, 2004). Additional research rigorously evaluating *MHFA* for its impact on the first aid recipients themselves and suicidal behavior is needed (Kitchener & Jorm, 2006).

Gatekeeper training has also been a core part of all *Garret Lee Smith (GLS) Suicide Prevention Program* which is in place in 49 states and 48 tribes. A multi-site evaluation assessed the



connection between community gatekeeper training and a reduction of suicide attempts and deaths by comparing the change in suicide mortality rates and nonfatal suicidal behavior among the population aged 10-24 in counties implementing *GLS* trainings, with the trajectory observed in similar counties that did not implement these trainings. Counties implementing *GLS* trainings had significantly lower youth suicide rates the year following the training implementation (-1.07,  $p=.03$ ) (Walrath, Garraza, Reid, Goldston, & McKeon, 2015). This finding represents a decrease of 1 suicide death per 100,000 10 to 24 year olds or the avoidance of approximately 237 deaths in this age group between 2007 and 2010. Counties implementing *GLS* program activities also had significantly lower suicide attempt rates among youths 16 to 23 years of age in the year following implementation of the *GLS* program than did similar counties that did not implement *GLS* program activities (4.9 fewer attempts per 1000 youths [95% CI, 1.8-8.0 fewer attempts per 1000 youths];  $p = .003$ ; (Godoy Garraza, Walrath, Goldston, Reid, & McKeon, 2015)). More than 79 000 suicide attempts may have been averted during the period studied following implementation of the *GLS* program.

- **Screening combined with care management and overall continuity of care.** The *Henry Ford Perfect Depression Care* program was the pre-cursor to *Zero Suicide*, and its overall goal was to eliminate suicide. More broadly, though, the aim was to completely redesign depression care delivery to achieve breakthrough improvement in quality and safety by focusing on six aims: effectiveness, safety, patient centeredness, timeliness, efficiency, and equity among patients. The program developed concrete measures to assess progress on each of these aims and began with screening and assessment of each patient for suicide risk with coordinated continuous follow-up care system wide (C. E. Coffey, 2006). An examination of the impact of the *Henry Ford Perfect Depression Care (Pre-cursor to Zero Suicide)* program found that there was a dramatic and statistically significant decrease in the rate of suicide between the baseline years prior to the intervention (1999 and 2000) to the intervention years (2002-2009). During this time period, the suicide rate fell 82% (C. E. Coffey, 2006; C. E. Coffey, Coffey, & Ahmedani, 2013). Further, suicide rates also declined among HMO members who participated in targeted suicide prevention efforts and received mental health specialty services. However, for those HMO members who accessed only general medical services as opposed to specialty mental health services, the suicide rate increased (M. Coffey, Coffey, & Ahmedani, 2015).
- **Crisis intervention.** Suicide prevention hotlines are one way to provide crisis intervention. In an evaluation of the effectiveness of the *National Suicide Prevention Lifeline (NSPL)* to prevent suicide, 1,085 suicidal individuals who called the hotline completed a standard risk assessment for suicide, and 380 of those completed a follow-up assessment between 1 and 52 days after the initial assessment. Researchers found that over half of the initial sample were seriously considering suicide when they called, and they had a plan for their suicide. Researchers also

found that participants experienced significant decreases in suicidality over the course of the telephone session, and that levels of hopelessness and psychological pain continued to decrease after their initial call (Gould, Kalafat, Harrismunfakh, & Kleinman, 2007).

In another study, this time employing a randomized controlled trial, Gould, Cross, Pisani, Munfakh, and Kleinman (2013) assessed the impact of the *Applied Suicide Intervention Skills Training (ASIST)*, a widely implemented training program that helps hotline counselors, emergency workers, and other gatekeepers to identify and connect with suicidal individuals, understand their reasoning for living and dying, and assist with safely connecting those in need to available resources. The training was evaluated across the NSPL network of hotlines over the period 2008-2009. Using data from 1,410 suicidal individuals who called 17 Lifeline centers, researchers found that compared to callers who spoke to counselors that received the usual care training, individuals who spoke with counselors trained in *ASIST* were significantly more likely to feel less depressed, less suicidal, less overwhelmed, and more hopeful by the end of their call to the hotline. Counselors trained in *ASIST* were also more skilled at keeping callers on the phone longer and establishing a connection with them. However, training in *ASIST* did not result in more comprehensive suicide risk assessments than usual care training (Gould et al., 2013).



## Intervene to Lessen Harms and Prevent Future Risk

### Rationale

Individuals who have experienced mental health challenges, suicidal ideation, and/or who have made suicide attempts and/or have engaged in non-suicidal self-injury are at increased risk of suicide (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). Risk of suicide can also increase among those who have lost a friend, family member, co-worker, or other acquaintance to suicide (Pitman, Osborn, King, & Erlangsen, 2014). Exposure to sensationalized or uninformed reporting regarding on suicide may heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to suicide contagion (Etzersdorfer & Sonneck, 1998; Niederkrotenthaler & Sonneck, 2007).

### Approaches

A broad array of approaches to lesson harms and reduce future risk of suicide among those at increased risk include the provision of mental health care and improved continuity of care, improving linkage to care through active post-discharge planning and follow-up that decreases barriers to ongoing therapeutic support, increasing connectedness to supportive others, addressing bereavement, and framing communications to emphasize resilience, decrease negative affect, and to prevent contagion.

- **Treatment for people at-risk of suicide** typically includes various forms of psychotherapy delivered by licensed providers to help individuals with mental health problems and other risk factors for suicide with problem-solving, impulsivity and emotion regulation.
- **Treatment to prevent re-attempts.** These approaches typically include follow-up contact and use diverse modalities (e.g., home visits, mail, telephone, e-mail) to engage recent suicide attempt survivors in continued treatment to prevent re-attempts. Treatment may focus on improved coping skills, mindfulness, and other emotional regulation skills, and may include case management home visits to increase adherence to treatment and continuity of care; and one-on-one interpersonal therapy and/or group therapy. Approaches that engage and connect attempters to peers and providers are especially important because many attempters do not present to aftercare; 12%-25% reattempt within a year, and 3%-9% of attempt survivors die by suicide within 1 to 5 years of their initial attempt (Inagaki et al., 2015)
- **Postvention** approaches are implemented *after* a suicide has taken place and may include debriefing sessions, counseling, and/or bereavement support groups for surviving friends and family members/loved ones. These programs have not typically been evaluated for their impact on suicide or suicidal behavior but may reduce survivors' guilt, feelings of depression, and complicated grief (Szumilas & Kutcher, 2011).

- **Safe messaging following a suicide.** The manner in which information on a recent suicide is communicated to the public (e.g. school assemblies, mass media, social media) can heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to suicide contagion. Therefore, responsible and safe reporting may help prevent suicide and/or suicide contagion.

### Potential Outcomes

- Reduction in mental health-related sequelae
- Increase connectedness
- Improved coping skills
- Improved messaging following suicide
- Reduction in re-attempts

### Evidence

The evidence addressing strategies to lesson harm and prevent future risk of suicide includes the evaluation of effects of specific approaches on risk and protective factors as well as suicide-related mortality. However, because the evaluation of suicide-related mortality requires large sample sizes and extended follow-up, much of the evidence in this area primarily focuses on risk and protective factors.

- **Treatment for people at-risk of suicide.** There are a number of treatments with evidence of impact on risk and protective factors for suicide. One example is the *Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)* program. IMPACT aims to prevent suicide among older primary care patients by reducing suicide ideation and depression in primary care settings. It facilitates the development of a therapeutic alliance, a personalized treatment plan that includes patient preferences, as well as proactive follow-up (biweekly during an acute phase and monthly during continuation phase) by a depression care manager (Hunkeler et al., 2006). The program has been shown to significantly improve quality of life, and to reduce functional impairment, depression and suicidal ideation over 24-months of follow-up (Hunkeler et al., 2006; Unutzer et al., 2006) relative to patients who received care as usual.

Another example is *Collaborative Assessment and Management of Suicidality (CAMS)*, which is a therapeutic approach for suicide-specific assessment and treatment of patient's suicide risk. This flexible approach can be used across treatment settings and clinician theoretical orientations and involves the clinician and patient working together in an interactive assessment process to develop patient-specific treatment plans. CAMS sessions are collaborative and involve constant

**Comment [A]:** The write-up of the evidence for this strategy needs to follow the format used in the other sections of the TP. I modified the write-up for the first approach to illustrate the format. You will need to do something similar for the second approach.



patient about what is and is not working with the ultimate goal of enhancing the therapeutic alliance and increasing treatment motivation in the suicidal patient. CAMS been tested and supported in 6 correlational studies (Jobes, 2012), in a variety of inpatient and outpatient settings and in one RCT with several additional RCTs under way. CAMS has been associated with significant improvements in suicidal ideation, overall symptom distress, and feelings of hopelessness at 12 month follow-up among a community-based sample of suicidal outpatients. (Comtois et al., 2011).

Other examples include *Dialectical Behavioral Therapy (DBT)* and *Attachment-Based Family Therapy (ABFT)*. DBT is a multicomponent therapy for individuals at high risk for suicide and who may struggle with impulsivity and emotional regulation. The components of DBT include individual therapy, group skills training, between-session telephone coaching and a therapist consultation team. In a randomized controlled trial of women with recent suicidal or self-injurious behavior, those receiving DBT were half as likely to make a suicide attempt at two-year follow-up than women receiving community treatment (23% vs 46%), required less hospitalization for suicide ideation, and had lower medical risk across all suicide attempts and self-injurious acts combined (Linehan et al., 2006).

ABFT is a program for adolescents aged 12-18 and is designed to treat clinically diagnosed major depressive disorder, eliminate suicidal ideation, and reduce dispositional anxiety (Diamond et al., 2010). A randomized controlled trial of ABFT found that suicidal adolescents assigned to ABFT experienced significantly greater improvement in suicidal ideation over 24 weeks of follow-up than did adolescents assigned to enhanced usual care (-4.37 vs. -2.34;  $p = .001$ ;  $d=0.97$ ). Additionally, a higher percentage of ABFT participants reported no suicidal ideation in the week prior to assessment at 12 weeks than did adolescents receiving enhanced usual care (69.2% vs. 34.6%;  $p = .01$ ; OR= 4.25) and at 24 weeks (82.1% vs. 46.2%;  $p = .006$ ; OR=5.37) (Diamond et al., 2010).

- **Treatment to prevent re-attempts.**

**Emergency Department Brief Intervention with Follow-up Visits** is a program that involves a one-hour discharge information session that addresses suicidal behavior, distress, risk and protective factors, alternatives to suicidal behavior, and referral options, combined with nine follow-up contacts over 18-months (at 1, 2, 4, 7, 11 weeks and 4, 6, 12, 18 months). Follow-up contacts are either conducted by phone or through home visits according to a specific time line for up to 18-months. A randomized controlled trial that enrolled suicide attempters from eight hospital emergency departments in five culturally different sites found that a brief intervention combined with 9 follow-up visits over 18-months was associated with significantly fewer deaths

from suicide relative to a treatment-as-usual group (0.2% versus 2.2%, respectively;  $\chi^2 = 13.83$ ,  $P < 0.001$ ) (Fleischmann et al., 2008).

**Active follow-up contact approaches** such as postcards, letters, and telephone calls, are intended to increase a patient's sense of connectedness with health care providers and decrease isolation. These approaches include expression of care and support and typically invite patients to reconnect with their provider. Contacts are made periodically (e.g., monthly or every few months in the first 12 months post-discharge with some programs continuing contact for 2 or more years). These approaches have been found in a meta-analysis conducted by Inagaki et al. (2015) to reduce reattempts by approximately 17% for up to 12 months post-discharge, however, the long-term effects of these approaches on reattempts has not yet been demonstrated. Also, because the number of trials and associated sample sizes included in this meta-analysis were small, it was not possible to determine the effect of active contact and follow-up approaches on death by suicide. In a randomized controlled trial of post-crisis suicide prevention long-term follow-up contact approach, Motto and Bostrom (2001) found that patients who refused ongoing care but who were randomized to be contacted by letter four times per year had a lower rate of suicide over two years of follow-up than did patients in the control group who received no further contact. Other studies have also shown post-crisis letters and coping cards to be protective against suicide ideation and attempts (Hassanian-Moghaddam, Sarjami, Kolahi, & Carter, 2011; Wang et al., 2016).

**Cognitive Behavior Therapy for Suicide Prevention (CBT-SP)** uses a risk reduction, relapse prevention approach that includes an analysis of proximal risk factors and stressors (e.g., relationship problems, school or work-related difficulties) leading up to and following the suicidal event; safety plan development; skill building; and psychoeducation. *CBT-SP* also has family skill modules focused on family support and communication patterns as well as improving the family's problem solving skills. A randomized controlled trial found of *CBT-SP* found that 10-session outpatient cognitive therapy designed to prevent repeat suicide attempts resulted in a 50% reduction in the likelihood of a suicide reattempt among adults who had been admitted to an emergency department for a suicide attempt relative to treatment as usual (Brown et al., 2005).

- **Postvention** programs such as *StandBy Response Service* are implemented with the goal of providing support to survivors of suicide. *StandBy* provides clients with face-to-face outreach and telephone support through a professional crisis response team. Site coordinators develop customized case management plans, referring clients to other existing community services matched to their needs (Visser, Comans, & Scuffham, 2014). In a study by Visser et al. (2014), *StandBy* clients were significantly less likely to be at high risk for suicidality than a suicide bereaved comparison group who had not had contact with the *StandBy* program (48% and 64% respectively,  $p = 0.005$ ). Additionally, research suggests that active postvention approaches in



which outreach to suicide survivors occurs at the scene of a suicide is associated with intake into treatment sooner, greater attendance at support group meetings, and attendance at more meetings compared to passive postvention (versus passive approaches where survivors self-refer for services) (J. Cerel & Campbell, 2008).

- **Safe messaging following a suicide.** *Media guidelines* for reporting on suicides can help assure that stories on suicide are communicated in a safe and effective way. Reports that are both inclusive of suicide prevention messages, stories of hope and resilience, risk and protective factors, and links to helping resources (e.g., hotline) and that avoid sensationalizing events or reducing suicide to one cause can help reduce the likelihood of suicide contagion. The most compelling evidence supporting the effect of *media guidelines* on reduction in suicides comes from Austria. After a sharp increase in suicides on the Viennese subway, media guidelines were introduced and an interrupted time series design was used to evaluate the national impact of the guidelines on subsequent suicides. Changes in the quality and quantity of media reporting resulted in a reduction of 81 suicides annually (95% confidence interval: -149 to -13;  $t = -2.32$ ,  $df = 54$ ,  $p < 0.024$ ) in the Viennese subway system (Niederkrotenthaler & Sonneck, 2007)

## Sector Involvement

Public health can play an important and unique role in addressing suicide. Public health agencies, which typically place prevention at the forefront of efforts and work to create broad population-level impact, can bring critical leadership and resources to bear on this problem. For example, these agencies can serve as a convener, bringing together partners and stakeholders to plan, prioritize, and coordinate suicide prevention efforts. Public health agencies are also well positioned to collect and disseminate data, implement preventive measures, evaluate programs, and track progress. Although public health can play a leadership role in preventing suicide, the strategies and approaches outlined in this technical package cannot be accomplished by the public health sector alone.

Other sectors vital to implementing this package include, but are not limited to, education, government (local, state, and federal), social services, health services, business/labor, justice, housing, media, and organizations that comprise the civil society sector such as faith-based organizations, youth-serving organizations, foundations, and other non-governmental organizations. Collectively, these sectors can make a difference in preventing suicide by impacting the various contexts and underlying risks that contribute to suicide.

The strategies and approaches described in this technical package are summarized in Appendix A along with the relevant sectors that are well positioned to lead implementation efforts.

[Linda to insert text specific to the strategies and approaches]

Regardless of strategy, action by many sectors will be necessary for the successful implementation of this package. In this regard, all sectors can play an important and influential role in creating safe and protective environments where individuals who are at high risk of suicide can easily access the mental healthcare and services they need.



## Monitoring and Evaluation

Monitoring and evaluation are necessary components of the public health approach to prevention. It is important to have timely and reliable data to monitor the extent of the problem and to evaluate the impact of prevention efforts. Data are necessary for program implementation; planning, implementation, and assessment all rely on accurate measurement of the problem.

Surveillance data helps researchers and practitioners track changes in the burden of suicide. Surveillance systems exist at the federal, state, and local levels. It is important to assess the availability of surveillance data and data systems across these levels to identify and address gaps in the systems. CDC's National Vital Statistics System and the National Violent Death Reporting System (NVDRS) are examples of surveillance systems that provide data on deaths from suicide. NVDRS, for example, is a state-based surveillance system that combines data from death certificates, law enforcement reports, and coroner or medical examiner reports to provide detailed information on the circumstances of violent deaths, including suicide, which can assist communities in guiding prevention approaches (Blair, Fowler, Jack, & Crosby, 2016). The National Electronic Injury Surveillance System-All Injury Program (NEISS-AIP) provides nationally representative data about all types and causes of nonfatal injuries treated in U.S. hospital emergency departments, and can be used to assess national rates of, and trends in, self-harm injuries by cause (e.g., falls, poisoning, etc.), age, race/ethnicity, sex, disposition (where the injured person goes when released from the Emergency Department).

In addition to information on deaths and nonfatal injuries, there are also surveillance systems that provide national, state, and some local estimates of suicidal behavior. The Youth Risk Behavior Surveillance System (YRBSS) collects information from a nationally representative sample of 9-12 grade students and is a key resource in monitoring health-risk behaviors among youth, including whether youth have seriously considered attempting suicide, attempted suicide, made a plan, or required treatment by a doctor or nurse for a suicide attempt that resulted in an injury, poisoning, or overdose (Brener et al., 2013). The YRBSS data are obtained from a national school-based survey conducted by CDC as well as school-based state, territorial, tribal, and large urban school district survey conducted by education and health agencies. The National Survey on Drug Use and Health (NSDUH) is an annual nationwide survey of individuals aged 12 years and older that provides national and state-level estimates of drug use and mental health-related issues, including suicide ideation and suicide attempts.

It is also important at all levels (local, state, and federal) to address gaps in responses, track progress of prevention efforts and evaluate the impact of those efforts, including the impact of this technical package. Evaluation data, produced through program implementation and monitoring, is essential to provide information on what does and does not work to reduce rates of suicide and its associated risk and protective factors. Theories of change and logic models that identify short, intermediate, and long-term outcomes are an important part of program evaluation.



The evidence-base for suicide prevention has advanced greatly over the last few decades. However, additional research is needed to understand the impact of prevention programs on preventing suicide, as opposed to merely examining the effectiveness of programs to impact risk factors associated with suicide. More research is also needed to examine the effectiveness of upstream and community-level strategies to prevent suicide at the population level. Lastly, it will be important for researchers to test the effectiveness of combinations of the strategies and approaches included in this package. Most existing evaluations focus on approaches implemented in isolation. However, there is potential to understand the synergistic effects within a comprehensive prevention approach. Additional research is needed to understand the extent to which combinations of strategies and approaches result in greater reductions in suicide than individual programs, practices, or policies.

## Conclusion

Suicide is a serious public health problem whose rates have been on the rise for more than a decade and whose costs stretch well into the billions of dollars each year. And while suicide is a rare outcome statistically, its human impact has a ripple effect that is far-reaching. Each of us likely interacts with suicide survivors, those with lived experience, and those with thoughts of suicide, on a daily basis—at home, at work, and in our communities. Suicide and suicide attempts are therefore public health issues of societal concern. Fortunately, like many public health problems, suicide is preventable, and fortunately more is being done to prevent suicide than ever before, as evidenced by the work of the National Action Alliance for Suicide Prevention, the release of the first world report on suicide, more timely surveillance data, and critical mention in the President’s FY17 budget, to name just a few examples. Unfortunately and unlike most other public health problems, suicide still struggles against stigma, shame, and secrecy related to help-seeking, mental illness, being a survivor, or someone with lived experience; misplaced fear of asking someone about their risk of suicide (versus the fear and consequence of not asking), and fear of taking up certain strategies known to be effective but perhaps unpopular; misinformation about suicide preventability, and disproportionate funding given the public health burden. Suicide also struggles against the right degree of awareness where too much information, for example by well-meaning reporters and others, may actually do harm.

In an effort to continue pushing the field and society further towards prevention, this technical package includes strategies and approaches that ideally would be used in a comprehensive fashion, in combination—in a multi-level, multi-sectoral way. This technical package includes strategies and approaches targeting upstream prevention, e.g., social emotional learning for children and youth, as well as strategies focused more downstream, e.g., cognitive behavioral treatment to prevent re-attempts. It includes universal, selective, and indicated strategies, or strategies that focus on the whole population regardless of risk to strategies that focus on those groups at highest risk. Importantly, this technical package extends the bounds of the typical prevention strategies to consider approaches at the outer



levels of the social ecology, e.g., policies to stabilize housing and community engagement initiatives. In short, care and attention has been paid to all aspects of suicide prevention.

While the evidence base continues to be built, the collection of programs, policies, and practices laid out here are available for implementation now. And in keeping with good public health practice, the intent is that monitoring and evaluation will play a key role in that implementation. Moreover, as new evidence becomes available, this technical package can be refined to reflect the current state of the science.

In closing, and in keeping with a message of resilience as spoken by those with lived experience, ‘hope, help, and healing is possible.’

## References

- Arsenault-Lapierre, G., Kim, C., & Turecki, G. (2004). Psychiatric diagnoses in 3275 suicides: a meta-analysis. *BMC Psychiatry*, 4, 37. doi:10.1186/1471-244X-4-37
- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*: Prentice-Hall, Inc.
- Basile, K. C., Espelage, D. L., Rivers, I., McMahon, P. M., & Simon, T. R. (2009). The theoretical and empirical links between bullying behavior and male sexual violence perpetration. *Aggression and violent behavior*, 14(5), 336-347.
- Basile, K. C., Hamburger, M. E., Swahn, M. H., & Choi, C. (2013). Sexual violence perpetration by adolescents in dating versus same-sex peer relationships: differences in associated risk and protective factors. *Western Journal of Emergency Medicine*, 14(4), 329.
- Beautrais, A. L. (2001). Effectiveness of barriers at suicide jumping sites: A case study. *Aust NZ J Psychiat*, 35. doi:10.1080/0004867010060501
- Beautrais, A. L., Gibb, S. J., Fergusson, D. M., Horwood, L. J., & Larkin, G. L. (2009). Removing bridge barriers stimulates suicides: An unfortunate natural experiment. *Aust NZ J Psychiat*, 43. doi:10.1080/00048670902873714
- Beyer, K. M., Layde, P. M., Hamberger, L. K., & Laud, P. W. (2015). Does neighborhood environment differentiate intimate partner femicides from other femicides? *Violence Against Women*, 21(1), 49-64. doi:10.1177/1077801214564075
- Blair, J. M., Fowler, K. A., Jack, S. P., & Crosby, A. E. (2016). The National Violent Death Reporting System: overview and future directions. *Inj Prev*, 22 Suppl 1, i6-i11. doi:10.1136/injuryprev-2015-041819
- Borowsky, I. W., Hogan, M., & Ireland, M. (1997). Adolescent sexual aggression: risk and protective factors. *Pediatrics*, 100(6), E7.
- Branas, C. C., Cheney, R. A., MacDonald, J. M., Tam, V. W., Jackson, T. D., & Ten Have, T. R. (2011). A difference-in-differences analysis of health, safety, and greening vacant urban space. *Am J Epidemiol*, 174(11), 1296-1306. doi:10.1093/aje/kwr273
- Brown, G. K., Ten Have, T., Henriques, G. R., Xie, S. X., Hollander, J. E., & Beck, A. T. (2005). Cognitive therapy for the prevention of suicide attempts: a randomized controlled trial. *JAMA*, 294(5), 563-570. doi:10.1001/jama.294.5.563
- Butchart, A., Phinney, A., Check, P., & Villaveces, A. (2004). *Preventing Violence: A Guide to Implementing the Recommendations of the World Report on Violence and Health*. Geneva, Switzerland: World Health Organization.
- Capaldi, D. M., Knoble, N. B., Shortt, J. W., & Kim, H. K. (2012). A Systematic Review of Risk Factors for Intimate Partner Violence. *Partner Abuse*, 3(2), 231-280. doi:10.1891/1946-6560.3.2.231
- Carter, M., McGee, R., Taylor, B., & Williams, S. (2007). Health outcomes in adolescence: associations with family, friends and school engagement. *J Adolesc*, 30(1), 51-62. doi:10.1016/j.adolescence.2005.04.002
- Cavanagh, J. T., Carson, A. J., Sharpe, M., & Lawrie, S. M. (2003). Psychological autopsy studies of suicide: a systematic review. *Psychol Med*, 33(3), 395-405.
- Centers for Disease Control and Prevention. (2009). Strategic direction for the prevention of suicidal behavior: Promoting individual, family, and community connectedness to prevent suicidal behavior. Retrieved from Available at: [http://www.cdc.gov/ViolencePrevention/pdf/Suicide\\_Strategic\\_Direction\\_Full\\_version-a.pdf](http://www.cdc.gov/ViolencePrevention/pdf/Suicide_Strategic_Direction_Full_version-a.pdf)
- Centers for Disease Control and Prevention. (2016a). Child Maltreatment: Risk and Protective Factors. Retrieved from Available at: <http://www.cdc.gov/violenceprevention/childmaltreatment/riskprotectivefactors.html>
- Centers for Disease Control and Prevention. (2016b). Elder Maltreatment: Risk and Protective Factors. Retrieved from Available at: <http://www.cdc.gov/ViolencePrevention/eldermaltreatment/riskprotectivefactors.html>



- Centers for Disease Control and Prevention. (2016c). Sexual Violence: Risk and Protective Factors. Retrieved from Available at: <http://www.cdc.gov/ViolencePrevention/sexualviolence/riskprotectivefactors.html>
- Centers for Disease Control and Prevention. (2016d). Web-Based Injury Statistics Query and Reporting System (WISQARS). Retrieved June 3, 2016 Available at: <http://www.cdc.gov/injury/wisqars/index.html>
- Centers for Disease Control and Prevention. (2016e). Youth Violence: Risk and Protective Factors. Retrieved from Available at: <http://www.cdc.gov/violenceprevention/youthviolence/riskprotectivefactors.html>
- Cerel, J., & Campbell, F. R. (2008). Suicide survivors seeking mental health services: a preliminary examination of the role of an active postvention model. *Suicide Life Threat Behav*, 38(1), 30-34. doi:10.1521/suli.2008.38.1.30
- Cerel, J., McIntosh, J. L., Neimeyer, R. A., Maple, M., & Marshall, D. (2014). The Continuum of "Survivorship": Definitional Issues in the Aftermath of Suicide. *Suicide and life-threatening behavior*, 44(6), 591-600. doi:10.1111/sltb.12093
- Chapman, A. L., & Dixon-Gordon, K. L. (2007). Emotional antecedents and consequences of deliberate self-harm and suicide attempts. *Suicide Life Threat Behav*, 37(5), 543-552. doi:10.1521/suli.2007.37.5.543
- Cherpitel, C. J., Borges, G. L. G., & Wilcox, H. C. (2004). Acute alcohol use and suicidal behavior: A review of the literature. *Alcoholism: Clinical and Experimental Research*, 28(5 SUPPL.), 18S-28S.
- Classen, T. J., & Dunn, R. A. (2012). The effect of job loss and unemployment duration on suicide risk in the United States: a new look using mass-layoffs and unemployment duration. *Health Econ*, 21(3), 338-350. doi:10.1002/hec.1719
- Coffey, C. E. (2006). Pursuing perfect depression care. *Psychiatr Serv*, 57(10), 1524-1526. doi:10.1176/ps.2006.57.10.1524
- Coffey, C. E., Coffey, M. J., & Ahmedani, B. K. (2013). An update on perfect depression care. *Psychiatr Serv*, 64(4), 396. doi:10.1176/appi.PS.640422
- Coffey, M., Coffey, C., & Ahmedani, B. K. (2015). Suicide in a health maintenance organization population. *JAMA Psychiatry*, 72(3), 294-296. doi:10.1001/jamapsychiatry.2014.2440
- Comtois, K. A., Jobes, D. A., S. O'Connor, S., Atkins, D. C., Janis, K., E. Chessen, C., . . . Yuodelis-Flores, C. (2011). Collaborative assessment and management of suicidality (CAMS): feasibility trial for next-day appointment services. *Depress Anxiety*, 28(11), 963-972. doi:10.1002/da.20895
- Coulton, C. J., Crampton, D. S., Irwin, M., Spilsbury, J. C., & Korbin, J. E. (2007). How neighborhoods influence child maltreatment: a review of the literature and alternative pathways. *Child Abuse Negl*, 31(11-12), 1117-1142. doi:10.1016/j.chiabu.2007.03.023
- Cox, G. R., Owens, C., Robinson, J., Nicholas, A., Lockley, A., Williamson, M., . . . Pirkis, J. (2013). Interventions to reduce suicides at suicide hotspots: a systematic review. *BMC Public Health*, 13(1), 1-12. doi:10.1186/1471-2458-13-214
- Crosby, A. E., Espitia-Hardeman, V., Ortega, L., & Lozano, B. (2013). Alcohol and suicide. *Alcohol: Science, Policy and Public Health*, 190.
- Crosby, A. E., Han, B., Ortega, L., Parks, S. E., & Gfroerer, J. (2011). Suicidal Thoughts and Behaviors Among Adults Aged ≥18 Years — United States, 2008–2009. *MMWR*, 60(No. SS-13), 1-22.
- Crosby, A. E., Ortega, L., & Melanson, C. (2011). *Self-directed Violence Surveillance: Uniform Definitions and Recommended Data Elements, Version 1.0*. Retrieved from Atlanta, GA:
- Cunningham, P. J. (2009). Beyond parity: primary care physicians' perspectives on access to mental health care. *Health Aff (Millwood)*, 28(3), w490-501. doi:10.1377/hlthaff.28.3.w490
- Curtin, S. C., Warner, M., & Hedegaard, H. (2016). *Increase in suicide in the United States, 1999-2014*. ( ). Hyattsville, MD: National Center for Health Statistics Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/25116188>.
- Cylus, J., Glymour, M. M., & Avendano, M. (2014). Do generous unemployment benefit programs reduce suicide rates? A state fixed-effect analysis covering 1968-2008. *Am J Epidemiol*, 180(1), 45-52. doi:10.1093/aje/kwu106

- Dahlberg, L. L., & Krug, E. G. (2002). Violence-a global public health problem. In E. Krug, L. L. Dahlberg, J. A. Mercy, A. B. Zwi, & R. Lozano (Eds.), *World Report on Violence and Health* (pp. 1-56). Geneva, Switzerland: World Health Organization.
- DeGue, S., Massetti, G. M., Holt, M. K., Tharp, A. T., Valle, L. A., Matjasko, J. L., & Lippy, C. (2013). Identifying links between sexual violence and youth violence perpetration: New opportunities for sexual violence prevention. *Psychology of violence*, 3(2), 140.
- Deisenhammer, E. A., Ing, C. M., Strauss, R., Kemmler, G., Hinterhuber, H., & Weiss, E. M. (2009). The duration of the suicidal process: how much time is left for intervention between consideration and accomplishment of a suicide attempt? *J Clin Psychiatry*, 70(1), 19-24.
- Desai, R. A., Dausey, D. J., & Rosenheck, R. A. (2005). Mental health service delivery and suicide risk: the role of individual patient and facility factors. *Am J Psychiatry*, 162(2), 311-318. doi:10.1176/appi.ajp.162.2.311
- Diamond, G. S., Wintersteen, M. B., Brown, G. K., Diamond, G. M., Gallop, R., Shelef, K., & Levy, S. (2010). Attachment-based family therapy for adolescents with suicidal ideation: a randomized controlled trial. *J Am Acad Child Adolesc Psychiatry*, 49(2), 122-131.
- Dunne, E. J., McIntosh, J. L., & Dunne-Maxim, K. (Eds.). (1987). *Suicide and its aftermath: Understanding and counseling the survivors*. New York: Norton.
- Durkheim, E. (1897/1951). *Suicide: A study in sociology* (JA Spaulding & G. Simpson, trans.). Glencoe, IL: Free Press. (Original work published 1897).
- Elgar, F. J., Craig, W., Boyce, W., Morgan, A., & Vella-Zarb, R. (2009). Income inequality and school bullying: multilevel study of adolescents in 37 countries. *J Adolesc Health*, 45(4), 351-359. doi:10.1016/j.jadohealth.2009.04.004
- Escobedo, L. G., & Ortiz, M. (2002). The relationship between liquor outlet density and injury and violence in New Mexico. *Accid Anal Prev*, 34(5), 689-694.
- Etzersdorfer, E., & Sonneck, G. (1998). Preventing suicide by influencing mass-media reporting: The Viennese experience, 1980-1996. *Arch Suicide Res*, 4.
- Ferdon, C., Crosby, A. E., Caine, E. D., Hindman J., Reed, G. A., & Iskander, J. (In press). CDC Public Health Grand Rounds: Preventing Suicide through a Comprehensive Public Health Approach. *MMWR*.
- Flavin, P., & Radcliff, B. (2009). Public policies and suicide rates in the American states. *Social Indicators Research*, 90(2), 195-209.
- Fleischmann, A., Bertolote, J. M., Wasserman, D., De Leo, D., Bolhari, J., Botega, N. J., . . . Thanh, H. T. (2008). Effectiveness of brief intervention and contact for suicide attempters: a randomized controlled trial in five countries. *Bulletin of the World Health Organization*, 86(9), 703-709. doi:S0042-96862008000900014 [pii]
- Fowler, K. A., Gladden, R. M., Vagi, K. J., Barnes, J., & Frazier, L. (2015). Increase in suicides associated with home eviction and foreclosure during the US housing crisis: findings from 16 National Violent Death Reporting System States, 2005-2010. *Am J Public Health*, 105(2), 311-316. doi:10.2105/AJPH.2014.301945
- Freisthler, B., Merritt, D. H., & LaScala, E. A. (2006). Understanding the ecology of child maltreatment: a review of the literature and directions for future research. *Child Maltreat*, 11(3), 263-280. doi:10.1177/1077559506289524
- Frieden, T. R. (2010). A framework for public health action: the health impact pyramid. *Am J Public Health*, 100(4), 590-595. doi:10.2105/AJPH.2009.185652
- Ghahramanlou-Holloway, M., Bhar, S., Brown, G., Olsen, C., & Beck, A. T. (2012). Changes in problem-solving appraisal after cognitive therapy for the prevention of suicide. *Psychological Medicine*, 42(06), 1185-1193.
- Giesbrecht, N., Huguette, N., Ogden, L., Kaplan, M. S., McFarland, B. H., Caetano, R., . . . Nolte, K. B. (2015). Acute alcohol use among suicide decedents in 14 US states: impacts of off-premise and on-premise alcohol outlet density. *Addiction*, 110(2), 300-307. doi:10.1111/add.12762



- Godoy Garraza, L., Walrath, C., Goldston, D. B., Reid, H., & McKeon, R. (2015). Effect of the Garrett Lee Smith Memorial Suicide Prevention Program on Suicide Attempts Among Youths. *JAMA Psychiatry*, 72(11), 1143-1149. doi:10.1001/jamapsychiatry.2015.1933
- Goldsmith, S. K., Pellmar, T. C., Kleinman, A. M., & Bunney, W. E. (2002). *Reducing suicide: A national imperative*: National Academies Press.
- Gould, M. S., Cross, W., Pisani, A. R., Munfakh, J. L., & Kleinman, M. (2013). Impact of Applied Suicide Intervention Skills Training on the National Suicide Prevention Lifeline. *Suicide Life Threat Behav*, 43(6), 676-691. doi:10.1111/sltb.12049
- Gould, M. S., Kalafat, J., Harrismunfakh, J. L., & Kleinman, M. (2007). An evaluation of crisis hotline outcomes. Part 2: Suicidal callers. *Suicide Life Threat Behav*, 37(3), 338-352. doi:10.1521/suli.2007.37.3.338
- Grossman, D. C., Mueller, B. A., Riedy, C., Dowd, M. D., Villaveces, A., Prodzinski, J., . . . Harruff, R. (2005). Gun storage practices and risk of youth suicide and unintentional firearm injuries. *JAMA*, 293(6), 707-714. doi:10.1001/jama.293.6.707
- Haddon, W. (1980). Advances in the epidemiology of injuries as a basis for public policy. *Public Health Reports*, 95(5), 411-421.
- Han, B., Crosby, A. E., Ortega, L. A., Parks, S. E., Compton, W. M., & Gfroerer, J. (2016). Suicidal ideation, suicide attempt, and occupations among employed adults aged 18–64years in the United States. *Comprehensive psychiatry*, 66, 176-186.
- Harris, E. C., & Barraclough, B. (1997). Suicide as an outcome for mental disorders. A meta-analysis. *Br J Psychiatry*, 170, 205-228.
- Harris, E. C., & Barraclough, B. (1998). Excess mortality of mental disorder. *Br J Psychiatry*, 173, 11-53.
- Harris, K. M., Carpenter, C., & Bao, Y. (2006). The effects of state parity laws on the use of mental health care. *Med Care*, 44(6), 499-505. doi:10.1097/01.mlr.0000215813.16211.00
- Hassanian-Moghaddam, H., Sarjami, S., Kolahi, A. A., & Carter, G. L. (2011). Postcards in Persia: randomised controlled trial to reduce suicidal behaviours 12 months after hospital-treated self-poisoning. *British Journal of Psychiatry*, 198(4), 309-316.
- Hawton, K. (2007). Restricting access to methods of suicide: Rationale and evaluation of this approach to suicide prevention. *Crisis*, 28. doi:10.1027/0227-5910.28.s1.4
- Heise, L., & Garcia-Moreno, C. (2002). Violence by Intimate Partners. In E. Krug, L. L. Dahlberg, J. A. Mercy, A. B. Zwi, & R. Lozano (Eds.), *World Report on Violence and Health* (pp. 87-121). Geneva, Switzerland: World Health Organization.
- Herman, K. C., Borden, L. A., Reinke, W. M., & Webster-Stratton, C. (2011). The Impact of the Incredible Years Parent, Child, and Teacher Training Programs on Children's Co-Occurring Internalizing Symptoms. *Sch Psychol Q*, 26(3), 189-201. doi:10.1037/a0025228
- Hong, J. S., Kral, M. J., Espelage, D. L., & Allen-Meares, P. (2012). The social ecology of adolescent-initiated parent abuse: a review of the literature. *Child Psychiatry Hum Dev*, 43(3), 431-454. doi:10.1007/s10578-011-0273-y
- Houle, J. N., & Light, M. T. (2014). The home foreclosure crisis and rising suicide rates, 2005 to 2010. *Am J Public Health*, 104(6), 1073-1079. doi:10.2105/AJPH.2013.301774
- Hunkeler, E. M., Katon, W., Tang, L., Williams, J. W., Jr., Kroenke, K., Lin, E. H., . . . Unutzer, J. (2006). Long term outcomes from the IMPACT randomised trial for depressed elderly patients in primary care. *BMJ*, 332(7536), 259-263. doi:10.1136/bmj.38683.710255.BE
- Inagaki, M., Kawashima, Y., Kawanishi, C., Yonemoto, N., Sugimoto, T., Furuno, T., . . . Yamada, M. (2015). Interventions to prevent repeat suicidal behavior in patients admitted to an emergency department for a suicide attempt: a meta-analysis. *J Affect Disord*, 175, 66-78. doi:10.1016/j.jad.2014.12.048
- Isometsa, E. T. (2001). Psychological autopsy studies--a review. *Eur Psychiatry*, 16(7), 379-385.

- Jobes, D. A. (2012). The Collaborative Assessment and Management of Suicidality (CAMS): an evolving evidence-based clinical approach to suicidal risk. *Suicide Life Threat Behav*, 42(6), 640-653. doi:10.1111/j.1943-278X.2012.00119.x
- Johnson, F. W., Gruenewald, P. J., & Remer, L. G. (2009). Suicide and alcohol: do outlets play a role? *Alcohol Clin Exp Res*, 33(12), 2124-2133. doi:10.1111/j.1530-0277.2009.01052.x
- Kaplan, M. S., McFarland, B. H., Huguet, N., Conner, K., Caetano, R., Giesbrecht, N., & Nolte, K. B. (2013). Acute alcohol intoxication and suicide: a gender-stratified analysis of the National Violent Death Reporting System. *Inj Prev*, 19(1), 38-43. doi:10.1136/injuryprev-2012-040317
- Kellam, S. G., Brown, C. H., Poduska, J. M., Ialongo, N. S., Wang, W., Toyinbo, P., . . . Wilcox, H. C. (2008). Effects of a universal classroom behavior management program in first and second grades on young adult behavioral, psychiatric, and social outcomes. *Drug Alcohol Depend*, 95 Suppl 1, S5-S28. doi:10.1016/j.drugalcdep.2008.01.004
- Kessler, R. C., Demler, O., Frank, R. G., Olfson, M., Pincus, H. A., Walters, E. E., . . . Zaslavsky, A. M. (2005). Prevalence and treatment of mental disorders, 1990 to 2003. *N Engl J Med*, 352(24), 2515-2523. doi:10.1056/NEJMsa043266
- Kitchener, B. A., & Jorm, A. F. (2004). Mental health first aid training in a workplace setting: a randomized controlled trial [ISRCTN13249129]. *BMC Psychiatry*, 4, 23. doi:10.1186/1471-244X-4-23
- Kitchener, B. A., & Jorm, A. F. (2006). Mental health first aid training: review of evaluation studies. *Aust N Z J Psychiatry*, 40(1), 6-8. doi:10.1111/j.1440-1614.2006.01735.x
- Kleiman, E. M., Riskind, J. H., Schaefer, K. E., & Weingarden, H. (2012). The moderating role of social support on the relationship between impulsivity and suicide risk. *Crisis*, 33(5), 273-279. doi:10.1027/0227-5910/a000136
- Klevens, J., Simon, T. R., & Chen, J. (2012). Are the perpetrators of violence one and the same? Exploring the co-occurrence of perpetration of physical aggression in the United States. *J Interpers Violence*, 27(10), 1987-2002. doi:10.1177/0886260511431441
- Knox, K. L., Litts, D. A., Talcott, G. W., Feig, J. C., & Caine, E. D. (2003). Risk of suicide and related adverse outcomes after exposure to a suicide prevention programme in the US Air Force: cohort study. *BMJ*, 327(7428), 1376.
- Knox, K. L., Pflanz, S., Talcott, G. W., Campise, R. L., Lavigne, J. E., Bajorska, A., . . . Caine, E. D. (2010). The US Air Force suicide prevention program: implications for public health policy. *Am J Public Health*, 100(12), 2457-2463. doi:10.2105/ajph.2009.159871
- Knox, M. S., Burkhart, K., & Hunter, K. E. (2010). ACT against violence parents raising safe kids program: Effects on maltreatment-related parenting behaviors and beliefs. *Journal of Family Issues*.
- Lang, M. (2013). The impact of mental health insurance laws on state suicide rates. *Health Econ*, 22(1), 73-88. doi:10.1002/hecl.1816
- Linehan, M. M., Comtois, K. A., Murray, A. M., Brown, M. Z., Gallop, R. J., Heard, H. L., . . . Lindenboim, N. (2006). Two-year randomized controlled trial and follow-up of dialectical behavior therapy vs therapy by experts for suicidal behaviors and borderline personality disorder. *Arch Gen Psychiatry*, 63(7), 757-766. doi:10.1001/archpsyc.63.7.757
- Losel, F., & Farrington, D. P. (2012). Direct protective and buffering protective factors in the development of youth violence. *Am J Prev Med*, 43(2 Suppl 1), S8-S23. doi:10.1016/j.amepre.2012.04.029
- Luo, F., Florence, C. S., Quispe-Agnoli, M., Ouyang, L., & Crosby, A. E. (2011). Impact of business cycles on US suicide rates, 1928-2007. *Am J Public Health*, 101(6), 1139-1146. doi:10.2105/ajph.2010.300010
- Maimon, D., Browning, C. R., & Brooks-Gunn, J. (2010). Collective efficacy, family attachment, and urban adolescent suicide attempts. *J Health Soc Behav*, 51(3), 307-324. doi:10.1177/0022146510377878
- Mark, T. L., Shern, D. L., Bagalman, J. E., & Cao, Z. (2007). Ranking America's mental health: An analysis of depression across the states. *Alexandria, VA: Mental Health America*.



- McIntosh, W. L., Spies, E., Stone, D. M., Lokey, C. N., Trudeau, A. R., & Bartholow, B. (2016). Suicide Rates by Occupational Group - 17 States, 2012. *MMWR Morb Mortal Wkly Rep*, 65(25), 641-645. doi:10.15585/mmwr.mm6525a1
- Miller, M., Warren, M., Hemenway, D., & Azrael, D. (2015). Firearms and suicide in US cities. *Inj Prev*, 21(e1), e116-119. doi:10.1136/injuryprev-2013-040969
- Mishara, B. L. (Ed.) (1995). *The Impact of Suicide*. New York: Springer.
- Mishara, B. L., & Martin, N. (2012). Effects of a comprehensive police suicide prevention program. *Crisis: Journal of Crisis Intervention & Suicide*, 33(3), 162-168.
- Mitchell, A. M., Kim, Y., Prigerson, H. G., & Mortimer-Stephens, M. (2004). Complicated grief in survivors of suicide. *Crisis*, 25(1), 12-18. doi:10.1027/0227-5910.25.1.12
- Motto, J. A., & Bostrom, A. G. (2001). A randomized controlled trial of postcrisis suicide prevention. *Psychiatr Serv*, 52(6), 828-833.
- Muennig, P., Cohen, A. K., Palmer, A., & Zhu, W. (2013). The relationship between five different measures of structural social capital, medical examination outcomes, and mortality. *Soc Sci Med*, 85, 18-26. doi:10.1016/j.socscimed.2013.02.007
- National Action Alliance for Suicide Prevention. (2014). Research Prioritization Task Force.(2014). *A prioritized research agenda for suicide prevention: An action plan to save lives*.
- National Action Alliance for Suicide Prevention Workplace Task Force. (2015). *Comprehensive Blueprint for Workplace Suicide Prevention*. Washington, D.C. : Author.
- National Action Alliance for Suicide Prevention: Suicide Attempt Survivors Task Force. (2014). *The Way Forward: Pathways to hope, recovery, and wellness with insights from lived experience*. Washington, D.C. : Author.
- National Action Alliance for Suicide Prevention: Survivors of Suicide Loss Task Force. (2015). *Responding to Grief, Trauma, and Distress After a Suicide: U.S. National Guidelines*. Washington, D.C. : Author.
- Niederkrotenthaler, T., & Sonneck, G. (2007). Assessing the impact of media guidelines for reporting on suicides in Austria: Interrupted time series analysis. *Aust N Z J Psychiatry*, 41. doi:10.1080/00048670701266680
- Olfson, M., Gerhard, T., Huang, C., Crystal, S., & Stroup, T. S. (2015). Premature Mortality Among Adults With Schizophrenia in the United States. *JAMA Psychiatry*, 72(12), 1172-1181. doi:10.1001/jamapsychiatry.2015.1737
- Owens, D. (2002). Fatal and non-fatal repetition of self-harm: Systematic review. *British Journal of Psychiatry*, 181(3), 193-199.
- Pena, J. B., & Caine, E. D. (2006). Screening as an approach for adolescent suicide prevention. *Suicide Life Threat Behav*, 36(6), 614-637. doi:10.1521/suli.2006.36.6.614
- Perron, S., Burrows, S., Fournier, M., Perron, P. A., & Ouellet, F. (2013). Installation of a bridge barrier as a suicide prevention strategy in Montreal, Quebec, Canada. *Am J Public Health*, 103(7), 1235-1239. doi:10.2105/ajph.2012.301089
- Pinchevsky, G. M., & Wright, E. M. (2012). The impact of neighborhoods on intimate partner violence and victimization. *Trauma Violence Abuse*, 13(2), 112-132. doi:10.1177/1524838012445641
- Pirkis, J., Too, L. S., Spittal, M. J., Krysinaka, K., Robinson, J., & Cheung, Y. T. D. (2015). Interventions to reduce suicides at suicide hotspots: a systematic review and meta-analysis. *The Lancet Psychiatry*, 2(11), 994-1001. doi:http://dx.doi.org/10.1016/S2215-0366(15)00266-7
- Pitman, A., Osborn, D., King, M., & Erlangsen, A. (2014). Effects of suicide bereavement on mental health and suicide risk. *Lancet Psychiatry*, 1, 86-94.
- Pollock, L. R., & Williams, J. M. (2004). Problem-solving in suicide attempters. *Psychol Med*, 34(1), 163-167.
- Reeves, A., Stuckler, D., McKee, M., Gunnell, D., Chang, S. S., & Basu, S. (2012). Increase in state suicide rates in the USA during economic recession. *Lancet*, 380(9856), 1813-1814. doi:10.1016/S0140-6736(12)61910-2
- Reid, M. J., Webster-Stratton, C., & Hammond, M. (2003). Follow-up of children who received the Incredible Years intervention for oppositional-defiant disorder: Maintenance and prediction of 2-year outcome. *Behavior Therapy*, 34(4), 471-491.

- Resnick, M. D., Ireland, M., & Borowsky, I. (2004). Youth violence perpetration: what protects? What predicts? Findings from the National Longitudinal Study of Adolescent Health. *J Adolesc Health*, 35(5), 424 e421-410. doi:10.1016/j.jadohealth.2004.01.011
- Rowhani-Rahbar, A., Simonetti, J. A., & Rivara, F. P. (2016). Effectiveness of Interventions to Promote Safe Firearm Storage. *Epidemiol Rev*, 38(1), 111-124. doi:10.1093/epirev/mxv006
- Runyan, C. W., Becker, A., Brandspigel, S., Barber, C., Trudeau, A., & Novins, D. (2016). Lethal Means Counseling for Parents of Youth Seeking Emergency Care for Suicidality. *West J Emerg Med*, 17(1), 8-14. doi:10.5811/westjem.2015.11.28590
- Runyan, D., Wattam, C., Ikeda, R., Hassan, F., & Ramiro, L. (2002). Child abuse and neglect by parents and other caregivers. In E. Krug, L. L. Dahlberg, J. A. Mercy, A. B. Zwi, & R. Lozano (Eds.), *World Report on Violence and Health* (pp. 59-86). Geneva, Switzerland: World Health Organization.
- Sampson, R. J., Morenoff, J. D., & Gannon-Rowley, T. (2002). Assessing "Neighborhood Effects": Social Processes and New Directions in Research. *Annual Review of Sociology*, 28, 443-478.
- Schilling, E. A., Aseltine, R. H., Jr., & James, A. (2016). The SOS Suicide Prevention Program: Further Evidence of Efficacy and Effectiveness. *Prev Sci*, 17(2), 157-166. doi:10.1007/s11121-015-0594-3
- Shepard, D. S., Gurewich, D., Lwin, A. K., Reed, G. A., Jr., & Silverman, M. M. (2016). Suicide and Suicidal Attempts in the United States: Costs and Policy Implications. *Suicide Life Threat Behav*, 46(3), 352-362. doi:10.1111/sltb.12225
- Silverman, M. M., & Maris, R. W. (1995). The prevention of suicidal behaviors: An overview. *Suicide and life-threatening behavior*, 25(1), 10-21.
- Simon, O. R., Swann, A. C., Powell, K. E., Potter, L. B., Kresnow, M. J., & O'Carroll, P. W. (2001). Characteristics of impulsive suicide attempts and attempters. *Suicide Life Threat Behav*, 32(1 Suppl), 49-59.
- Spoth, R. L., Gyll, M., & Day, S. X. (2002). Universal family-focused interventions in alcohol-use disorder prevention: cost-effectiveness and cost-benefit analyses of two interventions. *J Stud Alcohol*, 63(2), 219-228.
- Substance Abuse and Mental Health Services Administration. (2014). *Report to Congress: Garrett Lee Smith Suicide Prevention Program*. Rockville, MD.
- Sudak, H., Maxim, K., & Carpenter, M. (2008). Suicide and stigma: a review of the literature and personal reflections. *Acad Psychiatry*, 32(2), 136-142. doi:10.1176/appi.ap.32.2.136
- Szumilas, M., & Kutcher, S. (2011). Post-suicide intervention programs: a systematic review. *Can J Public Health*, 102(1), 18-29.
- Townsend, E., Hawton, K., Altman, D. G., Arensman, E., Gunnell, D., Hazell, P., . . . Van Heeringen, K. (2001). The efficacy of problem-solving treatments after deliberate self-harm: meta-analysis of randomized controlled trials with respect to depression, hopelessness and improvement in problems. *Psychological Medicine*, 31(6), 979-988.
- Tyrer, P., Reed, G. M., & Crawford, M. J. (2015). Classification, assessment, prevalence, and effect of personality disorder. *Lancet*, 385(9969), 717-726. doi:10.1016/S0140-6736(14)61995-4
- U.S. Office of the Surgeon General, & National Action Alliance for Suicide Prevention. (2012). *2012 National Strategy for Suicide Prevention: Goals and Objectives for Action*. Washington, D.C.: HHS.
- U.S. Public Health Service. (1999). *The Surgeon General's Call to Action to Prevent Suicide*. Washington, D.C.
- Unutzer, J., Tang, L., Oishi, S., Katon, W., Williams, J. W., Jr., Hunkeler, E., . . . Langston, C. (2006). Reducing suicidal ideation in depressed older primary care patients. *J Am Geriatr Soc*, 54(10), 1550-1556.
- Visser, V. S., Comans, T. A., & Scuffham, P. A. (2014). Evaluation Of The Effectiveness Of A Community-Based Crisis Intervention Program For People Bereaved By Suicide. *Journal of Community Psychology*, 42(1), 19-28. doi:10.1002/jcop.21586
- Walrath, C., Garraza, L. G., Reid, H., Goldston, D. B., & McKeon, R. (2015). Impact of the Garrett Lee Smith youth suicide prevention program on suicide mortality. *Am J Public Health*, 105(5), 986-993. doi:10.2105/AJPH.2014.302496



- Wang, Y. C., Hsieh, L. Y., Wang, M. Y., Chou, C. H., Huang, M. W., & Ko, H. C. (2016). Coping Card Usage can Further Reduce Suicide Reattempt in Suicide Attempter Case Management Within 3-Month Intervention. *Suicide Life Threat Behav*, 46(1), 106-120. doi:10.1111/sltb.12177
- Wasserman, D., Hoven, C. W., Wasserman, C., Wall, M., Eisenberg, R., Hadlaczky, G., . . . Carli, V. (2014). School-based suicide prevention programmes: The SEYLE cluster-randomised, controlled trial. *The Lancet*, 385(9977), 1536-1544. doi:10.1016/S0140-6736(14)61213-7
- Webster-Stratton, C., & Hammond, M. (1997). Treating children with early-onset conduct problems: a comparison of child and parent training interventions. *J Consult Clin Psychol*, 65(1), 93-109.
- Webster-Stratton, C., Reid, M. J., & Hammond, M. (2001). Preventing conduct problems, promoting social competence: a parent and teacher training partnership in head start. *J Clin Child Psychol*, 30(3), 283-302. doi:10.1207/S15374424JCCP3003\_2
- Webster-Stratton, C. H., Reid, M. J., & Beauchaine, T. (2011). Combining parent and child training for young children with ADHD. *Journal of Clinical Child & Adolescent Psychology*, 40(2), 191-203.
- Webster-Stratton, C., Jamila Reid, M., & Stoolmiller, M. (2008). Preventing conduct problems and improving school readiness: evaluation of the incredible years teacher and child training programs in high-risk schools. *Journal of child psychology and psychiatry*, 49(5), 471-488.
- Widome, R., Sieving, R. E., Harpin, S. A., & Hearst, M. O. (2008). Measuring neighborhood connection and the association with violence in young adolescents. *J Adolesc Health*, 43(5), 482-489. doi:10.1016/j.jadohealth.2008.04.013
- Wilcox, H. C., Kellam, S. G., Brown, C. H., Poduska, J. M., Ialongo, N. S., Wang, W., & Anthony, J. C. (2008). The impact of two universal randomized first- and second-grade classroom interventions on young adult suicide ideation and attempts. *Drug Alcohol Depend*, 95 Suppl 1, S60-73.
- Wilson, W. J. (2011). *When work disappears: The world of the new urban poor*: Vintage.
- World Health Organization. (2014). *Suicide Prevention: A Global Imperative*. Geneva, Switzerland: WHO Press.
- Wyman, P. A., Brown, C. H., LoMurray, M., Schmeelk-Cone, K., Petrova, M., Yu, Q., . . . Wang, W. (2010). An outcome evaluation of the Sources of Strength suicide prevention program delivered by adolescent peer leaders in high schools. *Am J Public Health*, 100(9), 1653-1661. doi:
- Yip, P., Caine, E., Yousuf, S., Chang, S.-S., Wu, K., & Chen, Y.-Y. (2012). Means restriction for suicide prevention. *Lancet*, 379. doi:10.1016/s0140-6736(12)60521-2

## Appendix A: Summary of Strategies and Approaches to Prevent Suicide

Strategy	Approach/Program, Practice or Policy	Best Available Evidence			Lead Sectors <sup>1</sup>
		Suicide	Suicide Attempts or Ideation	Other Risk/Protective Factors for Suicide	
Strengthen economic supports	Strengthen household financial security				
	Unemployment benefit programs	✓			Government (local, state, Federal)
	Housing stabilization policies				
	The National Neighborhood Stabilization Program			✓	Government (local, state, Federal)
Strengthen access to mental health care	Coverage of mental health conditions in health insurance policies				
	Mental Health Parity Laws	✓		✓	Government (state, Federal)  Health care
Establish protective environments	Reducing access to lethal means among persons at-risk				
	Intervening at hot spots	✓			Government (local, state, Federal)
	Safe storage practices		✓	✓	Public Health
	Organizational policies and culture				
	Together for Life	✓			Business/Labor



		Best Available Evidence			
	<i>US Air Force Suicide Prevention Program</i>	✓		✓	Government (local, state, Federal)
	Community-based policies to reduce excessive alcohol use				
	<i>Alcohol outlet density</i>	✓		✓	Government (local, state, Federal)
Promote connectedness to protect against suicide	Peer norm approaches				
	<i>Sources of Strength</i>			✓	Public Health Social Services
	Community-engagement activities				
	<i>Greening vacant urban spaces</i>			✓	Public Health
Teach coping and problem- solving skills	Social emotional learning				
	<i>Youth Aware of Mental Health Program</i>		✓		Public Health
	<i>Signs of Suicide</i>		✓	✓	Education
	<i>Good Behavior Game</i>		✓	✓	
	Parenting skill and family relationship approaches				
	<i>The Incredible Years</i>			✓	Public Health
				Education	

		Best Available Evidence			
	<i>Strengthening Families 10-14</i>			✓	
Identify and support people at-risk	Gatekeeper training				
	<i>Mental Health First Aid</i>			✓	Public Health Healthcare Social Services
	Screening combined with care management				
	<i>Henry Ford Perfect Depression Care (Pre-cursor to Zero Suicide)</i>	✓		✓	Healthcare
	Crisis Intervention				
	<i>National Suicide Prevention Lifeline</i>		✓	✓	Public Health Social Services
	<i>Applied Suicide Intervention Skills Training</i>		✓	✓	
Treatment for people at risk of suicide					
<i>Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)</i>		✓	✓	Healthcare Social Services	
<i>Collaborative Assessment and Management of Suicidality (CAMS)</i>		✓	✓		



		Best Available Evidence			
Intervene to lessen harms and prevent future risk	<i>Dialectical Behavioral Therapy</i>		✓	✓	
	<i>Attachment-Based Family Therapy</i>		✓		
	Treatment to prevent re-attempts				
	<i>ED Brief Intervention with Follow-up Visits</i>	✓			Healthcare
	<i>Active follow-up contact approaches</i>	✓	✓		
	<i>CBT for Suicide Prevention</i>				
	Postvention				
	<i>StandBy Response Service</i>		✓		Healthcare
	Safe messaging following a suicide				
	<i>Media Guidelines</i>	✓			Public Health

<sup>1</sup>This column refers to the lead sectors well positioned to bring leadership and resources to implementation efforts. For each strategy, there are many other sectors such as non-governmental organizations that are instrumental to prevention planning and implementing the specific programmatic activities.

**Comment [A]:** One idea. Should we add relationships? Keep the levels the same as the SEM or is this ok?

**Policies, Programs, and Practices to Support  
Individuals, Families, & Communities:**

**A Technical Package to Prevent Suicide**

**Prepared by:**

Deb Stone, ScD, MSW, MPH  
Kristin Holland, PhD, MPH  
Brad Bartholow, PhD  
Alex Crosby, MD, MPH  
Shane Davis, PhD  
Natalie Wilkins, PhD

**Division of Violence Prevention  
National Center for Injury Prevention and Control (NCIPC)  
Centers for Disease Control and Prevention**

**2016**



*Policies, Programs, and Practices to Support Individuals, Families, & Communities:*  
*A Technical Package to Prevent Suicide* is a publication of the National Center for Injury Prevention  
and Control of the Centers for Disease Control and Prevention.

Centers for Disease Control and Prevention  
Thomas R. Frieden, MD, MPH, Director

National Center for Injury Prevention and Control  
Debra E. Houry, MD, MPH, Director

Division of Violence Prevention  
James A. Mercy, PhD, Director

*Suggested Citation:* Stone, D.M., Holland, K.M., Bartholow, B., Crosby, A.E., Davis, S., and Wilkins, N.  
Policies, Programs, and Practices to Support Individuals, Families, and Communities: *A Technical  
Package to Prevent Suicide*. Atlanta, GA: National Center for Injury Prevention and Control, Centers for  
Disease Control and Prevention, 2016.

Contents

Acknowledgements

Comment [A]: I didn't add the page numbers yet figuring it might change but I can if you like. Also, I just noticed there are two page 5's and no page 4!

External Reviewers.....

Overview of Technical Package.....

Strengthen Economic Supports.....

Strengthen Access to Mental Health Care.....

Create Protective Environments.....

Promote Connectedness.....

Teach Coping and Problem-Solving Skills.....

Identify and Support People At Risk.....

Intervene to Lessen Harms and Prevent Future Risk.....

Sector Involvement.....

Monitoring and Evaluation.....

Conclusion.....

References.....

Appendix.....



## External Reviewers

[to be inserted later]

## Acknowledgments

[to be inserted later]

Please include Helen Singer, MPH



## Overview

This technical package represents a select group of strategies based on the best available evidence to help communities and states sharpen their focus on prevention activities with the greatest potential to prevent suicide. These strategies include strengthening economic supports; strengthening access to mental health care; creating protective environments; promoting connectedness to protect against suicide; teaching coping and problem-solving skills; identifying and supporting people at-risk; and intervening to lessen harms and prevent future risk. The strategies represented in this package include those with a focus on preventing suicide from happening in the first place as well as approaches to lessen the immediate and long-term harms of suicidal behavior for individuals, families, communities, and society. The strategies in the technical package support the goals and objectives of the National Strategy for Suicide Prevention and the National Action Alliance for Suicide Prevention's priority to strengthen community-based prevention. Commitment, cooperation, and leadership from numerous sectors, including public health, education, justice, health care, social services, business/labor, and government can bring about the successful implementation of this package.

### What is a Technical Package?

A technical package is a compilation of a core set of strategies to achieve and sustain substantial reductions in a specific risk factor or outcome (Frieden, 2014). Technical packages help communities and states prioritize prevention activities based on the best available evidence. This technical package has three components. The first component is the **strategy** or the preventive direction or actions to achieve the goal of preventing suicide. The second component is the **approach**. The approach includes the specific ways to advance the strategy. This can be accomplished through *programs, policies, and practices*. The approaches included come primarily from studies based in the United States. The **evidence** for each of the approaches in preventing suicide or its associated risk factors is included as the third component. This package is intended as a resource to guide and inform prevention decision-making in communities and states.

### Preventing Suicide is a Priority

Suicide, as defined by the Centers for Disease Control and Prevention (CDC), is part of a broader class of behavior called *self-directed violence*. Self-directed violence refers to behavior directed at oneself that deliberately results in injury or the *potential* for injury (Crosby, Ortega, & Melanson, 2011). Self-directed violence may be *suicidal* or *non-suicidal* in nature. For the purposes of this document, we refer only to behavior where suicide is intended:

- **Suicide** is a death caused by self-directed injurious behavior with any intent to die as a result of the behavior.

- **Suicide attempt** is defined as a *non-fatal* self-directed and potentially injurious behavior with any intent to die as a result of the behavior. A suicide attempt may or may not result in injury.

**Suicide is highly prevalent.** Suicide presents a major challenge to public health in the United States and worldwide. It contributes to premature death, morbidity, lost productivity, and health care costs (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014). In 2014 (the most recent year of available death data), suicide was responsible for 42,773 deaths in the U.S., which is approximately one suicide every 12 minutes (Centers for Disease Control and Prevention, 2016d). In 2014, suicide ranked as the 10th leading cause of death and has been among the top 12 leading causes of death since 1975 in the U.S (Centers for Disease Control and Prevention, 2016d). Overall suicide rates have increased 24% from 1999 to 2014 (Curtin, Warner, & Hedegaard, 2016). Suicide is a problem throughout the life span; it is the second leading cause of death among those aged 10–19 years, also second among persons in their 20s and 30s; it is the fourth leading cause among persons in their 40s and seventh among persons in their 50s (Centers for Disease Control and Prevention, 2016d).

Suicides reflect only a portion of the problem (Crosby, Han, Ortega, Parks, & Gfroerer, 2011). Substantially more people are hospitalized as a result of nonfatal suicidal behavior (i.e. suicide attempts) than are fatally injured, and an even greater number are either treated in ambulatory settings (e.g., emergency departments) or not treated at all (Crosby, Han, et al., 2011). For example, during 2014, among adults aged 18 years and older, for every one suicide there were 9 adults treated in hospital emergency departments for self-harm injuries, 27 who reported making a suicide attempt, and over 227 who reported seriously considering suicide (i.e. ideation) (Ferdon et al., In press).

**Suicide is associated with several risk and protective factors.** Suicide, like other human behaviors, is complex with no single determining cause. Instead, suicide occurs in response to multiple biological, psychological, interpersonal, environmental and societal influences that interact with one another, often over time. The social-ecological model-- encompassing multiple levels of focus from the individual, relationship, community, and societal-- is a useful framework for viewing and understanding suicide risk factors identified in the literature (Dahlberg & Krug, 2002). Risk and protective factors for suicide exist at each level. For example, risk factors include:

- **Individual level:** History of depression and other mental illnesses, alcohol and drug abuse, previous suicide attempt, violence victimization, genetic and biological determinants, hopelessness
- **Relationship level:** High conflict or violent relationships, sense of isolation and lack of social support, family/loved one's history of suicide, financial and work stress
- **Community level:** Inadequate community connectedness, barriers to health care (e.g., lack of access to providers and medications)



- **Societal level:** Availability of lethal means of suicide, unsafe media portrayals of suicide, stigma associated with help-seeking and mental illness (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014).

It is important to recognize that the vast majority of individuals who are depressed or who have other risk factors noted, do *not* die by suicide. Furthermore, the relevance of each risk factor can vary by age, race, gender, sexual orientation, residential geography, and socio-cultural and economic status (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014).

Protective factors, or those influences that guard *against* the risk for suicide, can also be found across the different levels of the social-ecological model. Protective factors identified in the literature include: effective coping and problem solving skills, moral objections to suicide, strong and supportive relationships with partners, friends, and family; connectedness to school, community and other social institutions; availability of quality and ongoing physical and mental health care, and reduced access to lethal means (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014). These protective factors can either counter a specific risk factor or guard against a number of risks associated with suicide.

**Suicide is connected to other forms of violence.** Suicide and other forms of violence often share some of the same root causes (Butchart, Phinney, Check, & Villaveces, 2004; Klevens, Simon, & Chen, 2012). For example, in neighborhoods where there is low social cohesion, or where residents don't support and trust each other, people are at higher risk for suicide (Desai, Dausey, & Rosenheck, 2005) as well as perpetration of child maltreatment (Coulton, Crampton, Irwin, Spilsbury, & Korbin, 2007; Freisthler, Merritt, & LaScala, 2006), teen dating violence (Capaldi, Knoble, Shortt, & Kim, 2012), intimate partner violence (Pinchevsky & Wright, 2012), and youth violence (Sampson, Morenoff, & Gannon-Rowley, 2002). Additionally, a lack of economic opportunities and unemployment are associated with suicide (Luo, Florence, Quispe-Agnoli, Ouyang, & Crosby, 2011; Reeves et al., 2012), as well as perpetration of child maltreatment (D. Runyan, Wattam, Ikeda, Hassan, & Ramiro, 2002), intimate partner violence (Heise & Garcia-Moreno, 2002; Pinchevsky & Wright, 2012), sexual violence (Centers for Disease Control and Prevention, 2016c) and youth violence (Wilson, 2011). Other shared risk factors for suicide and violence occur at the individual level and include substance abuse, mental health problems, witnessing violence, and a lack of problem-solving skills (Centers for Disease Control and Prevention, 2016a, 2016c, 2016e; U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012).

Just as risk factors may be shared across suicide and violence, so too may protective factors overlap. For example, connectedness increases individual's and communities' resilience to suicide and other forms of violence, including connectedness to one's community (Basile, Hamburger, Swahn, & Choi, 2013; Borowsky, Hogan, & Ireland, 1997; Centers for Disease Control and Prevention, 2016b; Coulton et al.,

2007; Kleiman, Riskind, Schaefer, & Weingarden, 2012; Pinchevsky & Wright, 2012; Widome, Sieving, Harpin, & Hearst, 2008), school (Basile, Espelage, Rivers, McMahon, & Simon, 2009; Capaldi et al., 2012; Carter, McGee, Taylor, & Williams, 2007; DeGue et al., 2013; Hong, Kral, Espelage, & Allen-Meares, 2012; Losel & Farrington, 2012), family (Capaldi et al., 2012; Centers for Disease Control and Prevention, 2016a; Elgar, Craig, Boyce, Morgan, & Vella-Zarb, 2009; Maimon, Browning, & Brooks-Gunn, 2010; Resnick, Ireland, & Borowsky, 2004), caring adults (Capaldi et al., 2012; Losel & Farrington, 2012; Maimon et al., 2010), and pro-social peers (Capaldi et al., 2012; Losel & Farrington, 2012).

**The health and economic consequences of suicide are substantial.** Suicide and suicide attempts have far-reaching consequences for individuals, families, and communities (Dunne, McIntosh, & Dunne-Maxim, 1987; Mishara, 1995; National Action Alliance for Suicide Prevention: Suicide Attempt Survivors Task Force, 2014; National Action Alliance for Suicide Prevention: Survivors of Suicide Loss Task Force, 2015). By one conservative estimate, for every death by suicide six people are directly impacted (i.e. survivors). Based on this figure it is estimated that there are over 13 million survivors in the U.S. and unfortunately, survivorship itself is a risk factor for suicide (Crosby & Sacks, 2002). Research indicates that the health consequences of violence, including suicide, are also much more extensive than injury and death. Suicide attempt survivors (i.e. those with lived experience) may suffer long-term health and mental health consequences ranging from anger, guilt, and physical impairment, depending on the means and severity of the attempt (Chapman & Dixon-Gordon, 2007). Similarly, survivors of a loved one's suicide may experience ongoing pain and suffering including complicated grief (Mitchell, Kim, Prigerson, & Mortimer-Stephens, 2004), stigma, depression, anxiety, post-traumatic stress disorder, and increased risk of suicidal ideation and suicide (Julie Cerel, McIntosh, Neimeyer, Maple, & Marshall, 2014; Sudak, Maxim, & Carpenter, 2008).

The economic toll of suicide is immense as well. The total lifetime costs associated with nonfatal injuries and deaths caused by self-directed violence in 2013 were approximately \$93.5 billion after adjusting for under-reporting of suicide (Shepard, Gurewich, Lwin, Reed, & Silverman, 2016). The overwhelming burden of these costs results from lost productivity over the life course, with the average cost per suicide being over \$1.3 million (Shepard et al., 2016).

**Suicide can be prevented.** Despite the myths surrounding suicide, like most public health problems, suicide is preventable (U.S. Public Health Service, 1999). And while progress will continue to be made into the future, evidence for numerous programs, practices, and policies currently exists, and many programs are ready to be implemented now. Just as suicide is not caused by a single factor, research suggests that suicide will not be prevented by any single intervention taking place in any single setting (Silverman & Maris, 1995; U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). Rather, suicide prevention is best achieved by a focus across the individual-, relationship-, family-, community, and societal-levels and across all sectors, private and public (e.g.,



business, public health, physical and behavioral healthcare, justice, education, labor) (National Action Alliance for Suicide Prevention, 2014; World Health Organization, 2014).

### **Assessing the Evidence**

This technical package includes programs, practices, and policies with evidence of impact on suicide or risk or protective factors for suicide. To be considered for inclusion in the technical package, the program, practice, or policy selected had to meet at least one of these criteria: a) meta-analyses or systematic reviews showing impact on suicide; b) evidence from at least one rigorous (e.g., randomized controlled trial [RCT] or quasi-experimental design) evaluation study that found significant preventive effects on suicide; c) meta-analyses or systematic reviews showing impact on risk or protective factors for suicide, or d) evidence from at least one rigorous (e.g., RCT or quasi-experimental design) evaluation study that found significant impacts on risk or protective factors for suicide. Finally, consideration was also given to the likelihood of achieving beneficial effects on multiple forms of violence; no evidence of harmful effects on specific outcomes or with particular subgroups; and feasibility of implementation in a U.S. context if the program, policy, or practice has been evaluated in another country.

Within this technical package, some approaches do not yet have research evidence demonstrating impact on rates of suicide but instead are supported by evidence indicating impacts on risk or protective factors for suicide (e.g., help-seeking, stigma reduction, depression, connectedness). In terms of the strength of the evidence, programs that have demonstrated effects on suicidal behavior (e.g., reductions in deaths, attempts) provide a higher-level of evidence, but the evidence base is not that strong in all areas. For instance, there has been less evaluation of community engagement and family programs on suicidal behavior. Thus, approaches in this package that have effects on risk or protective factors reflect the developmental nature of the evidence base and the use of the best available evidence at a given time.

It is also important to note that there is often significant heterogeneity among the programs, policies, or practices that fall within one approach or strategy area in terms of the nature and quality of the available evidence. Not all programs, policies, or practices that utilize the same approach (e.g., gatekeeper training) are equally effective, and even those that are effective may not work across all populations. Tailoring programs and more evaluation may be necessary to address different population groups. The examples provided are not intended to be a comprehensive list of evidence-based programs, policies, or practices for each approach, but rather illustrate models that have been shown to impact suicide or have beneficial effects on risk or protective factors for suicide. In practice, the effectiveness of the programs, policies and practices identified in this package will be strongly dependent on the quality of their implementation and the communities in which they are implemented. Implementation guidance to assist practitioners, organizations and communities will be developed separately.

### Context and Cross-Cutting Themes

The strategies and approaches that have been included in this technical package represent different levels of the social ecology, with efforts intended to impact the community and societal levels, as well individual and relationship levels. The strategies and approaches are intended to work in combination and reinforce each other to prevent suicide (see box below). The strategies are arranged in order such that those strategies hypothesized to have the greatest potential for broad public health impact on suicide are included first, followed by those that might impact more select populations (e.g., persons who have already made a suicide attempt).

**Comment [A]:** Can we just call this Promote Connectedness so it's more consistent with other strategy titles? Seems like 'to protect against suicide' is implied in all of the strategies.

Preventing Suicide	
Strategy	Approach
Strengthen economic supports	<ul style="list-style-type: none"><li>Strengthen household financial security</li><li>Housing stabilization policies</li></ul>
Strengthen access to mental health care	<ul style="list-style-type: none"><li>Coverage of mental health conditions in health insurance policies</li></ul>
Create protective environments	<ul style="list-style-type: none"><li>Reducing access to lethal means among persons at-risk of suicide</li><li>Organizational policies and culture</li><li>Community-based policies to reduce excessive alcohol use</li></ul>
Promote connectedness to protect against suicide	<ul style="list-style-type: none"><li>Peer norm approaches</li><li>Community engagement activities</li></ul>
Teach coping and problem-solving skills	<ul style="list-style-type: none"><li>Social-emotional learning</li><li>Parenting skill and family relationship approaches</li></ul>
Identify and support people at risk	<ul style="list-style-type: none"><li>Gatekeeper training</li><li>Screening combined with care management</li><li>Crisis intervention</li></ul>
Intervene to lessen harms and prevent future risk	<ul style="list-style-type: none"><li>Treatment for people at-risk of suicide</li><li>Treatment to prevent re-attempts</li><li>Postvention</li><li>Safe messaging following a suicide</li></ul>

The example programs, policies, and practices have been implemented within particular contexts. The social and cultural context of communities is critically important to take into account when selecting strategies and approaches. Practitioners in the field may be in the best position to assess the needs and strengths of their communities and work with community members to make decisions about the combination of approaches included here that are best suited to their context.



Suicide ideation, attempts, morbidity and mortality vary by gender, race/ethnicity, age, occupation, and other important population characteristics. Barriers to disclosure, help seeking, timely access to quality care, and ongoing support are profoundly complex and may also vary by population and community characteristics. Ideally, the availability of multiple approaches tailored to the economic, cultural, and environmental context of individuals and communities are desirable as they may increase the likelihood of removing barriers to supportive and effective care and provide opportunities to develop individual and community resilience. These culturally appropriate approaches can then be included in comprehensive strategies to maximize the public health impact on reducing suicide-related morbidity and mortality among individuals and within communities.

This package includes strategies where public health agencies are well positioned to bring leadership and resources to implementation efforts. It also includes strategies where public health can serve as an important collaborator (e.g., strategies addressing community and societal level risks), but where leadership and commitment from other sectors such as business/labor or health care is critical to implement a particular policy or program (e.g., workplace policies; screening combined with care management). The role of various sectors in the implementation of a strategy or approach in preventing suicide is described further in the section on *Sector Involvement*.

In the sections that follow, the strategies and approaches with the best available evidence for preventing suicide are described.

## Strengthen Economic Supports

### Rationale

Studies from the U.S. examining historical trends indicate that suicide rates increase during economic recessions marked by high unemployment rates, job losses, and economic instability and decrease during economic expansions and periods marked by low unemployment rates, particularly for working-age individuals 25 to 64 years old (Luo et al., 2011; Fowler et al., 2015). Economic and financial strain, such as job loss, long periods of unemployment, reduced income, difficulty covering medical, food, and housing expenses, and even the anticipation of such financial stress, increase an individual's risk for suicide; buffering these risks can therefore, potentially protect against suicide (Stack & Wasserman, 2007). For example, strengthening economic support systems can help people pay stay in their homes or obtain affordable housing while also paying for necessities such as food and medical care, job training, child care, among other expenses required for daily living. In providing this support, stress and anxiety and the potential for a crisis situation may be reduced, thereby preventing suicide.

### Approaches

Economic supports for individuals and families can be strengthened by targeting household financial security and ensuring stability in housing during periods of economic stress.

- **Strengthening household financial security** can **reduce** the risk of suicide by providing individuals with the financial means to cover basic expenses and lessen the stress and hardship associated with a job loss or other unanticipated financial problems. The provision of unemployment benefits, livable wages, Temporary Assistance to Needy Families (TANF), medical benefits, and retirement and disability insurance to help cover the cost of necessities or to offset costs in the event of disability are examples of ways to strengthen household financial security.
- **Housing stabilization policies** aim to keep people in their homes and provide housing options for those in need during times of financial insecurity. This may occur through programs that provide affordable housing such as through government subsidies or through other options available to potential homebuyers such as loan modification programs, move-out planning, or financial counseling services that help minimize the risk or impact of foreclosures and eviction.

### Potential Outcomes

- Reduced suicide rates
- Lower foreclosure rates
- Lower eviction rates
- Reduced emotional distress

**Comment [A]:** Linda, do you think we should say can theoretically reduce the risk...same question for housing.



## Evidence

There is evidence suggesting that strengthening household financial security and stabilizing housing can reduce suicide risk.

- **Strengthen household financial security.** An examination of variations in U.S. *unemployment benefit programs* across states demonstrated that the impact of unemployment on suicide was offset in those states that provided greater than average unemployment benefits (Cylus, Glymour, & Avendano, 2014). Another U.S. study examining the link between unemployment and suicide risk using monthly suicide data, length of unemployment, and job losses found that the duration of unemployment, as opposed to just the loss of job, predicted suicide risk (Classen & Dunn, 2012). Together, these results suggest that not only should state unemployment benefit programs be generous in their financial allocations, but also in their duration. Other measures to strengthen household financial security (e.g., transfer payments related to retirement and disability insurance, unemployment insurance compensation, medical benefits, and other forms of family assistance) have also shown an impact on suicide. A study by Flavin and Radcliff (2009) examined the impact of states' per capita spending on transfer payments, medical benefits, and family assistance and total state spending on suicide rates between 1990-2000, controlling for a number of suicide risk factors (e.g., residential mobility, divorce rate, unemployment rate) at the state level. As per capita spending on total transfer payments, medical benefits, and family assistance increased there was an associated decrease in state suicide rates. Moreover, it wasn't spending in general that was associated with the reduction but spending on these types of assistance. In terms of lives saved, Flavin & Radcliff calculated the cost of reducing a state's suicide rate by a full point for the years studied. At the national level, an estimated 3,000 fewer suicides would occur per year nationwide if every state increased their per capita spending on these types of assistance by \$45 per year (Flavin & Radcliff, 2009).
- **Housing stabilization policies.** The *National Neighborhood Stabilization Program* was designed to help neighborhoods suffering from high rates of foreclosure and abandonment by slowing the deterioration of the neighborhoods and providing affordable housing options for low, moderate, and middle-income homebuyers. This program also offers financial assistance to eligible individuals for the purchase of a new home. Although this program has not been rigorously evaluated for its impact on suicide outcomes, it addresses foreclosure and eviction, which are risk factors for suicide. A longitudinal analysis of annual data on suicides and foreclosures demonstrated that as the proportion of foreclosed properties increased in U.S. states, so did the state suicide rate, particularly among working-aged adults (Houle & Light, 2014). Another study of data from 16 U.S. states participating in the National Violent Death Reporting System found that suicides precipitated by home foreclosures and evictions increased more than 100% from

2005 (before the housing crisis began) to 2010 (after it had peaked; Fowler, Gladden, Vagi, Barnes, and Frazier (2015)). Most of these suicides occurred prior to the actual loss of the decedent's home. These findings suggest that integrating suicide prevention resources, messaging, and referrals into financial, foreclosure, and move-out planning and counseling services may help to prevent suicide.



## Strengthen Access to Mental Health Care

### Rationale

While most people with mental health problems do not attempt or die by suicide (Olfson, Gerhard, Huang, Crystal, & Stroup, 2015; Owens, 2002), and risk conferred by mental illnesses differ (Arsenault-Lapierre, Kim, & Turecki, 2004; E. C. Harris & Barraclough, 1997; Tyrer, Reed, & Crawford, 2015), previous research indicates that mental illness is an important risk factor for suicide (E. C. Harris & Barraclough, 1998; World Health Organization, 2014). Studies suggest that up to 90% of people who die by suicide may have had a mental illness at the time of their deaths (Arsenault-Lapierre et al., 2004; Cavanagh, Carson, Sharpe, & Lawrie, 2003; Isometsa, 2001). State-level suicide rates have also been found to be correlated with general mental health measures such as depression (Lang, 2013; Mark, Shern, Bagalman, & Cao, 2007). Findings from the National Comorbidity Survey indicate that relatively few people in the U.S. with mental health disorders receive treatment for those conditions (Kessler et al., 2005). Lack of access to mental health care is one of the contributing factors related to the underuse of mental health services (Cunningham, 2009). Identifying ways to improve access to timely, affordable, and quality mental health care for people in need is a critical component to suicide prevention (World Health Organization, 2014). Apart from the treatment benefits, it can also serve to normalize help-seeking behavior and increase the use of such services.

### Approaches

One approach to strengthening access to mental health care is through the provision of mental health coverage in health insurance policies.

- **Coverage of mental health conditions in health insurance policies.** Federal and state laws include provisions for equal coverage of mental health services in health insurance plans that is on par with coverage for other health concerns (i.e., mental health parity). Benefits and services covered include such things as the number of visits, co-pays, deductibles, inpatient/outpatient services, prescription drugs, and hospitalizations. If a state has a stronger mental health parity law than the federal parity law, then insurance plans regulated by the state must follow the state parity law. Federal parity replaces the state law only in cases where the state law prevents the application of the federal parity law (e.g., includes coverage for some mental health conditions but not others). Equal coverage does not necessarily imply good coverage as health insurance plans vary in the extent to which benefits and services are offered to address various health conditions. Rather it helps to ensure that mental health services are covered on par with other health concerns.

### Potential Outcomes

- Increased utilization of mental health services

- Decreased symptoms of mental illnesses
- Decreased rates of suicide attempts
- Decreased rates of suicide

## Evidence

There is evidence suggesting that coverage of mental health conditions in health insurance policies can reduce risk factors associated with suicide and may directly impact suicide rates.

- **Coverage of mental health conditions in health insurance policies.** The National Survey of Drug Use and Health is a nationally representative survey of the U.S. population that provides data on substance use, mental health conditions, and services utilization. Using data from this survey, K. M. Harris, Carpenter, and Bao (2006) found that 12 months after states enacted *mental health parity laws*, self-reported use of mental healthcare services significantly increased. Moreover, subsequent research by Lang (2013) examined state mental health laws and suicide rates between 1990 and 2004 and found that mental health parity laws, specifically, were associated with an approximate 5% reduction in suicide rates. This reduction, in the 29 states with parity laws, equated to the prevention of 592 suicides per year and a cost savings of \$1.3-3.1 million per suicide prevented (Lang, 2013).



## Create Protective Environments

### Rationale

**Comment [A]:** Not sure if the additions I made to the rationale are too duplicative of info below. If so, go ahead and delete.

Prevention efforts that focus not only on individual behavior change (e.g., help-seeking, treatment interventions) but on changes to the environment can increase the likelihood of positive behavioral and health outcomes (Haddon, 1980). Creating environments that address risk and protective factors where individuals live, work, and play, can help prevent suicide (Dahlberg & Krug, 2002; U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). For example, rates of suicide and suicide attempts are elevated in certain occupational groups (Han et al., 2016; McIntosh et al., 2016), therefore, changes to the organizational culture in these occupations, by way of implementation of supportive policies or even physical modifications to the workplace environment, can demonstrate that good health and mental health are valued and that stigma and other risk factors for suicide, are not (K. L. Knox et al., 2010; National Action Alliance for Suicide Prevention Workplace Task Force, 2015). Similarly, changing the availability of and access to common suicide risk factors in the environment such as bridges, alcohol, medications, or firearms, can reduce suicide rates, particularly in times of crisis (Beautrais, Gibb, Fergusson, Horwood, & Larkin, 2009; Crosby, Espitia-Hardeman, Ortega, & Lozano, 2013; Kaplan et al., 2013; Miller, Warren, Hemenway, & Azrael, 2015; C. W. Runyan et al., 2016).

### Approaches

The current evidence suggests three promising approaches for creating environments that protect against suicide.

- **Reducing access to lethal means among persons at-risk of suicide.** Means of suicide such as firearms, hanging/suffocation, or jumping from heights provide little opportunity for rescue and, as such, have high case fatality rates (e.g., about 85% of people who use a firearm in a suicide attempt will die from the injury). Research also indicates that 1) the interval between thinking about and attempting suicide can be as short as 5 or 10 minutes (Deisenhammer et al., 2009; Simon et al., 2001) and 2) that people tend *not* to substitute a different method when a highly lethal method is unavailable or difficult to access (Hawton, 2007; Yip et al., 2012). Therefore, increasing the time interval between the thought and the suicide attempt, for example, by making it more difficult to access lethal means, can be lifesaving. The following are examples of approaches reducing access to lethal means for persons at-risk of suicide:
  - *Intervening at Suicide Hotspots.* Suicide hotspots, or places where suicides may take place relatively easily, include tall structures (e.g., bridges and cliffs), railway tracks, and isolated locations such as parks. Efforts to prevent suicide at these locations include

erecting barriers to prevent jumping and installing signs and telephones to encourage individuals who are considering suicide, to seek help (Cox et al., 2013).

- *Safe Storage Practices.* Safe storage of medications, firearms, and other household products can reduce the risk for suicide by separating individuals who may be vulnerable and/or impulsive from easy access to lethal means. Such practices may include education and counseling around storing firearms--locked in a secure place (e.g., in a gun safe or lock box), unloaded and separate from the ammunition--and keeping medicines in a locked cabinet or other secure location away from people who may be at risk or who have made prior attempts (Rowhani-Rahbar, Simonetti, & Rivara, 2016; C. W. Runyan et al., 2016).
- **Organizational policies and culture** that promote protective environments may be implemented in places of employment. Such policies and cultural values may promote prosocial behavior (e.g., asking for help), skill building, changing social norms, referral and access to helping services (e.g. mental health, substance abuse treatment, financial counseling), and encourage leadership support from the top down. Such policies and cultural shifts can positively impact organizational climate and morale and help prevent suicide and its related risk factors (e.g. depression, social isolation) (National Action Alliance for Suicide Prevention Workplace Task Force, 2015).
- **Community-based policies to reduce excessive alcohol use.** Research studies in the United States have found that greater alcohol availability is positively associated with alcohol-involved suicides (Escobedo & Ortiz, 2002; Giesbrecht et al., 2015). Policies to reduce excessive alcohol use broadly include zoning to limit alcohol outlet locations and density, taxes on alcohol, and bans on the sale of alcohol for individuals under the legal drinking age. These policies are important because acute alcohol use has been found to be associated with more than one-third of suicides and approximately 40% of suicide attempts (Cherpitel, Borges, & Wilcox, 2004).

### Potential Outcomes

- Increase in safe storage of means
- Reduction in suicide attempts
- Reduction in suicide deaths
- Increase in help-seeking
- Reduction in alcohol-related suicide deaths

### Evidence

The evidence for the effectiveness of means restriction and other ways to establish protective environments is some of the strongest in the field (Zalsman et al., 2016), as described below.



- **Reducing access to lethal means among persons at-risk of suicide.** A meta-analysis examining the impact of *suicide hotspot interventions* implemented in combination or in isolation, both in the U.S. and abroad, found associated reduced rates of suicide (Cox et al., 2013; Pirkis et al., 2015). For example, after erecting a barrier on the Jacques-Cartier bridge in Canada, the suicide rate from jumping from the bridge decreased from about 10 suicide deaths per year to about 3 deaths per year (Perron, Burrows, Fournier, Perron, & Ouellet, 2013). Moreover, the reduction in suicides by jumping was sustained even when all bridges and nearby jumping sites were considered, suggesting little to no displacement of suicides to other jumping sites (Perron et al., 2013). Further evidence for the effectiveness of bridge barriers was demonstrated by a study examining the impact of the *removal* of safety barriers from the Grafton Bridge in Auckland, New Zealand. After removal of the barrier, sadly, both the number and rate of suicide increased fivefold (Beautrais, 2001; Beautrais et al., 2009).

Another form of means reduction involves implementation of *safe storage practices*. In a case-control study of firearm-related events identified from 37 counties in Washington, Oregon, and Missouri, and from 5 trauma centers, Grossman et al. (2005) found that storing firearms unloaded, separate from ammunition, in a locked place and/or secured with a safety device was protective of suicide attempts among adolescents. Further, a recent systematic review of clinic and community-based education and counseling interventions suggested that the provision of safety devices significantly increased safe firearm storage practices compared to counseling alone or compared to the provision of economic incentives to acquire safety devices on one's own (Rowhani-Rahbar et al., 2016).

Another program, *The Emergency Department Counseling on Access to Lethal Means (ED CALM)*, trained psychiatric emergency clinicians in a large children's hospital to provide lethal means counseling and safe storage boxes to parents of patients under age 18 receiving care for suicidal behavior. In a pre-post quality improvement project, Runyan et. al (2016) found that at post-test 76% (of the 55% of parents followed up, n=114) reported that all medications in the home were locked up as compared to fewer than 10% at the time of the initial emergency department visit. Among parents who indicated the presence of guns in the home at pre-test (i.e. 67%), all (100%) reported guns were currently locked up at post-test (C. W. Runyan et al., 2016).

- **Organizational policies and culture.** *Together for Life* is a workplace program of the Montreal Police Force implemented to address suicide among officers. Policy and program components were designed to foster an organizational culture that promoted mutual support and solidarity among all members of the Force. The program included training of supervisors, managers and all units to improve competencies in identifying suicidal risk and to improve use and awareness of existing resources. The program also included an education campaign to improve awareness and help-seeking (Mishara & Martin, 2012). Police suicides were tracked over 12 years and

compared to rates in the control city of Quebec. The suicide rate in the intervention group decreased significantly by 78.9% to a rate of 6.42 suicides per 100,000 population per year compared to an 11% increase in the control city (rate: 29.0 per 100,000) (Mishara & Martin, 2012).

Another example of this approach is the *United States Air Force Suicide Prevention Program (AFSPP)*. AFSPP included 11 policy and education initiatives and was designed to change the culture of the Air Force surrounding suicide. The program uses leaders as role models and agents of change, establishes expectations for behavior related to awareness of suicide risk, develops population skills and knowledge (i.e., education and training), and investigates every suicide (i.e., outcomes measurement). The program represents a fundamental shift from viewing suicide and mental illness solely as medical problem and instead sees them as larger service-wide problems impacting the whole community (K. L. Knox, Litts, Talcott, Feig, & Caine, 2003). Using a time-series design to examine the impact of the AFSPP program on various violence-related outcomes, researchers found that the program was associated with a 33% relative risk reduction in suicide (K. L. Knox et al., 2003). The program was also associated with relative risk reductions in related outcomes including moderate and severe family violence (30% and 54%, respectively), homicide (51%), and accidental death (18%) (K. L. Knox et al., 2003). A longitudinal assessment of the program over the period 1981 to 2008 (16 years before the 1997 launch of the program and 11 years post-launch) found significantly lower rates of suicide after the program was launched than before (K. L. Knox et al., 2010). These effects were sustained over time, except in 2004, which the authors found was associated with less rigorous implementation in that year than in the other years (K. L. Knox et al., 2010).

- **Community-based policies to reduce excessive alcohol use.** While multiple policies to limit alcohol use exist, several studies on alcohol outlet *density*, specifically, suggest that measures to reduce alcohol outlet density can potentially reduce alcohol-involved suicides. Additionally, a longitudinal analysis of alcohol outlet density, suicide mortality, and hospitalizations for suicide attempts over 6 years in 581 California zip codes indicated that the density of bars, specifically, is related to suicide and suicide attempts, particularly in rural areas (Johnson, Gruenewald, & Remer, 2009).



## Promote Connectedness to Protect Against Suicide

### Rationale

Sociologist, Emile Durkheim theorized in 1897 that weak social bonds, i.e. lack of connectedness, are among the chief causes for suicidality (Durkheim, 1897/1951). *Connectedness* is the degree to which an individual or group of individuals are socially close, interrelated, or share resources with others (Centers for Disease Control and Prevention, 2009). Social connections can be formed within and between multiple levels of the social ecology (Dahlberg & Krug, 2002), for instance between individuals (e.g. peers, neighbors, co-workers), families, schools, neighborhoods, workplace, faith communities, cultural groups, and society as a whole. Related to connectedness, *social capital* refers to a sense of trust in one's community and neighborhood, social integration, and also the availability and participation in social organizations (Beyer, Layde, Hamberger, & Laud, 2015; Muennig, Cohen, Palmer, & Zhu, 2013). Many ecological cross-sectional and longitudinal studies have examined the impact of aspects of social capital on depression symptoms, depressive disorder, mental health more generally, and suicide. While the evidence is still being built the pattern is towards an inverse association between social capital measured by social trust, community/ neighborhood engagement, and improved mental health. Connectedness and social capital together can serve to protect against suicidal behaviors by decreasing isolation, encouraging adaptive coping behaviors, increasing belongingness, personal value and worth all of which helps individuals to build resilience in the face of adversity. Connectedness can also provide individuals with better access to formal supports and resources, mobilize communities to meet the needs of its members and provide collective primary prevention activities to the community as a whole (Centers for Disease Control and Prevention, 2009).

### Approaches

Promoting connectedness among individuals and within communities through modeling peer norms and enhancing community engagement can protect against suicide.

- **Peer norm approaches** seek to normalize prosocial behaviors/protective factors for suicide such as help-seeking, reaching out and talking to trusted adults, and peer connectedness. These approaches typically target youth and are delivered in school settings but can also be implemented in community settings.

- **Community engagement activities.** Community engagement is an aspect of social capital. Community engagement approaches may involve residents participating in a range of activities, including religious activities, community clean-up and greening activities, and physical exercise. These activities provide opportunities for residents to become more involved in the community and to connect with other community members, organizations, and resources, resulting in enhanced overall physical health, reduced stress, and decreased depressive symptoms, thereby reducing risk of suicide.

### Potential Outcomes

- Reduction in maladaptive coping attitudes and behaviors
- Increase in healthy coping attitudes and behaviors
- Increase in referrals for youth in distressed
- Increase help-seeking behaviors
- Positive perception of adult support

### Evidence

Current evidence suggests that peer norm approaches and community engagement can reduce risk factors associated with suicidal behaviors.

- **Peer norm approaches.** Evaluations show that programs such as *Sources of Strength* can improve school norms and beliefs about suicide that are created and disseminated by student peers. In a randomized controlled trial of *Sources of Strength* conducted with 18 high-schools (6 metropolitan, 12 rural), Wyman et al. (2010) found that the program improved peer leaders' adaptive norms regarding suicide, their connectedness to adults, and school engagement. Peer leaders were also more likely than controls to refer a suicidal friend to an adult. Among students, the intervention increased perceptions of adult support for suicidal youths and the acceptability of seeking help. Perception of adult support increased most in students with a history of suicidal ideation. Finally, trained peer leaders also reported a greater decrease in maladaptive coping attitudes compared with untrained leaders (Wyman et al., 2010).
- **Community engagement activities.** A vacant lot greening initiative was undertaken in Philadelphia between 1999 and 2008. Local residents and community members worked together to green 4,436 lots (or 7.8 million square feet) in 4 areas of the city. Researchers found significant associated reductions in community residents' self-reported stress levels and engagement in more physical exercise than residents in control vacant lot areas. Other benefits included reductions in firearm assaults and vandalism (Branas et al., 2011).



## Teach Coping and Problem-Solving Skills

### Rationale

Building life skills prepares individuals to successfully tackle every day challenges and adapt to stress and adversity. Life skills encompasses many concepts, but most often include coping and problem-solving skills, conflict resolution, and critical thinking. Life skills are important in shielding individuals from suicidal behaviors (World Health Organization, 2014). Suicide prevention programs that focus on life and social skills training are drawn from social cognitive theories (Bandura, 1986), surmising that individuals who engage in suicidal behavior is attributed to either direct learning, modeling, and environmental and individual (e.g. hopelessness) characteristics. The literature linking life skills and suicide is robust--- The inability to employ adequate coping strategies to cope with immediate stressors or identify and find solutions for problems have been characterized among suicide attempters (Pollock & Williams, 2004). Treatments that include bolstering problem skills (Goldsmith, Pellmar, Kleinman, & Bunney, 2002) and include problem-solving techniques (Ghahramanlou-Holloway, Bhar, Brown, Olsen, & Beck, 2012; Townsend et al., 2001) appear to reduce suicidal ideation and attempts more effectively. Prevention programs focused on teaching these skills target youth, parents and families and have been used with both universal and at-risk populations. While many do not target suicidal behaviors directly, these programs strive to train youth and parents important life skills to offset the underlying vulnerabilities that contribute to engaging in high risk behaviors early in life.

### Approaches

Current evidence provides support for the following two approaches:

- **Social emotional learning programs** focus on developing and strengthening communication and problem-solving skills, emotion regulation, conflict resolution, help seeking and coping skills. These approaches address a range of risk and protective factors for suicidal behavior. They provide children and youth with skills to resolve problems in relationships, school, and with peers, and help youth to address other negative influences (e.g., substance use) associated with suicide. These approaches are typically delivered to all students in a particular grade or school, although some programs also focus on groups of students considered to be at high-risk for suicide. Opportunities to practice and reinforce skills are an important part of programs that work (Herman, Borden, Reinke, & Webster-Stratton, 2011).
- **Parenting skill and family relationship programs** are designed to strengthen parenting skills, enhance positive parent-child interactions, and improve children's behavioral and emotional skills and abilities. Several parenting and family relationship programs have been shown in rigorous evaluations to improve resilience and reduce risk factors for various behaviors, including



ones closely related to suicide, such as depression, internalizing behaviors, and substance abuse (M. S. Knox, Burkhart, & Hunter, 2010).

### Potential Outcomes

- Reduction in suicide attempts and suicide ideation
- Enhanced knowledge of risk and protective factors associated with suicide
- Reduction in suicide risk behaviors (i.e., depression, anxiety, conduct problems, substance abuse)
- Improve and normalize help-seeking behavior
- Enhance social competence and emotional regulation skills
- Enhance problem-solving and conflict management skills

### Evidence

There are several programs with evidence that support teaching social, emotional and parenting skills to reduce suicidal behaviors and associated risk factors.

- **Social emotional learning programs.** The *Youth Aware of Mental Health Program (YAM)* is a program developed for teenagers that uses interactive dialogue and role-playing to teach adolescents about the risk and protective factors associated with suicide (including knowledge about depression and anxiety) and enhances their problem-solving skills for dealing with adverse life events, stress, school and other problems. The program includes 3 hours of role-play sessions and interactive workshops combined with a booklet that students can keep, educational posters displayed in classroom, and interactive lectures about mental health at the beginning and end of the program (Wasserman et al., 2014). In a cluster-randomized controlled trial of YAM conducted across 10 European Union countries and 168 schools, students participating in the YAM program were significantly less likely to have an incident suicide attempt (OR 0.45, 95%CI 0.24–0.85;  $p=0.014$ ) and severe suicidal ideation (0.50, 0.27-0.92;  $p=0.025$ ) at the 12-month follow-up compared to the control group. Additionally, related to severe suicide ideation, in the YAM group absolute risk fell by 0.50% and RR fell by 49.6% (Wasserman et al., 2014).

*Signs of Suicide (SOS)* is another school-based prevention program for students aged 13-17. The program includes guided classroom discussions about suicide and depression. As part of the program, students are screened for depression and suicide risk and referred for professional help as indicated. The program is designed to increase knowledge about suicide and risk factors associated with suicidal behavior as well as improve and normalize help-seeking behavior (Schilling, Aseltine, & James, 2016). In a randomized controlled trial, SOS was shown to reduce self-reported suicide attempts at 3-months post intervention among



participating students compared to control students. The SOS program also increased students' knowledge of how to get help for themselves or friends for depression and/or suicidal thoughts, and favorable attitudes toward help-seeking. SOS participants with a lifetime history of suicide attempt were also less likely to report planning a suicide in the 3 months following the program compared to lower-risk participants (Schilling et al., 2016).

Finally, the *Good Behavior Game (GBG)* is a classroom-based program for elementary school children aged 6-10; it represents an example of upstream suicide prevention programming. The program uses a team-based behavior management strategy that promotes good behavior by setting clear expectations for good behavior and consequences for maladaptive behavior. The goal of the GBG is to create an integrated classroom social system that is supportive of all children being able to learn with little aggressive or disruptive behavior (Wilcox et al., 2008). In an outcome evaluation of the GBG, first graders assigned to GBG reported half the adjusted odds of suicidal ideation and suicide attempts. The beneficial effect of the program was consistent for suicidal ideation regardless of whether baseline covariates were included. The GBG effect on attempts was less robust in some adjusted models including caregiver mental health. In the second cohort of GBG students, neither suicidal ideation nor suicide attempts were significantly different between GBG and the control interventions (Wilcox et al., 2008). This finding likely arose due to the lack of implementation fidelity and pointed to the need for GBG to be delivered with precision, consistency, and teacher support. GBG was also found to be associated with reduced risk of later substance abuse, a risk factor for suicide (Kellam et al., 2008).

- **Parenting skill and family relationship programs.** Parenting and family skills training approaches have shown promising impacts in preventing key risk factors associated with suicide. For example, the *Incredible Years (IY)* is a comprehensive group training program for parents, teachers and children designed to reduce conduct and substance abuse problems, two important suicide risk factors, in youth by improving protective factors such as responsive and positive parent-teacher-child interactions and relationships, emotion self-regulation and social competence (all protective factors for suicide) (Herman et al., 2011). The program includes 9- 20 sessions offered in community-based settings (e.g., religious, recreation centers, mental health treatment centers, and hospitals). Several studies have demonstrated the effect of the IY program on reducing internalizing symptoms, such as anxiety and depression, and child conduct problems (C. H. Webster-Stratton, Reid, & Beauchaine, 2011; Webster-Stratton, Jamila Reid, & Stoolmiller, 2008). The program is also associated with improved problem-solving and conflict management; these skills were maintained at 1-year follow-up (Reid, Webster-Stratton, & Hammond, 2003; C. Webster-Stratton & Hammond,

1997; C. Webster-Stratton, Reid, & Hammond, 2001). The program demonstrated greater benefits as the dosage of the intervention increased (Herman et al., 2011).

Additionally, *Strengthening Families 10-14* is a program that involves sessions between parents, youth, and family with the goal of improving parents' skills for disciplining, managing emotions and conflict, and communicating with their children; promoting youths' interpersonal and problem-solving skills; and creating family activities to build cohesion and positive parent-child interactions. The premise of the program is that developing these skills for both parents and children will reduce internalizing behavior and adolescent substance abuse, two important risk factors for suicide (Spoth, Gyll, & Day, 2002). *Strengthening Families* has been shown to decrease externalizing behaviors, alcohol use, and drug use among youth participants and reductions in depression, alcohol use, and drug use among participating families (Spoth et al., 2002).



## Identify and Support People At-Risk

### Rationale

In order to decrease suicide, attention to people at increased or high risk is necessary as these individuals tend to experience suicidal behavior at higher than average rates. These vulnerable or disadvantaged populations include, but are not limited to, individuals with lower socio-economic status or who are living with a mental health problem; people who have attempted suicide previously, individuals who are institutionalized, have been victims of violence, or are homeless; and members of certain ethnic minority groups. Supporting these vulnerable groups requires proactive case finding along with access to, and retention in, mental health services. Finding effective ways of identifying at-risk or vulnerable groups, customizing services to make them accessible and maintaining care remain key challenges. For example, simply improving services does not guarantee that those services will be used by those most in need of them, nor will it necessarily increase the number of people who follow treatments that are recommended. People who are disadvantaged face social and economic issues that may adversely affect their ability to respond to the treatments or advice that are offered.

### Approaches

The following three approaches focus on identifying and supporting people at increased risk.

- **Gatekeeper training** is designed to train teachers, coaches, providers and others in the community to identify people who may be at risk of suicide and to respond effectively, including facilitating treatment seeking and support services. Gatekeeper training is typically implemented in schools to identify at-risk youth and within health care settings to identify adults (and youth).
- **Screening combined with care management and overall continuity of care** has been used in primary care and behavioral health care settings to assure that people who may be at high-risk of suicide are identified and receive ongoing treatment as needed, particularly after inpatient discharge and other transitions within the healthcare system so they don't 'slip through the cracks'. These approaches typically employ screening for depression and/or suicide combined with collaborative treatment planning between patients and their providers and patient follow-up.
- **Crisis intervention.** These approaches provide support and referral services, typically by connecting a person in crisis (or a friend or family member of someone at-risk) to trained volunteers and/or professional staff via telephone hotline, online chat, or text messaging. Crisis intervention approaches are intended to impact key risk factors for suicide, including feelings of depression, hopelessness, and subsequent mental health care utilization. Like means reduction,

crisis interventions can put space or time between an individual who may be considering suicide and harmful behavior.

### Potential Outcomes

- Reduction in suicide attempts
- Reduction in suicide deaths
- Increased identification of individuals at-risk for suicidal behavior
- Increased at-risk individuals in treatment
- Increased community members trained to identify at-risk individuals
- Increased referrals for health care

### Evidence

There is evidence that community gatekeeper programs are successful in reducing suicides and suicide attempts but the efforts must be maintained (Substance Abuse and Mental Health Services Administration, 2014). However, there is limited evidence for effectiveness screening programs, but at the same time, standard principles for public health screening make them promising (Pena & Caine, 2006). The number of studies evaluating crisis intervention services is limited, but a few studies do indicate that those who use the hotline services have decreased suicidal thoughts and behavior.

- **Gatekeeper training.** One example of gatekeeper training is the *Mental Health First Aid (MHFA)* program. This program is designed for the lay public and consists of three weekly sessions of three hours each. Participants learn the symptoms of people in mental health crises and/or in the early stages of mental health problems (i.e., those experiencing suicidal thoughts and behavior, acute stress reaction, panic attacks and acute psychotic behavior, and depression, anxiety, and psychotic disorders), possible risk factors, and where and how to get evidence-based effective help (Kitchener & Jorm, 2004). In a randomized controlled trial of 300 participants of *MHFA*, the intervention group reported greater confidence in providing help to others, greater likelihood of advising people to seek professional help, improved concordance with health professionals about treatments, and decreased stigmatizing attitudes. Additionally, the intervention resulted in improved mental health of the participants themselves. All results were statistically significant at  $p < .05$ . (Kitchener & Jorm, 2004). Additional research rigorously evaluating *MHFA* for its impact on the first aid recipients themselves and suicidal behavior is needed (Kitchener & Jorm, 2006).

Gatekeeper training has also been a core part of all *Garret Lee Smith (GLS) Suicide Prevention Program* which is in place in 49 states and 48 tribes. A multi-site evaluation assessed the



connection between community gatekeeper training and a reduction of suicide attempts and deaths by comparing the change in suicide mortality rates and nonfatal suicidal behavior among the population aged 10-24 in counties implementing *GLS* trainings, with the trajectory observed in similar counties that did not implement these trainings. Counties implementing *GLS* trainings had significantly lower youth suicide rates the year following the training implementation (-1.07,  $p=.03$ ) (Walrath, Garraza, Reid, Goldston, & McKeon, 2015). This finding represents a decrease of 1 suicide death per 100,000 10 to 24 year olds or the avoidance of approximately 237 deaths in this age group between 2007 and 2010. Counties implementing *GLS* program activities also had significantly lower suicide attempt rates among youths 16 to 23 years of age in the year following implementation of the *GLS* program than did similar counties that did not implement *GLS* program activities (4.9 fewer attempts per 1000 youths [95% CI, 1.8-8.0 fewer attempts per 1000 youths];  $p = .003$ ; (Godoy Garraza, Walrath, Goldston, Reid, & McKeon, 2015)). More than 79 000 suicide attempts may have been averted during the period studied following implementation of the *GLS* program.

- **Screening combined with care management and overall continuity of care.** The *Henry Ford Perfect Depression Care* program was the pre-cursor to *Zero Suicide*, and its overall goal was to eliminate suicide. More broadly, though, the aim was to completely redesign depression care delivery to achieve breakthrough improvement in quality and safety by focusing on six aims: effectiveness, safety, patient centeredness, timeliness, efficiency, and equity among patients. The program developed concrete measures to assess progress on each of these aims and began with screening and assessment of each patient for suicide risk with coordinated continuous follow-up care system wide (C. E. Coffey, 2006). An examination of the impact of the *Henry Ford Perfect Depression Care (Pre-cursor to Zero Suicide)* program found that there was a dramatic and statistically significant decrease in the rate of suicide between the baseline years prior to the intervention (1999 and 2000) to the intervention years (2002-2009). During this time period, the suicide rate fell 82% (C. E. Coffey, 2006; C. E. Coffey, Coffey, & Ahmedani, 2013). Further, suicide rates also declined among HMO members who participated in targeted suicide prevention efforts and received mental health specialty services. However, for those HMO members who accessed only general medical services as opposed to specialty mental health services, the suicide rate increased (M. Coffey, Coffey, & Ahmedani, 2015).
- **Crisis intervention.** Suicide prevention hotlines are one way to provide crisis intervention. In an evaluation of the effectiveness of the *National Suicide Prevention Lifeline (NSPL)* to prevent suicide, 1,085 suicidal individuals who called the hotline completed a standard risk assessment for suicide, and 380 of those completed a follow-up assessment between 1 and 52 days after the initial assessment. Researchers found that over half of the initial sample were seriously considering suicide when they called, and they had a plan for their suicide. Researchers also

found that participants experienced significant decreases in suicidality over the course of the telephone session, and that levels of hopelessness and psychological pain continued to decrease after their initial call (Gould, Kalafat, Harrismunfakh, & Kleinman, 2007).

In another study, this time employing a randomized controlled trial, Gould, Cross, Pisani, Munfakh, and Kleinman (2013) assessed the impact of the *Applied Suicide Intervention Skills Training (ASIST)*, a widely implemented training program that helps hotline counselors, emergency workers, and other gatekeepers to identify and connect with suicidal individuals, understand their reasoning for living and dying, and assist with safely connecting those in need to available resources. The training was evaluated across the NSPL network of hotlines over the period 2008-2009. Using data from 1,410 suicidal individuals who called 17 Lifeline centers, researchers found that compared to callers who spoke to counselors that received the usual care training, individuals who spoke with counselors trained in *ASIST* were significantly more likely to feel less depressed, less suicidal, less overwhelmed, and more hopeful by the end of their call to the hotline. Counselors trained in *ASIST* were also more skilled at keeping callers on the phone longer and establishing a connection with them. However, training in *ASIST* did not result in more comprehensive suicide risk assessments than usual care training (Gould et al., 2013).



## Intervene to Lessen Harms and Prevent Future Risk

### Rationale

Individuals who have experienced mental health challenges, suicidal ideation, and/or who have made suicide attempts and/or have engaged in non-suicidal self-injury are at increased risk of suicide (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). Risk of suicide can also increase among those who have lost a friend, family member, co-worker, or other acquaintance to suicide (Pitman, Osborn, King, & Erlangsen, 2014). Exposure to sensationalized or uninformed reporting regarding on suicide may heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to suicide contagion (Etzersdorfer & Sonneck, 1998; Niederkrotenthaler & Sonneck, 2007).

### Approaches

A broad array of approaches to lesson harms and reduce future risk of suicide among those at increased risk include the provision of mental health care and improved continuity of care, improving linkage to care through active post-discharge planning and follow-up that decreases barriers to ongoing therapeutic support, increasing connectedness to supportive others, addressing bereavement, and framing communications to emphasize resilience, decrease negative affect, and to prevent contagion.

- **Treatment for people at-risk of suicide** typically includes various forms of psychotherapy delivered by licensed providers to help individuals with mental health problems and other risk factors for suicide with problem-solving, impulsivity and emotion regulation.
- **Treatment to prevent re-attempts.** These approaches typically include follow-up contact and use diverse modalities (e.g., home visits, mail, telephone, e-mail) to engage recent suicide attempt survivors in continued treatment to prevent re-attempts. Treatment may focus on improved coping skills, mindfulness, and other emotional regulation skills, and may include case management home visits to increase adherence to treatment and continuity of care; and one-on-one interpersonal therapy and/or group therapy. Approaches that engage and connect attempters to peers and providers are especially important because many attempters do not present to aftercare; 12%-25% reattempt within a year, and 3%-9% of attempt survivors die by suicide within 1 to 5 years of their initial attempt (Inagaki et al., 2015)
- **Postvention** approaches are implemented *after* a suicide has taken place and may include debriefing sessions, counseling, and/or bereavement support groups for surviving friends and family members/loved ones. These programs have not typically been evaluated for their impact on suicide or suicidal behavior but may reduce survivors' guilt, feelings of depression, and complicated grief (Szumilas & Kutcher, 2011).

- **Safe messaging following a suicide.** The manner in which information on a recent suicide is communicated to the public (e.g. school assemblies, mass media, social media) can heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to suicide contagion. Therefore, responsible and safe reporting may help prevent suicide and/or suicide contagion.

### Potential Outcomes

- Reduction in mental health-related sequelae
- Increase connectedness
- Improved coping skills
- Improved messaging following suicide
- Reduction in re-attempts

### Evidence

The evidence addressing strategies to lesson harm and prevent future risk of suicide includes the evaluation of effects of specific approaches on risk and protective factors as well as suicide-related mortality. However, because the evaluation of suicide-related mortality requires large sample sizes and extended follow-up, much of the evidence in this area primarily focuses on risk and protective factors.

- **Treatment for people at-risk of suicide.** There are a number of treatments with evidence of impact on risk and protective factors for suicide. One example is the *Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)* program. *IMPACT* aims to prevent suicide among older primary care patients by reducing suicide ideation and depression in primary care settings. It facilitates the development of a therapeutic alliance, a personalized treatment plan that includes patient preferences, as well as proactive follow-up (biweekly during an acute phase and monthly during continuation phase) by a depression care manager (Hunkeler et al., 2006). The program has been shown to significantly improve quality of life, and to reduce functional impairment, depression and suicidal ideation over 24-months of follow-up (Hunkeler et al., 2006; Unutzer et al., 2006) relative to patients who received care as usual.

Another example is *Collaborative Assessment and Management of Suicidality (CAMS)*, which is a therapeutic approach for suicide-specific assessment and treatment of patient's suicide risk. This flexible approach can be used across treatment settings and clinician theoretical orientations and involves the clinician and patient working together in an interactive assessment process to develop patient-specific treatment plans. *CAMS* sessions are collaborative and involve constant



patient about what is and is not working with the ultimate goal of enhancing the therapeutic alliance and increasing treatment motivation in the suicidal patient. CAMS been tested and supported in 6 correlational studies (Jobes, 2012), in a variety of inpatient and outpatient settings and in one RCT with several additional RCTs under way. CAMS has been associated with significant improvements in suicidal ideation, overall symptom distress, and feelings of hopelessness at 12 month follow-up among a community-based sample of suicidal outpatients. (Comtois et al., 2011).

Other examples include *Dialectical Behavioral Therapy (DBT)* and *Attachment-Based Family Therapy (ABFT)*. DBT is a multicomponent therapy for individuals at high risk for suicide and who may struggle with impulsivity and emotional regulation. The components of DBT include individual therapy, group skills training, between-session telephone coaching and a therapist consultation team. In a randomized controlled trial of women with recent suicidal or self-injurious behavior, those receiving DBT were half as likely to make a suicide attempt at two-year follow-up than women receiving community treatment (23% vs 46%), required less hospitalization for suicide ideation, and had lower medical risk across all suicide attempts and self-injurious acts combined (Linehan et al., 2006).

ABFT is a program for adolescents aged 12-18 and is designed to treat clinically diagnosed major depressive disorder, eliminate suicidal ideation, and reduce dispositional anxiety (Diamond et al., 2010). A randomized controlled trial of ABFT found that suicidal adolescents assigned to ABFT experienced significantly greater improvement in suicidal ideation over 24 weeks of follow-up than did adolescents assigned to enhanced usual care (-4.37 vs. -2.34;  $p = .001$ ;  $d=0.97$ ). Additionally, a higher percentage of ABFT participants reported no suicidal ideation in the week prior to assessment at 12 weeks than did adolescents receiving enhanced usual care (69.2% vs. 34.6%;  $p = .01$ ; OR= 4.25) and at 24 weeks (82.1% vs. 46.2%;  $p = .006$ ; OR=5.37) (Diamond et al., 2010).

- **Treatment to prevent re-attempts.** Several strategies that aim to prevent re-attempts have demonstrated impact on reducing suicidal behavior. For example, *Emergency Department Brief Intervention with Follow-up Visits* is a program that involves a one-hour discharge information session that addresses suicidal behavior, distress, risk and protective factors, alternatives to suicidal behavior, and referral options, combined with nine follow-up contacts over 18-months (at 1, 2, 4, 7, 11 weeks and 4, 6, 12, 18 months). Follow-up contacts are either conducted by phone or through home visits according to a specific time line for up to 18-months. A randomized controlled trial that enrolled suicide attempters from eight hospital emergency departments in five culturally different sites found that a brief intervention combined with 9 follow-up visits over 18-months was associated with significantly fewer deaths from suicide relative to a treatment-

as-usual group (0.2% versus 2.2%, respectively;  $\chi^2 = 13.83$ ,  $P < 0.001$ ) (Fleischmann et al., 2008).

Another example of treatment to prevent re-attempts involves *active follow-up contact approaches* such as postcards, letters, and telephone calls, are intended to increase a patient's sense of connectedness with health care providers and decrease isolation. These approaches include expression of care and support and typically invite patients to reconnect with their provider. Contacts are made periodically (e.g., monthly or every few months in the first 12 months post-discharge with some programs continuing contact for 2 or more years). These approaches have been found in a meta-analysis conducted by Inagaki et al. (2015) to reduce reattempts by approximately 17% for up to 12 months post-discharge, however, the long-term effects of these approaches on reattempts has not yet been demonstrated. Also, because the number of trials and associated sample sizes included in this meta-analysis were small, it was not possible to determine the effect of active contact and follow-up approaches on death by suicide.

In a randomized controlled trial of post-crisis suicide prevention long-term follow-up contact approach, Motto and Bostrom (2001) found that patients who refused ongoing care but who were randomized to be contacted by letter four times per year had a lower rate of suicide over two years of follow-up than did patients in the control group who received no further contact. Other studies have also shown post-crisis letters and coping cards to be protective against suicide ideation and attempts (Hassanian-Moghaddam, Sarjami, Kolahi, & Carter, 2011; Wang et al., 2016).

Finally, *Cognitive Behavior Therapy for Suicide Prevention (CBT-SP)* is an example of a therapeutic approach to prevent re-attempts. It uses a risk reduction, relapse prevention approach that includes an analysis of proximal risk factors and stressors (e.g., relationship problems, school or work-related difficulties) leading up to and following the suicidal event; safety plan development; skill building; and psychoeducation. *CBT-SP* also has family skill modules focused on family support and communication patterns as well as improving the family's problem solving skills. A randomized controlled trial found of *CBT-SP* found that 10-session outpatient cognitive therapy designed to prevent repeat suicide attempts resulted in a 50% reduction in the likelihood of a suicide reattempt among adults who had been admitted to an emergency department for a suicide attempt relative to treatment as usual (Brown et al., 2005).

- **Postvention** programs are implemented with the goal of providing support to survivors of suicide to reduce their own risk of suicide. One example of a postvention program, *StandBy Response Service (StandBy)*, provides clients with face-to-face outreach and telephone support through a professional crisis response team. Site coordinators develop customized case management plans, referring clients to other existing community services matched to their needs (Visser, Comans, &



Scuffham, 2014). In a study by Visser et al. (2014), *StandBy* clients were significantly less likely to be at high risk for suicidality than a suicide bereaved comparison group who had not had contact with the *StandBy* program (48% and 64% respectively,  $p = 0.005$ ). Additionally, research suggests that active postvention approaches in which outreach to suicide survivors occurs at the scene of a suicide is associated with intake into treatment sooner, greater attendance at support group meetings, and attendance at more meetings compared to passive postvention (versus passive approaches where survivors self-refer for services) (J. Cerel & Campbell, 2008).

- **Safe messaging following a suicide.** Safe messaging after a suicide can help assure that reporting of the event is done in such a way to reduce risk to consumers of news media and other messaging who may be particularly vulnerable. One way to ensure safe messaging following a suicide is to encourage that reporters adhere to *media guidelines for reporting on suicides*. Reports that are both inclusive of suicide prevention messages, stories of hope and resilience, risk and protective factors, and links to helping resources (e.g., hotline) and that avoid sensationalizing events or reducing suicide to one cause can help reduce the likelihood of suicide contagion. The most compelling evidence supporting the effect of *media guidelines* on reduction in suicides comes from Austria. After a sharp increase in suicides on the Viennese subway, media guidelines were introduced and an interrupted time series design was used to evaluate the national impact of the guidelines on subsequent suicides. Changes in the quality and quantity of media reporting resulted in a reduction of 81 suicides annually (95% confidence interval: -149 to -13;  $t = -2.32$ ,  $df = 54$ ,  $p < 0.024$ ) in the Viennese subway system (Niederkrotenthaler & Sonneck, 2007)

## Sector Involvement

Public health can play an important and unique role in addressing suicide. Public health agencies, which typically place prevention at the forefront of efforts and work to create broad population-level impact, can bring critical leadership and resources to bear on this problem. For example, these agencies can serve as a convener, bringing together partners and stakeholders to plan, prioritize, and coordinate suicide prevention efforts. Public health agencies are also well positioned to collect and disseminate data, implement preventive measures, evaluate programs, and track progress. Although public health can play a leadership role in preventing suicide, the strategies and approaches outlined in this technical package cannot be accomplished by the public health sector alone.

Other sectors vital to implementing this package include, but are not limited to, education, government (local, state, and federal), social services, health services, business/labor, justice, housing, media, and organizations that comprise the civil society sector such as faith-based organizations, youth-serving organizations, foundations, and other non-governmental organizations. Collectively, these sectors can make a difference in preventing suicide by impacting the various contexts and underlying risks that contribute to suicide.

The strategies and approaches described in this technical package are summarized in Appendix A along with the relevant sectors that are well positioned to lead implementation efforts.

[Linda to insert text specific to the strategies and approaches]

Regardless of strategy, action by many sectors will be necessary for the successful implementation of this package. In this regard, all sectors can play an important and influential role in creating safe and protective environments where individuals who are at high risk of suicide can easily access the mental healthcare and services they need.



## Monitoring and Evaluation

Monitoring and evaluation are necessary components of the public health approach to prevention. It is important to have timely and reliable data to monitor the extent of the problem and to evaluate the impact of prevention efforts. Data are necessary for program implementation; planning, implementation, and assessment all rely on accurate measurement of the problem.

Surveillance data helps researchers and practitioners track changes in the burden of suicide. Surveillance systems exist at the federal, state, and local levels. It is important to assess the availability of surveillance data and data systems across these levels to identify and address gaps in the systems. CDC's National Vital Statistics System and the National Violent Death Reporting System (NVDRS) are examples of surveillance systems that provide data on deaths from suicide. NVDRS, for example, is a state-based surveillance system that combines data from death certificates, law enforcement reports, and coroner or medical examiner reports to provide detailed information on the circumstances of violent deaths, including suicide, which can assist communities in guiding prevention approaches (Blair, Fowler, Jack, & Crosby, 2016). The National Electronic Injury Surveillance System-All Injury Program (NEISS-AIP) provides nationally representative data about all types and causes of nonfatal injuries treated in U.S. hospital emergency departments, and can be used to assess national rates of, and trends in, self-harm injuries by cause (e.g., falls, poisoning, etc.), age, race/ethnicity, sex, disposition (where the injured person goes when released from the Emergency Department).

In addition to information on deaths and nonfatal injuries, there are also surveillance systems that provide national, state, and some local estimates of suicidal behavior. The Youth Risk Behavior Surveillance System (YRBSS) collects information from a nationally representative sample of 9-12 grade students and is a key resource in monitoring health-risk behaviors among youth, including whether youth have seriously considered attempting suicide, attempted suicide, made a plan, or required treatment by a doctor or nurse for a suicide attempt that resulted in an injury, poisoning, or overdose (Brener et al., 2013). The YRBSS data are obtained from a national school-based survey conducted by CDC as well as school-based state, territorial, tribal, and large urban school district survey conducted by education and health agencies. The National Survey on Drug Use and Health (NSDUH) is an annual nationwide survey of individuals aged 12 years and older that provides national and state-level estimates of drug use and mental health-related issues, including suicide ideation and suicide attempts.

It is also important at all levels (local, state, and federal) to address gaps in responses, track progress of prevention efforts and evaluate the impact of those efforts, including the impact of this technical package. Evaluation data, produced through program implementation and monitoring, is essential to provide information on what does and does not work to reduce rates of suicide and its associated risk and protective factors. Theories of change and logic models that identify short, intermediate, and long-term outcomes are an important part of program evaluation.



The evidence-base for suicide prevention has advanced greatly over the last few decades. However, additional research is needed to understand the impact of prevention programs on preventing suicide, as opposed to merely examining the effectiveness of programs to impact risk factors associated with suicide. More research is also needed to examine the effectiveness of upstream and community-level strategies to prevent suicide at the population level. Lastly, it will be important for researchers to test the effectiveness of combinations of the strategies and approaches included in this package. Most existing evaluations focus on approaches implemented in isolation. However, there is potential to understand the synergistic effects within a comprehensive prevention approach. Additional research is needed to understand the extent to which combinations of strategies and approaches result in greater reductions in suicide than individual programs, practices, or policies.

## Conclusion

Suicide is a serious public health problem whose rates have been on the rise for more than a decade and whose costs stretch well into the billions of dollars each year. And while suicide is a rare outcome statistically, its human impact has a ripple effect that is far-reaching. Each of us likely interacts with suicide survivors, those with lived experience, and those with thoughts of suicide, on a daily basis—at home, at work, and in our communities. Suicide and suicide attempts are therefore public health issues of societal concern. Fortunately, like many public health problems, suicide is preventable, and fortunately more is being done to prevent suicide than ever before, as evidenced by the work of the National Action Alliance for Suicide Prevention, the release of the first world report on suicide, more timely surveillance data, and critical mention in the President’s FY17 budget, to name just a few examples. Unfortunately and unlike most other public health problems, suicide still struggles against stigma, shame, and secrecy related to help-seeking, mental illness, being a survivor, or someone with lived experience; misplaced fear of asking someone about their risk of suicide (versus the fear and consequence of not asking), and fear of taking up certain strategies known to be effective but perhaps unpopular; misinformation about suicide preventability, and disproportionate funding given the public health burden. Suicide also struggles against the right degree of awareness where too much information, for example by well-meaning reporters and others, may actually do harm.

In an effort to continue pushing the field and society further towards prevention, this technical package includes strategies and approaches that ideally would be used in a comprehensive fashion, in combination—in a multi-level, multi-sectoral way. This technical package includes strategies and approaches targeting upstream prevention, e.g., social emotional learning for children and youth, as well as strategies focused more downstream, e.g., cognitive behavioral treatment to prevent re-attempts. It includes universal, selective, and indicated strategies, or strategies that focus on the whole population regardless of risk to strategies that focus on those groups at highest risk. Importantly, this technical package extends the bounds of the typical prevention strategies to consider approaches at the outer



levels of the social ecology, e.g., policies to stabilize housing and community engagement initiatives. In short, care and attention has been paid to all aspects of suicide prevention.

While the evidence base continues to be built, the collection of programs, policies, and practices laid out here are available for implementation now. And in keeping with good public health practice, the intent is that monitoring and evaluation will play a key role in that implementation. Moreover, as new evidence becomes available, this technical package can be refined to reflect the current state of the science.

In closing, and in keeping with a message of resilience as spoken by those with lived experience, ‘hope, help, and healing is possible.’

## References

- Arsenault-Lapierre, G., Kim, C., & Turecki, G. (2004). Psychiatric diagnoses in 3275 suicides: a meta-analysis. *BMC Psychiatry*, 4, 37. doi:10.1186/1471-244X-4-37
- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*: Prentice-Hall, Inc.
- Basile, K. C., Espelage, D. L., Rivers, I., McMahon, P. M., & Simon, T. R. (2009). The theoretical and empirical links between bullying behavior and male sexual violence perpetration. *Aggression and violent behavior*, 14(5), 336-347.
- Basile, K. C., Hamburger, M. E., Swahn, M. H., & Choi, C. (2013). Sexual violence perpetration by adolescents in dating versus same-sex peer relationships: differences in associated risk and protective factors. *Western Journal of Emergency Medicine*, 14(4), 329.
- Beautrais, A. L. (2001). Effectiveness of barriers at suicide jumping sites: A case study. *Aust NZ J Psychiat*, 35. doi:10.1080/0004867010060501
- Beautrais, A. L., Gibb, S. J., Fergusson, D. M., Horwood, L. J., & Larkin, G. L. (2009). Removing bridge barriers stimulates suicides: An unfortunate natural experiment. *Aust NZ J Psychiat*, 43. doi:10.1080/00048670902873714
- Beyer, K. M., Layde, P. M., Hamberger, L. K., & Laud, P. W. (2015). Does neighborhood environment differentiate intimate partner femicides from other femicides? *Violence Against Women*, 21(1), 49-64. doi:10.1177/1077801214564075
- Blair, J. M., Fowler, K. A., Jack, S. P., & Crosby, A. E. (2016). The National Violent Death Reporting System: overview and future directions. *Inj Prev*, 22 Suppl 1, i6-i11. doi:10.1136/injuryprev-2015-041819
- Borowsky, I. W., Hogan, M., & Ireland, M. (1997). Adolescent sexual aggression: risk and protective factors. *Pediatrics*, 100(6), E7.
- Branas, C. C., Cheney, R. A., MacDonald, J. M., Tam, V. W., Jackson, T. D., & Ten Have, T. R. (2011). A difference-in-differences analysis of health, safety, and greening vacant urban space. *Am J Epidemiol*, 174(11), 1296-1306. doi:10.1093/aje/kwr273
- Brown, G. K., Ten Have, T., Henriques, G. R., Xie, S. X., Hollander, J. E., & Beck, A. T. (2005). Cognitive therapy for the prevention of suicide attempts: a randomized controlled trial. *JAMA*, 294(5), 563-570. doi:10.1001/jama.294.5.563
- Butchart, A., Phinney, A., Check, P., & Villaveces, A. (2004). *Preventing Violence: A Guide to Implementing the Recommendations of the World Report on Violence and Health*. Geneva, Switzerland: World Health Organization.
- Capaldi, D. M., Knoble, N. B., Shortt, J. W., & Kim, H. K. (2012). A Systematic Review of Risk Factors for Intimate Partner Violence. *Partner Abuse*, 3(2), 231-280. doi:10.1891/1946-6560.3.2.231
- Carter, M., McGee, R., Taylor, B., & Williams, S. (2007). Health outcomes in adolescence: associations with family, friends and school engagement. *J Adolesc*, 30(1), 51-62. doi:10.1016/j.adolescence.2005.04.002
- Cavanagh, J. T., Carson, A. J., Sharpe, M., & Lawrie, S. M. (2003). Psychological autopsy studies of suicide: a systematic review. *Psychol Med*, 33(3), 395-405.
- Centers for Disease Control and Prevention. (2009). Strategic direction for the prevention of suicidal behavior: Promoting individual, family, and community connectedness to prevent suicidal behavior. Retrieved from Available at: [http://www.cdc.gov/ViolencePrevention/pdf/Suicide\\_Strategic\\_Direction\\_Full\\_version-a.pdf](http://www.cdc.gov/ViolencePrevention/pdf/Suicide_Strategic_Direction_Full_version-a.pdf)
- Centers for Disease Control and Prevention. (2016a). Child Maltreatment: Risk and Protective Factors. Retrieved from Available at: <http://www.cdc.gov/violenceprevention/childmaltreatment/riskprotectivefactors.html>
- Centers for Disease Control and Prevention. (2016b). Elder Maltreatment: Risk and Protective Factors. Retrieved from Available at: <http://www.cdc.gov/ViolencePrevention/eldermaltreatment/riskprotectivefactors.html>



- Centers for Disease Control and Prevention. (2016c). Sexual Violence: Risk and Protective Factors. Retrieved from Available at: <http://www.cdc.gov/ViolencePrevention/sexualviolence/riskprotectivefactors.html>
- Centers for Disease Control and Prevention. (2016d). Web-Based Injury Statistics Query and Reporting System (WISQARS). Retrieved June 3, 2016 Available at: <http://www.cdc.gov/injury/wisqars/index.html>
- Centers for Disease Control and Prevention. (2016e). Youth Violence: Risk and Protective Factors. Retrieved from Available at: <http://www.cdc.gov/violenceprevention/youthviolence/riskprotectivefactors.html>
- Cerel, J., & Campbell, F. R. (2008). Suicide survivors seeking mental health services: a preliminary examination of the role of an active postvention model. *Suicide Life Threat Behav*, 38(1), 30-34. doi:10.1521/suli.2008.38.1.30
- Cerel, J., McIntosh, J. L., Neimeyer, R. A., Maple, M., & Marshall, D. (2014). The Continuum of "Survivorship": Definitional Issues in the Aftermath of Suicide. *Suicide and life-threatening behavior*, 44(6), 591-600. doi:10.1111/sltb.12093
- Chapman, A. L., & Dixon-Gordon, K. L. (2007). Emotional antecedents and consequences of deliberate self-harm and suicide attempts. *Suicide Life Threat Behav*, 37(5), 543-552. doi:10.1521/suli.2007.37.5.543
- Cherpitel, C. J., Borges, G. L. G., & Wilcox, H. C. (2004). Acute alcohol use and suicidal behavior: A review of the literature. *Alcoholism: Clinical and Experimental Research*, 28(5 SUPPL.), 18S-28S.
- Classen, T. J., & Dunn, R. A. (2012). The effect of job loss and unemployment duration on suicide risk in the United States: a new look using mass-layoffs and unemployment duration. *Health Econ*, 21(3), 338-350. doi:10.1002/hec.1719
- Coffey, C. E. (2006). Pursuing perfect depression care. *Psychiatr Serv*, 57(10), 1524-1526. doi:10.1176/ps.2006.57.10.1524
- Coffey, C. E., Coffey, M. J., & Ahmedani, B. K. (2013). An update on perfect depression care. *Psychiatr Serv*, 64(4), 396. doi:10.1176/appi.PS.640422
- Coffey, M., Coffey, C., & Ahmedani, B. K. (2015). Suicide in a health maintenance organization population. *JAMA Psychiatry*, 72(3), 294-296. doi:10.1001/jamapsychiatry.2014.2440
- Comtois, K. A., Jobes, D. A., S. O'Connor, S., Atkins, D. C., Janis, K., E. Chessen, C., . . . Yuodelis-Flores, C. (2011). Collaborative assessment and management of suicidality (CAMS): feasibility trial for next-day appointment services. *Depress Anxiety*, 28(11), 963-972. doi:10.1002/da.20895
- Coulton, C. J., Crampton, D. S., Irwin, M., Spilsbury, J. C., & Korbin, J. E. (2007). How neighborhoods influence child maltreatment: a review of the literature and alternative pathways. *Child Abuse Negl*, 31(11-12), 1117-1142. doi:10.1016/j.chiabu.2007.03.023
- Cox, G. R., Owens, C., Robinson, J., Nicholas, A., Lockley, A., Williamson, M., . . . Pirkis, J. (2013). Interventions to reduce suicides at suicide hotspots: a systematic review. *BMC Public Health*, 13(1), 1-12. doi:10.1186/1471-2458-13-214
- Crosby, A. E., Espitia-Hardeman, V., Ortega, L., & Lozano, B. (2013). Alcohol and suicide. *Alcohol: Science, Policy and Public Health*, 190.
- Crosby, A. E., Han, B., Ortega, L., Parks, S. E., & Gfroerer, J. (2011). Suicidal Thoughts and Behaviors Among Adults Aged ≥18 Years — United States, 2008–2009. *MMWR*, 60(No. SS-13), 1-22.
- Crosby, A. E., Ortega, L., & Melanson, C. (2011). *Self-directed Violence Surveillance: Uniform Definitions and Recommended Data Elements, Version 1.0*. Retrieved from Atlanta, GA:
- Cunningham, P. J. (2009). Beyond parity: primary care physicians' perspectives on access to mental health care. *Health Aff (Millwood)*, 28(3), w490-501. doi:10.1377/hlthaff.28.3.w490
- Curtin, S. C., Warner, M., & Hedegaard, H. (2016). *Increase in suicide in the United States, 1999-2014*. ( ). Hyattsville, MD: National Center for Health Statistics Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/25116188>.
- Cylus, J., Glymour, M. M., & Avendano, M. (2014). Do generous unemployment benefit programs reduce suicide rates? A state fixed-effect analysis covering 1968-2008. *Am J Epidemiol*, 180(1), 45-52. doi:10.1093/aje/kwu106

- Dahlberg, L. L., & Krug, E. G. (2002). Violence-a global public health problem. In E. Krug, L. L. Dahlberg, J. A. Mercy, A. B. Zwi, & R. Lozano (Eds.), *World Report on Violence and Health* (pp. 1-56). Geneva, Switzerland: World Health Organization.
- DeGue, S., Massetti, G. M., Holt, M. K., Tharp, A. T., Valle, L. A., Matjasko, J. L., & Lippy, C. (2013). Identifying links between sexual violence and youth violence perpetration: New opportunities for sexual violence prevention. *Psychology of violence*, 3(2), 140.
- Deisenhammer, E. A., Ing, C. M., Strauss, R., Kemmler, G., Hinterhuber, H., & Weiss, E. M. (2009). The duration of the suicidal process: how much time is left for intervention between consideration and accomplishment of a suicide attempt? *J Clin Psychiatry*, 70(1), 19-24.
- Desai, R. A., Dausey, D. J., & Rosenheck, R. A. (2005). Mental health service delivery and suicide risk: the role of individual patient and facility factors. *Am J Psychiatry*, 162(2), 311-318. doi:10.1176/appi.ajp.162.2.311
- Diamond, G. S., Wintersteen, M. B., Brown, G. K., Diamond, G. M., Gallop, R., Shelef, K., & Levy, S. (2010). Attachment-based family therapy for adolescents with suicidal ideation: a randomized controlled trial. *J Am Acad Child Adolesc Psychiatry*, 49(2), 122-131.
- Dunne, E. J., McIntosh, J. L., & Dunne-Maxim, K. (Eds.). (1987). *Suicide and its aftermath: Understanding and counseling the survivors*. New York: Norton.
- Durkheim, E. (1897/1951). *Suicide: A study in sociology* (JA Spaulding & G. Simpson, trans.). Glencoe, IL: Free Press. (Original work published 1897).
- Elgar, F. J., Craig, W., Boyce, W., Morgan, A., & Vella-Zarb, R. (2009). Income inequality and school bullying: multilevel study of adolescents in 37 countries. *J Adolesc Health*, 45(4), 351-359. doi:10.1016/j.jadohealth.2009.04.004
- Escobedo, L. G., & Ortiz, M. (2002). The relationship between liquor outlet density and injury and violence in New Mexico. *Accid Anal Prev*, 34(5), 689-694.
- Etzersdorfer, E., & Sonneck, G. (1998). Preventing suicide by influencing mass-media reporting: The Viennese experience, 1980-1996. *Arch Suicide Res*, 4.
- Ferdon, C., Crosby, A. E., Caine, E. D., Hindman J., Reed, G. A., & Iskander, J. (In press). CDC Public Health Grand Rounds: Preventing Suicide through a Comprehensive Public Health Approach. *MMWR*.
- Flavin, P., & Radcliff, B. (2009). Public policies and suicide rates in the American states. *Social Indicators Research*, 90(2), 195-209.
- Fleischmann, A., Bertolote, J. M., Wasserman, D., De Leo, D., Bolhari, J., Botega, N. J., . . . Thanh, H. T. (2008). Effectiveness of brief intervention and contact for suicide attempters: a randomized controlled trial in five countries. *Bulletin of the World Health Organization*, 86(9), 703-709. doi:S0042-96862008000900014 [pii]
- Fowler, K. A., Gladden, R. M., Vagi, K. J., Barnes, J., & Frazier, L. (2015). Increase in suicides associated with home eviction and foreclosure during the US housing crisis: findings from 16 National Violent Death Reporting System States, 2005-2010. *Am J Public Health*, 105(2), 311-316. doi:10.2105/AJPH.2014.301945
- Freisthler, B., Merritt, D. H., & LaScala, E. A. (2006). Understanding the ecology of child maltreatment: a review of the literature and directions for future research. *Child Maltreat*, 11(3), 263-280. doi:10.1177/1077559506289524
- Ghahramanlou-Holloway, M., Bhar, S., Brown, G., Olsen, C., & Beck, A. T. (2012). Changes in problem-solving appraisal after cognitive therapy for the prevention of suicide. *Psychological Medicine*, 42(06), 1185-1193.
- Giesbrecht, N., Huguette, N., Ogden, L., Kaplan, M. S., McFarland, B. H., Caetano, R., . . . Nolte, K. B. (2015). Acute alcohol use among suicide decedents in 14 US states: impacts of off-premise and on-premise alcohol outlet density. *Addiction*, 110(2), 300-307. doi:10.1111/add.12762
- Godoy Garraza, L., Walrath, C., Goldston, D. B., Reid, H., & McKeon, R. (2015). Effect of the Garrett Lee Smith Memorial Suicide Prevention Program on Suicide Attempts Among Youths. *JAMA Psychiatry*, 72(11), 1143-1149. doi:10.1001/jamapsychiatry.2015.1933



- Goldsmith, S. K., Pellmar, T. C., Kleinman, A. M., & Bunney, W. E. (2002). *Reducing suicide: A national imperative*: National Academies Press.
- Gould, M. S., Cross, W., Pisani, A. R., Munfakh, J. L., & Kleinman, M. (2013). Impact of Applied Suicide Intervention Skills Training on the National Suicide Prevention Lifeline. *Suicide Life Threat Behav*, 43(6), 676-691. doi:10.1111/sltb.12049
- Gould, M. S., Kalafat, J., Harrismunfakh, J. L., & Kleinman, M. (2007). An evaluation of crisis hotline outcomes. Part 2: Suicidal callers. *Suicide Life Threat Behav*, 37(3), 338-352. doi:10.1521/suli.2007.37.3.338
- Grossman, D. C., Mueller, B. A., Riedy, C., Dowd, M. D., Villaveces, A., Prodzinski, J., . . . Harruff, R. (2005). Gun storage practices and risk of youth suicide and unintentional firearm injuries. *JAMA*, 293(6), 707-714. doi:10.1001/jama.293.6.707
- Haddon, W. (1980). Advances in the epidemiology of injuries as a basis for public policy. *Public Health Reports*, 95(5), 411-421.
- Han, B., Crosby, A. E., Ortega, L. A., Parks, S. E., Compton, W. M., & Gfroerer, J. (2016). Suicidal ideation, suicide attempt, and occupations among employed adults aged 18–64years in the United States. *Comprehensive psychiatry*, 66, 176-186.
- Harris, E. C., & Barraclough, B. (1997). Suicide as an outcome for mental disorders. A meta-analysis. *Br J Psychiatry*, 170, 205-228.
- Harris, E. C., & Barraclough, B. (1998). Excess mortality of mental disorder. *Br J Psychiatry*, 173, 11-53.
- Harris, K. M., Carpenter, C., & Bao, Y. (2006). The effects of state parity laws on the use of mental health care. *Med Care*, 44(6), 499-505. doi:10.1097/01.mlr.0000215813.16211.00
- Hassanian-Moghaddam, H., Sarjami, S., Kolahi, A. A., & Carter, G. L. (2011). Postcards in Persia: randomised controlled trial to reduce suicidal behaviours 12 months after hospital-treated self-poisoning. *British Journal of Psychiatry*, 198(4), 309-316.
- Hawton, K. (2007). Restricting access to methods of suicide: Rationale and evaluation of this approach to suicide prevention. *Crisis*, 28. doi:10.1027/0227-5910.28.s1.4
- Heise, L., & Garcia-Moreno, C. (2002). Violence by Intimate Partners. In E. Krug, L. L. Dahlberg, J. A. Mercy, A. B. Zwi, & R. Lozano (Eds.), *World Report on Violence and Health* (pp. 87-121). Geneva, Switzerland: World Health Organization.
- Herman, K. C., Borden, L. A., Reinke, W. M., & Webster-Stratton, C. (2011). The Impact of the Incredible Years Parent, Child, and Teacher Training Programs on Children's Co-Occurring Internalizing Symptoms. *Sch Psychol Q*, 26(3), 189-201. doi:10.1037/a0025228
- Hong, J. S., Kral, M. J., Espelage, D. L., & Allen-Meares, P. (2012). The social ecology of adolescent-initiated parent abuse: a review of the literature. *Child Psychiatry Hum Dev*, 43(3), 431-454. doi:10.1007/s10578-011-0273-y
- Houle, J. N., & Light, M. T. (2014). The home foreclosure crisis and rising suicide rates, 2005 to 2010. *Am J Public Health*, 104(6), 1073-1079. doi:10.2105/AJPH.2013.301774
- Hunkeler, E. M., Katon, W., Tang, L., Williams, J. W., Jr., Kroenke, K., Lin, E. H., . . . Unutzer, J. (2006). Long term outcomes from the IMPACT randomised trial for depressed elderly patients in primary care. *BMJ*, 332(7536), 259-263. doi:10.1136/bmj.38683.710255.BE
- Inagaki, M., Kawashima, Y., Kawanishi, C., Yonemoto, N., Sugimoto, T., Furuno, T., . . . Yamada, M. (2015). Interventions to prevent repeat suicidal behavior in patients admitted to an emergency department for a suicide attempt: a meta-analysis. *J Affect Disord*, 175, 66-78. doi:10.1016/j.jad.2014.12.048
- Isometsa, E. T. (2001). Psychological autopsy studies--a review. *Eur Psychiatry*, 16(7), 379-385.
- Jobes, D. A. (2012). The Collaborative Assessment and Management of Suicidality (CAMS): an evolving evidence-based clinical approach to suicidal risk. *Suicide Life Threat Behav*, 42(6), 640-653. doi:10.1111/j.1943-278X.2012.00119.x
- Johnson, F. W., Gruenewald, P. J., & Remer, L. G. (2009). Suicide and alcohol: do outlets play a role? *Alcohol Clin Exp Res*, 33(12), 2124-2133. doi:10.1111/j.1530-0277.2009.01052.x

- Kaplan, M. S., McFarland, B. H., Huguet, N., Conner, K., Caetano, R., Giesbrecht, N., & Nolte, K. B. (2013). Acute alcohol intoxication and suicide: a gender-stratified analysis of the National Violent Death Reporting System. *Inj Prev*, 19(1), 38-43. doi:10.1136/injuryprev-2012-040317
- Kellam, S. G., Brown, C. H., Poduska, J. M., Ialongo, N. S., Wang, W., Toyinbo, P., . . . Wilcox, H. C. (2008). Effects of a universal classroom behavior management program in first and second grades on young adult behavioral, psychiatric, and social outcomes. *Drug Alcohol Depend*, 95 Suppl 1, S5-S28. doi:10.1016/j.drugalcdep.2008.01.004
- Kessler, R. C., Demler, O., Frank, R. G., Olfson, M., Pincus, H. A., Walters, E. E., . . . Zaslavsky, A. M. (2005). Prevalence and treatment of mental disorders, 1990 to 2003. *N Engl J Med*, 352(24), 2515-2523. doi:10.1056/NEJMsa043266
- Kitchener, B. A., & Jorm, A. F. (2004). Mental health first aid training in a workplace setting: a randomized controlled trial [ISRCTN13249129]. *BMC Psychiatry*, 4, 23. doi:10.1186/1471-244X-4-23
- Kitchener, B. A., & Jorm, A. F. (2006). Mental health first aid training: review of evaluation studies. *Aust N Z J Psychiatry*, 40(1), 6-8. doi:10.1111/j.1440-1614.2006.01735.x
- Kleiman, E. M., Riskind, J. H., Schaefer, K. E., & Weingarden, H. (2012). The moderating role of social support on the relationship between impulsivity and suicide risk. *Crisis*, 33(5), 273-279. doi:10.1027/0227-5910/a000136
- Klevens, J., Simon, T. R., & Chen, J. (2012). Are the perpetrators of violence one and the same? Exploring the co-occurrence of perpetration of physical aggression in the United States. *J Interpers Violence*, 27(10), 1987-2002. doi:10.1177/0886260511431441
- Knox, K. L., Litts, D. A., Talcott, G. W., Feig, J. C., & Caine, E. D. (2003). Risk of suicide and related adverse outcomes after exposure to a suicide prevention programme in the US Air Force: cohort study. *BMJ*, 327(7428), 1376.
- Knox, K. L., Pflanz, S., Talcott, G. W., Campise, R. L., Lavigne, J. E., Bajorska, A., . . . Caine, E. D. (2010). The US Air Force suicide prevention program: implications for public health policy. *Am J Public Health*, 100(12), 2457-2463. doi:10.2105/ajph.2009.159871
- Knox, M. S., Burkhart, K., & Hunter, K. E. (2010). ACT against violence parents raising safe kids program: Effects on maltreatment-related parenting behaviors and beliefs. *Journal of Family Issues*.
- Lang, M. (2013). The impact of mental health insurance laws on state suicide rates. *Health Econ*, 22(1), 73-88. doi:10.1002/hecl.1816
- Linehan, M. M., Comtois, K. A., Murray, A. M., Brown, M. Z., Gallop, R. J., Heard, H. L., . . . Lindenboim, N. (2006). Two-year randomized controlled trial and follow-up of dialectical behavior therapy vs therapy by experts for suicidal behaviors and borderline personality disorder. *Arch Gen Psychiatry*, 63(7), 757-766. doi:10.1001/archpsyc.63.7.757
- Losel, F., & Farrington, D. P. (2012). Direct protective and buffering protective factors in the development of youth violence. *Am J Prev Med*, 43(2 Suppl 1), S8-S23. doi:10.1016/j.amepre.2012.04.029
- Luo, F., Florence, C. S., Quispe-Agnoli, M., Ouyang, L., & Crosby, A. E. (2011). Impact of business cycles on US suicide rates, 1928-2007. *Am J Public Health*, 101(6), 1139-1146. doi:10.2105/ajph.2010.300010
- Maimon, D., Browning, C. R., & Brooks-Gunn, J. (2010). Collective efficacy, family attachment, and urban adolescent suicide attempts. *J Health Soc Behav*, 51(3), 307-324. doi:10.1177/0022146510377878
- Mark, T. L., Shern, D. L., Bagalman, J. E., & Cao, Z. (2007). Ranking America's mental health: An analysis of depression across the states. Alexandria, VA: Mental Health America.
- McIntosh, W. L., Spies, E., Stone, D. M., Lokey, C. N., Trudeau, A. R., & Bartholow, B. (2016). Suicide Rates by Occupational Group - 17 States, 2012. *MMWR Morb Mortal Wkly Rep*, 65(25), 641-645. doi:10.15585/mmwr.mm6525a1
- Miller, M., Warren, M., Hemenway, D., & Azrael, D. (2015). Firearms and suicide in US cities. *Inj Prev*, 21(e1), e116-119. doi:10.1136/injuryprev-2013-040969
- Mishara, B. L. (Ed.) (1995). *The Impact of Suicide*. New York: Springer.



- Mishara, B. L., & Martin, N. (2012). Effects of a comprehensive police suicide prevention program. *Crisis: Journal of Crisis Intervention & Suicide*, 33(3), 162-168.
- Mitchell, A. M., Kim, Y., Prigerson, H. G., & Mortimer-Stephens, M. (2004). Complicated grief in survivors of suicide. *Crisis*, 25(1), 12-18. doi:10.1027/0227-5910.25.1.12
- Motto, J. A., & Bostrom, A. G. (2001). A randomized controlled trial of postcrisis suicide prevention. *Psychiatr Serv*, 52(6), 828-833.
- Muennig, P., Cohen, A. K., Palmer, A., & Zhu, W. (2013). The relationship between five different measures of structural social capital, medical examination outcomes, and mortality. *Soc Sci Med*, 85, 18-26. doi:10.1016/j.socscimed.2013.02.007
- National Action Alliance for Suicide Prevention. (2014). Research Prioritization Task Force.(2014). *A prioritized research agenda for suicide prevention: An action plan to save lives*.
- National Action Alliance for Suicide Prevention Workplace Task Force. (2015). *Comprehensive Blueprint for Workplace Suicide Prevention*. Washington, D.C. : Author.
- National Action Alliance for Suicide Prevention: Suicide Attempt Survivors Task Force. (2014). *The Way Forward: Pathways to hope, recovery, and wellness with insights from lived experience*. Washington, D.C. : Author.
- National Action Alliance for Suicide Prevention: Survivors of Suicide Loss Task Force. (2015). *Responding to Grief, Trauma, and Distress After a Suicide: U.S. National Guidelines*. Washington, D.C. : Author.
- Niederkrotenthaler, T., & Sonneck, G. (2007). Assessing the impact of media guidelines for reporting on suicides in Austria: Interrupted time series analysis. *Aust N Z J Psychiatry*, 41. doi:10.1080/00048670701266680
- Olfson, M., Gerhard, T., Huang, C., Crystal, S., & Stroup, T. S. (2015). Premature Mortality Among Adults With Schizophrenia in the United States. *JAMA Psychiatry*, 72(12), 1172-1181. doi:10.1001/jamapsychiatry.2015.1737
- Owens, D. (2002). Fatal and non-fatal repetition of self-harm: Systematic review. *British Journal of Psychiatry*, 181(3), 193-199.
- Pena, J. B., & Caine, E. D. (2006). Screening as an approach for adolescent suicide prevention. *Suicide Life Threat Behav*, 36(6), 614-637. doi:10.1521/suli.2006.36.6.614
- Perron, S., Burrows, S., Fournier, M., Perron, P. A., & Ouellet, F. (2013). Installation of a bridge barrier as a suicide prevention strategy in Montreal, Quebec, Canada. *Am J Public Health*, 103(7), 1235-1239. doi:10.2105/ajph.2012.301089
- Pinchevsky, G. M., & Wright, E. M. (2012). The impact of neighborhoods on intimate partner violence and victimization. *Trauma Violence Abuse*, 13(2), 112-132. doi:10.1177/1524838012445641
- Pirkis, J., Too, L. S., Spittal, M. J., Krysinska, K., Robinson, J., & Cheung, Y. T. D. (2015). Interventions to reduce suicides at suicide hotspots: a systematic review and meta-analysis. *The Lancet Psychiatry*, 2(11), 994-1001. doi:http://dx.doi.org/10.1016/S2215-0366(15)00266-7
- Pitman, A., Osborn, D., King, M., & Erlangsen, A. (2014). Effects of suicide bereavement on mental health and suicide risk. *Lancet Psychiatry*, 1, 86-94.
- Pollock, L. R., & Williams, J. M. (2004). Problem-solving in suicide attempters. *Psychol Med*, 34(1), 163-167.
- Reeves, A., Stuckler, D., McKee, M., Gunnell, D., Chang, S. S., & Basu, S. (2012). Increase in state suicide rates in the USA during economic recession. *Lancet*, 380(9856), 1813-1814. doi:10.1016/S0140-6736(12)61910-2
- Reid, M. J., Webster-Stratton, C., & Hammond, M. (2003). Follow-up of children who received the Incredible Years intervention for oppositional-defiant disorder: Maintenance and prediction of 2-year outcome. *Behavior Therapy*, 34(4), 471-491.
- Resnick, M. D., Ireland, M., & Borowsky, I. (2004). Youth violence perpetration: what protects? What predicts? Findings from the National Longitudinal Study of Adolescent Health. *J Adolesc Health*, 35(5), 424 e421-410. doi:10.1016/j.jadohealth.2004.01.011
- Rowhani-Rahbar, A., Simonetti, J. A., & Rivara, F. P. (2016). Effectiveness of Interventions to Promote Safe Firearm Storage. *Epidemiol Rev*, 38(1), 111-124. doi:10.1093/epirev/mxv006

- Runyan, C. W., Becker, A., Brandspigel, S., Barber, C., Trudeau, A., & Novins, D. (2016). Lethal Means Counseling for Parents of Youth Seeking Emergency Care for Suicidality. *West J Emerg Med*, 17(1), 8-14. doi:10.5811/westjem.2015.11.28590
- Runyan, D., Wattam, C., Ikeda, R., Hassan, F., & Ramiro, L. (2002). Child abuse and neglect by parents and other caregivers. In E. Krug, L. L. Dahlberg, J. A. Mercy, A. B. Zwi, & R. Lozano (Eds.), *World Report on Violence and Health* (pp. 59-86). Geneva, Switzerland: World Health Organization.
- Sampson, R. J., Morenoff, J. D., & Gannon-Rowley, T. (2002). Assessing "Neighborhood Effects": Social Processes and New Directions in Research. *Annual Review of Sociology*, 28, 443-478.
- Schilling, E. A., Aseltine, R. H., Jr., & James, A. (2016). The SOS Suicide Prevention Program: Further Evidence of Efficacy and Effectiveness. *Prev Sci*, 17(2), 157-166. doi:10.1007/s11121-015-0594-3
- Shepard, D. S., Gurewich, D., Lwin, A. K., Reed, G. A., Jr., & Silverman, M. M. (2016). Suicide and Suicidal Attempts in the United States: Costs and Policy Implications. *Suicide Life Threat Behav*, 46(3), 352-362. doi:10.1111/sltb.12225
- Silverman, M. M., & Maris, R. W. (1995). The prevention of suicidal behaviors: An overview. *Suicide and life-threatening behavior*, 25(1), 10-21.
- Simon, O. R., Swann, A. C., Powell, K. E., Potter, L. B., Kresnow, M. J., & O'Carroll, P. W. (2001). Characteristics of impulsive suicide attempts and attempters. *Suicide Life Threat Behav*, 32(1 Suppl), 49-59.
- Spoth, R. L., Gyll, M., & Day, S. X. (2002). Universal family-focused interventions in alcohol-use disorder prevention: cost-effectiveness and cost-benefit analyses of two interventions. *J Stud Alcohol*, 63(2), 219-228.
- Stack, S., & Wasserman, I. (2007). Economic strain and suicide risk: a qualitative analysis. *Suicide and life-threatening behavior*, 37(1), 103-112.
- Substance Abuse and Mental Health Services Administration. (2014). *Report to Congress: Garrett Lee Smith Suicide Prevention Program*. Rockville, MD.
- Sudak, H., Maxim, K., & Carpenter, M. (2008). Suicide and stigma: a review of the literature and personal reflections. *Acad Psychiatry*, 32(2), 136-142. doi:10.1176/appi.ap.32.2.136
- Szumilas, M., & Kutcher, S. (2011). Post-suicide intervention programs: a systematic review. *Can J Public Health*, 102(1), 18-29.
- Townsend, E., Hawton, K., Altman, D. G., Arensman, E., Gunnell, D., Hazell, P., . . . Van Heeringen, K. (2001). The efficacy of problem-solving treatments after deliberate self-harm: meta-analysis of randomized controlled trials with respect to depression, hopelessness and improvement in problems. *Psychological Medicine*, 31(6), 979-988.
- Tyrer, P., Reed, G. M., & Crawford, M. J. (2015). Classification, assessment, prevalence, and effect of personality disorder. *Lancet*, 385(9969), 717-726. doi:10.1016/S0140-6736(14)61995-4
- U.S. Office of the Surgeon General, & National Action Alliance for Suicide Prevention. (2012). *2012 National Strategy for Suicide Prevention: Goals and Objectives for Action*. Washington, D.C.: HHS.
- U.S. Public Health Service. (1999). *The Surgeon General's Call to Action to Prevent Suicide*. Washington, D.C.
- Unutzer, J., Tang, L., Oishi, S., Katon, W., Williams, J. W., Jr., Hunkeler, E., . . . Langston, C. (2006). Reducing suicidal ideation in depressed older primary care patients. *J Am Geriatr Soc*, 54(10), 1550-1556.
- Visser, V. S., Comans, T. A., & Scuffham, P. A. (2014). Evaluation Of The Effectiveness Of A Community-Based Crisis Intervention Program For People Bereaved By Suicide. *Journal of Community Psychology*, 42(1), 19-28. doi:10.1002/jcop.21586
- Walrath, C., Garraza, L. G., Reid, H., Goldston, D. B., & McKeon, R. (2015). Impact of the Garrett Lee Smith youth suicide prevention program on suicide mortality. *Am J Public Health*, 105(5), 986-993. doi:10.2105/AJPH.2014.302496
- Wang, Y. C., Hsieh, L. Y., Wang, M. Y., Chou, C. H., Huang, M. W., & Ko, H. C. (2016). Coping Card Usage can Further Reduce Suicide Reattempt in Suicide Attempter Case Management Within 3-Month Intervention. *Suicide Life Threat Behav*, 46(1), 106-120. doi:10.1111/sltb.12177



- Wasserman, D., Hoven, C. W., Wasserman, C., Wall, M., Eisenberg, R., Hadlaczky, G., . . . Carli, V. (2014). School-based suicide prevention programmes: The SEYLE cluster-randomised, controlled trial. *The Lancet*, 385(9977), 1536-1544. doi:10.1016/S0140-6736(14)61213-7
- Webster-Stratton, C., & Hammond, M. (1997). Treating children with early-onset conduct problems: a comparison of child and parent training interventions. *J Consult Clin Psychol*, 65(1), 93-109.
- Webster-Stratton, C., Reid, M. J., & Hammond, M. (2001). Preventing conduct problems, promoting social competence: a parent and teacher training partnership in head start. *J Clin Child Psychol*, 30(3), 283-302. doi:10.1207/S15374424JCCP3003\_2
- Webster-Stratton, C. H., Reid, M. J., & Beauchaine, T. (2011). Combining parent and child training for young children with ADHD. *Journal of Clinical Child & Adolescent Psychology*, 40(2), 191-203.
- Webster-Stratton, C., Jamila Reid, M., & Stoolmiller, M. (2008). Preventing conduct problems and improving school readiness: evaluation of the incredible years teacher and child training programs in high-risk schools. *Journal of child psychology and psychiatry*, 49(5), 471-488.
- Widome, R., Sieving, R. E., Harpin, S. A., & Hearst, M. O. (2008). Measuring neighborhood connection and the association with violence in young adolescents. *J Adolesc Health*, 43(5), 482-489. doi:10.1016/j.jadohealth.2008.04.013
- Wilcox, H. C., Kellam, S. G., Brown, C. H., Poduska, J. M., Ialongo, N. S., Wang, W., & Anthony, J. C. (2008). The impact of two universal randomized first- and second-grade classroom interventions on young adult suicide ideation and attempts. *Drug Alcohol Depend*, 95 Suppl 1, S60-73.
- Wilson, W. J. (2011). *When work disappears: The world of the new urban poor*: Vintage.
- World Health Organization. (2014). *Suicide Prevention: A Global Imperative*. Geneva, Switzerland: WHO Press.
- Wyman, P. A., Brown, C. H., LoMurray, M., Schmeelk-Cone, K., Petrova, M., Yu, Q., . . . Wang, W. (2010). An outcome evaluation of the Sources of Strength suicide prevention program delivered by adolescent peer leaders in high schools. *Am J Public Health*, 100(9), 1653-1661. doi:
- Yip, P., Caine, E., Yousuf, S., Chang, S.-S., Wu, K., & Chen, Y.-Y. (2012). Means restriction for suicide prevention. *Lancet*, 379. doi:10.1016/s0140-6736(12)60521-2

## Appendix A: Summary of Strategies and Approaches to Prevent Suicide

Strategy	Approach/Program, Practice or Policy	Best Available Evidence			Lead Sectors <sup>1</sup>
		Suicide	Suicide Attempts or Ideation	Other Risk/Protective Factors for Suicide	
Strengthen economic supports	Strengthen household financial security				
	Unemployment benefit programs	✓			Government (local, state, Federal)
	Housing stabilization policies				
	The National Neighborhood Stabilization Program			✓	Government (local, state, Federal)
Strengthen access to mental health care	Coverage of mental health conditions in health insurance policies				
	Mental Health Parity Laws	✓		✓	Government (state, Federal)  Health care
Establish protective environments	Reducing access to lethal means among persons at-risk				
	Intervening at hot spots	✓			Government (local, state, Federal)
	Safe storage practices		✓	✓	Public Health
	Organizational policies and culture				
	Together for Life	✓			Business/Labor



		Best Available Evidence			
	<i>US Air Force Suicide Prevention Program</i>	✓		✓	Government (local, state, Federal)  Business/Labor
	Community-based policies to reduce excessive alcohol use				
	<i>Alcohol outlet density</i>	✓		✓	Government (local, state, Federal)
Promote connectedness to protect against suicide	Peer norm approaches				
	<i>Sources of Strength</i>			✓	Public Health Social Services
	Community-engagement activities				
	<i>Greening vacant urban spaces</i>			✓	Public Health
Teach coping and problem- solving skills	Social emotional learning				
	<i>Youth Aware of Mental Health Program</i>		✓		Public Health
	<i>Signs of Suicide</i>		✓	✓	Education
	<i>Good Behavior Game</i>		✓	✓	
	Parenting skill and family relationship approaches				
	<i>The Incredible Years</i>			✓	Public Health  Education

		Best Available Evidence			
	<i>Strengthening Families 10-14</i>			✓	
Identify and support people at-risk	Gatekeeper training				
	<i>Mental Health First Aid</i>			✓	Public Health Healthcare Social Services
	Screening combined with care management				
	<i>Henry Ford Perfect Depression Care (Pre-cursor to Zero Suicide)</i>	✓		✓	Healthcare
	Crisis Intervention				
	<i>National Suicide Prevention Lifeline</i>		✓	✓	Public Health Social Services
	<i>Applied Suicide Intervention Skills Training</i>		✓	✓	
Treatment for people at risk of suicide					
<i>Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)</i>		✓	✓	Healthcare Social Services	
<i>Collaborative Assessment and Management of Suicidality (CAMS)</i>		✓	✓		



		Best Available Evidence			
Intervene to lessen harms and prevent future risk	<i>Dialectical Behavioral Therapy</i>		✓	✓	
	<i>Attachment-Based Family Therapy</i>		✓		
	Treatment to prevent re-attempts				
	<i>ED Brief Intervention with Follow-up Visits</i>	✓			Healthcare
	<i>Active follow-up contact approaches</i>	✓	✓		
	<i>CBT for Suicide Prevention</i>				
	Postvention				
	<i>StandBy Response Service</i>		✓		Healthcare
	Safe messaging following a suicide				
	<i>Media Guidelines</i>	✓			Public Health

<sup>1</sup>This column refers to the lead sectors well positioned to bring leadership and resources to implementation efforts. For each strategy, there are many other sectors such as non-governmental organizations that are instrumental to prevention planning and implementing the specific programmatic activities.

**Policies, Programs, and Practices to Support  
Individuals, Families, & Communities:  
A Technical Package to Prevent Suicide**

**Prepared by:**

**Deb Stone, ScD, MSW, MPH  
Kristin Holland, PhD, MPH  
Brad Bartholow, PhD  
Alex Crosby, MD, MPH  
Shane Davis, PhD  
Natalie Wilkins, PhD**

**Division of Violence Prevention  
National Center for Injury Prevention and Control (NCIPC)  
Centers for Disease Control and Prevention**

**2016**



*Policies, Programs, and Practices to Support Individuals, Families, & Communities:*  
*A Technical Package to Prevent Suicide* is a publication of the National Center for Injury Prevention  
and Control of the Centers for Disease Control and Prevention.

Centers for Disease Control and Prevention  
Thomas R. Frieden, MD, MPH, Director

National Center for Injury Prevention and Control  
Debra E. Houry, MD, MPH, Director

Division of Violence Prevention  
James A. Mercy, PhD, Director

*Suggested Citation:* Stone, D.M., Holland, K.M., Bartholow, B., Crosby, A.E., Davis, S., and Wilkins, N.  
Policies, Programs, and Practices to Support Individuals, Families, and Communities: *A Technical  
Package to Prevent Suicide*. Atlanta, GA: National Center for Injury Prevention and Control, Centers for  
Disease Control and Prevention, 2016.

## Contents

Acknowledgements.....	4
External Reviewers.....	5
Overview of Technical Package.....	6
Strengthen Economic Supports.....	13
Strengthen Access to Mental Health Care.....	16
Create Protective Environments.....	18
Promote Connectedness.....	22
Teach Coping and Problem-Solving Skills.....	24
Identify and Support People At-Risk.....	28
Intervene to Lessen Harms and Prevent Future Risk.....	32
Sector Involvement.....	37
Monitoring and Evaluation.....	39
Conclusion.....	40
References.....	42
Appendix A.....	50



## Acknowledgments

[to be inserted later]

## External Reviewers

[to be inserted later]



## Overview

This technical package represents a select group of strategies based on the best available evidence to help communities and states sharpen their focus on prevention activities with the greatest potential to prevent suicide. These strategies include strengthening economic supports; strengthening access to mental health care; creating protective environments; promoting connectedness; teaching coping and problem-solving skills; identifying and supporting people at-risk; and intervening to lessen harms and prevent future risk. The strategies represented in this package include those with a focus on preventing suicide from happening in the first place as well as approaches to lessen the immediate and long-term harms of suicidal behavior for individuals, families, communities, and society. The strategies in the technical package support the goals and objectives of the National Strategy for Suicide Prevention and the National Action Alliance for Suicide Prevention's priority to strengthen community-based prevention. Commitment, cooperation, and leadership from numerous sectors, including public health, education, justice, health care, social services, business/labor, and government can bring about the successful implementation of this package.

### What is a Technical Package?

A technical package is a compilation of a core set of strategies to achieve and sustain substantial reductions in a specific risk factor or outcome (Frieden, 2014). Technical packages help communities and states prioritize prevention activities based on the best available evidence. This technical package has three components. The first component is the **strategy** or the preventive direction or actions to achieve the goal of preventing suicide. The second component is the **approach**. The approach includes the specific ways to advance the strategy. This can be accomplished through *programs, policies, and practices*. The approaches included come primarily from studies based in the United States. The **evidence** for each of the approaches in preventing suicide or its associated risk factors is included as the third component. This package is intended as a resource to guide and inform prevention decision-making in communities and states.

### Preventing Suicide is a Priority

Suicide, as defined by the Centers for Disease Control and Prevention (CDC), is part of a broader class of behavior called *self-directed violence*. Self-directed violence refers to behavior directed at oneself that deliberately results in injury or the *potential* for injury (Crosby, Ortega, & Melanson, 2011). Self-directed violence may be *suicidal* or *non-suicidal* in nature. For the purposes of this document, we refer only to behavior where suicide is intended:

- **Suicide** is a death caused by self-directed injurious behavior with any intent to die as a result of the behavior.

- **Suicide attempt** is defined as a *non-fatal* self-directed and potentially injurious behavior with any intent to die as a result of the behavior. A suicide attempt may or may not result in injury.

**Suicide is highly prevalent.** Suicide presents a major challenge to public health in the United States and worldwide. It contributes to premature death, morbidity, lost productivity, and health care costs (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014). In 2014 (the most recent year of available death data), suicide was responsible for 42,773 deaths in the U.S., which is approximately one suicide every 12 minutes (Centers for Disease Control and Prevention, 2016d). In 2014, suicide ranked as the 10th leading cause of death and has been among the top 12 leading causes of death since 1975 in the U.S (Centers for Disease Control and Prevention, 2016d). Overall suicide rates have increased 24% from 1999 to 2014 (Curtin, Warner, & Hedegaard, 2016). Suicide is a problem throughout the life span; it is the second leading cause of death among those aged 10–19 years, also second among persons in their 20s and 30s; it is the fourth leading cause among persons in their 40s and seventh among persons in their 50s (Centers for Disease Control and Prevention, 2016d).

Suicides reflect only a portion of the problem (Crosby, Han, Ortega, Parks, & Gfroerer, 2011). Substantially more people are hospitalized as a result of nonfatal suicidal behavior (i.e. suicide attempts) than are fatally injured, and an even greater number are either treated in ambulatory settings (e.g., emergency departments) or not treated at all (Crosby, Han, et al., 2011). For example, during 2014, among adults aged 18 years and older, for every one suicide there were 9 adults treated in hospital emergency departments for self-harm injuries, 27 who reported making a suicide attempt, and over 227 who reported seriously considering suicide (i.e. ideation) (Ferdon et al., In press).

**Suicide is associated with several risk and protective factors.** Suicide, like other human behaviors, is complex with no single determining cause. Instead, suicide occurs in response to multiple biological, psychological, interpersonal, environmental and societal influences that interact with one another, often over time. The social-ecological model-- encompassing multiple levels of focus from the individual, relationship, community, and societal-- is a useful framework for viewing and understanding suicide risk factors identified in the literature (Dahlberg & Krug, 2002). Risk and protective factors for suicide exist at each level. For example, risk factors include:

- **Individual level:** History of depression and other mental illnesses, alcohol and drug abuse, previous suicide attempt, violence victimization, genetic and biological determinants, hopelessness
- **Relationship level:** High conflict or violent relationships, sense of isolation and lack of social support, family/loved one's history of suicide, financial and work stress
- **Community level:** Inadequate community connectedness, barriers to health care (e.g., lack of access to providers and medications)



- **Societal level:** Availability of lethal means of suicide, unsafe media portrayals of suicide, stigma associated with help-seeking and mental illness (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014).

It is important to recognize that the vast majority of individuals who are depressed or who have other risk factors noted, do *not* die by suicide. Furthermore, the relevance of each risk factor can vary by age, race, gender, sexual orientation, residential geography, and socio-cultural and economic status (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014).

Protective factors, or those influences that guard *against* the risk for suicide, can also be found across the different levels of the social-ecological model. Protective factors identified in the literature include: effective coping and problem solving skills, moral objections to suicide, strong and supportive relationships with partners, friends, and family; connectedness to school, community and other social institutions; availability of quality and ongoing physical and mental health care, and reduced access to lethal means (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014). These protective factors can either counter a specific risk factor or guard against a number of risks associated with suicide.

**Suicide is connected to other forms of violence.** Suicide and other forms of violence often share some of the same root causes (Butchart, Phinney, Check, & Villaveces, 2004; Klevens, Simon, & Chen, 2012). For example, in neighborhoods where there is low social cohesion, or where residents don't support and trust each other, people are at higher risk for suicide (Desai, Dausey, & Rosenheck, 2005) as well as perpetration of child maltreatment (Coulton, Crampton, Irwin, Spilsbury, & Korbin, 2007; Freisthler, Merritt, & LaScala, 2006), teen dating violence (Capaldi, Knoble, Shortt, & Kim, 2012), intimate partner violence (Pinchevsky & Wright, 2012), and youth violence (Sampson, Morenoff, & Gannon-Rowley, 2002). Additionally, a lack of economic opportunities and unemployment are associated with suicide (Luo, Florence, Quispe-Agnoli, Ouyang, & Crosby, 2011; Reeves et al., 2012), as well as perpetration of child maltreatment (D. Runyan, Wattam, Ikeda, Hassan, & Ramiro, 2002), intimate partner violence (Heise & Garcia-Moreno, 2002; Pinchevsky & Wright, 2012), sexual violence (Centers for Disease Control and Prevention, 2016c) and youth violence (Wilson, 2011). Other shared risk factors for suicide and violence occur at the individual level and include substance abuse, mental health problems, witnessing violence, and a lack of problem-solving skills (Centers for Disease Control and Prevention, 2016a, 2016c, 2016e; U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012).

Just as risk factors may be shared across suicide and violence, so too may protective factors overlap. For example, connectedness increases individual's and communities' resilience to suicide and other forms of violence, including connectedness to one's community (Basile, Hamburger, Swahn, & Choi, 2013; Borowsky, Hogan, & Ireland, 1997; Centers for Disease Control and Prevention, 2016b; Coulton et al.,

2007; Kleiman, Riskind, Schaefer, & Weingarden, 2012; Pinchevsky & Wright, 2012; Widome, Sieving, Harpin, & Hearst, 2008), school (Basile, Espelage, Rivers, McMahon, & Simon, 2009; Capaldi et al., 2012; Carter, McGee, Taylor, & Williams, 2007; DeGue et al., 2013; Hong, Kral, Espelage, & Allen-Meares, 2012; Losel & Farrington, 2012), family (Capaldi et al., 2012; Centers for Disease Control and Prevention, 2016a; Elgar, Craig, Boyce, Morgan, & Vella-Zarb, 2009; Maimon, Browning, & Brooks-Gunn, 2010; Resnick, Ireland, & Borowsky, 2004), caring adults (Capaldi et al., 2012; Losel & Farrington, 2012; Maimon et al., 2010), and pro-social peers (Capaldi et al., 2012; Losel & Farrington, 2012).

**The health and economic consequences of suicide are substantial.** Suicide and suicide attempts have far-reaching consequences for individuals, families, and communities (Dunne, McIntosh, & Dunne-Maxim, 1987; Mishara, 1995; National Action Alliance for Suicide Prevention: Suicide Attempt Survivors Task Force, 2014; National Action Alliance for Suicide Prevention: Survivors of Suicide Loss Task Force, 2015). By one conservative estimate, for every death by suicide six people are directly impacted (i.e. survivors). Based on this figure it is estimated that there are over 13 million survivors in the U.S. and unfortunately, survivorship itself is a risk factor for suicide (Crosby & Sacks, 2002). Research indicates that the health consequences of violence, including suicide, are also much more extensive than injury and death. Suicide attempt survivors (i.e. those with lived experience) may suffer long-term health and mental health consequences ranging from anger, guilt, and physical impairment, depending on the means and severity of the attempt (Chapman & Dixon-Gordon, 2007). Similarly, survivors of a loved one's suicide may experience ongoing pain and suffering including complicated grief (Mitchell, Kim, Prigerson, & Mortimer-Stephens, 2004), stigma, depression, anxiety, post-traumatic stress disorder, and increased risk of suicidal ideation and suicide (Julie Cerel, McIntosh, Neimeyer, Maple, & Marshall, 2014; Sudak, Maxim, & Carpenter, 2008).

The economic toll of suicide is immense as well. The total lifetime costs associated with nonfatal injuries and deaths caused by self-directed violence in 2013 were approximately \$93.5 billion after adjusting for under-reporting of suicide (Shepard, Gurewich, Lwin, Reed, & Silverman, 2016). The overwhelming burden of these costs results from lost productivity over the life course, with the average cost per suicide being over \$1.3 million (Shepard et al., 2016).

**Suicide can be prevented.** Despite the myths surrounding suicide, like most public health problems, suicide is preventable (U.S. Public Health Service, 1999). And while progress will continue to be made into the future, evidence for numerous programs, practices, and policies currently exists, and many programs are ready to be implemented now. Just as suicide is not caused by a single factor, research suggests that suicide will not be prevented by any single intervention taking place in any single setting (Silverman & Maris, 1995; U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). Rather, suicide prevention is best achieved by a focus across the individual-, relationship-, family-, community, and societal-levels and across all sectors, private and public (e.g.,



business, public health, physical and behavioral healthcare, justice, education, labor) (National Action Alliance for Suicide Prevention, 2014; World Health Organization, 2014).

### **Assessing the Evidence**

This technical package includes programs, practices, and policies with evidence of impact on suicide or risk or protective factors for suicide. To be considered for inclusion in the technical package, the program, practice, or policy selected had to meet at least one of these criteria: a) meta-analyses or systematic reviews showing impact on suicide; b) evidence from at least one rigorous (e.g., randomized controlled trial [RCT] or quasi-experimental design) evaluation study that found significant preventive effects on suicide; c) meta-analyses or systematic reviews showing impact on risk or protective factors for suicide, or d) evidence from at least one rigorous (e.g., RCT or quasi-experimental design) evaluation study that found significant impacts on risk or protective factors for suicide. Finally, consideration was also given to the likelihood of achieving beneficial effects on multiple forms of violence; no evidence of harmful effects on specific outcomes or with particular subgroups; and feasibility of implementation in a U.S. context if the program, policy, or practice has been evaluated in another country.

Within this technical package, some approaches do not yet have research evidence demonstrating impact on rates of suicide but instead are supported by evidence indicating impacts on risk or protective factors for suicide (e.g., help-seeking, stigma reduction, depression, connectedness). In terms of the strength of the evidence, programs that have demonstrated effects on suicidal behavior (e.g., reductions in deaths, attempts) provide a higher-level of evidence, but the evidence base is not that strong in all areas. For instance, there has been less evaluation of community engagement and family programs on suicidal behavior. Thus, approaches in this package that have effects on risk or protective factors reflect the developmental nature of the evidence base and the use of the best available evidence at a given time.

It is also important to note that there is often significant heterogeneity among the programs, policies, or practices that fall within one approach or strategy area in terms of the nature and quality of the available evidence. Not all programs, policies, or practices that utilize the same approach (e.g., gatekeeper training) are equally effective, and even those that are effective may not work across all populations. Tailoring programs and more evaluation may be necessary to address different population groups. The examples provided are not intended to be a comprehensive list of evidence-based programs, policies, or practices for each approach, but rather illustrate models that have been shown to impact suicide or have beneficial effects on risk or protective factors for suicide. In practice, the effectiveness of the programs, policies and practices identified in this package will be strongly dependent on the quality of their implementation and the communities in which they are implemented. Implementation guidance to assist practitioners, organizations and communities will be developed separately.

## Context and Cross-Cutting Themes

The strategies and approaches that have been included in this technical package represent different levels of the social ecology, with efforts intended to impact the community and societal levels, as well individual and relationship levels. The strategies and approaches are intended to work in combination and reinforce each other to prevent suicide (see box below). The strategies are arranged in order such that those strategies hypothesized to have the greatest potential for broad public health impact on suicide are included first, followed by those that might impact more select populations (e.g., persons who have already made a suicide attempt).

Preventing Suicide	
Strategy	Approach
Strengthen economic supports	<ul style="list-style-type: none"><li>Strengthen household financial security</li><li>Housing stabilization policies</li></ul>
Strengthen access to mental health care	<ul style="list-style-type: none"><li>Coverage of mental health conditions in health insurance policies</li></ul>
Create protective environments	<ul style="list-style-type: none"><li>Reducing access to lethal means among persons at-risk of suicide</li><li>Organizational policies and culture</li><li>Community-based policies to reduce excessive alcohol use</li></ul>
Promote connectedness	<ul style="list-style-type: none"><li>Peer norm approaches</li><li>Community engagement activities</li></ul>
Teach coping and problem-solving skills	<ul style="list-style-type: none"><li>Social-emotional learning</li><li>Parenting skill and family relationship approaches</li></ul>
Identify and support people at risk	<ul style="list-style-type: none"><li>Gatekeeper training</li><li>Screening combined with care management</li><li>Crisis intervention</li></ul>
Intervene to lessen harms and prevent future risk	<ul style="list-style-type: none"><li>Treatment for people at-risk of suicide</li><li>Treatment to prevent re-attempts</li><li>Postvention</li><li>Safe messaging following a suicide</li></ul>

The example programs, policies, and practices have been implemented within particular contexts. The social and cultural context of communities is critically important to take into account when selecting strategies and approaches. Practitioners in the field may be in the best position to assess the needs and strengths of their communities and work with community members to make decisions about the combination of approaches included here that are best suited to their context.



Suicide ideation, attempts, morbidity and mortality vary by gender, race/ethnicity, age, occupation, and other important population characteristics. Barriers to disclosure, help seeking, timely access to quality care, and ongoing support are profoundly complex and may also vary by population and community characteristics. Ideally, the availability of multiple approaches tailored to the economic, cultural, and environmental context of individuals and communities are desirable as they may increase the likelihood of removing barriers to supportive and effective care and provide opportunities to develop individual and community resilience. These culturally appropriate approaches can then be included in comprehensive strategies to maximize the public health impact on reducing suicide-related morbidity and mortality among individuals and within communities.

This package includes strategies where public health agencies are well positioned to bring leadership and resources to implementation efforts. It also includes strategies where public health can serve as an important collaborator (e.g., strategies addressing community and societal level risks), but where leadership and commitment from other sectors such as business, labor or health care is critical to implement a particular policy or program (e.g., workplace policies; screening combined with care management). The role of various sectors in the implementation of a strategy or approach in preventing suicide is described further in the section on *Sector Involvement*.

In the sections that follow, the strategies and approaches with the best available evidence for preventing suicide are described.

## Strengthen Economic Supports

### Rationale

Studies from the U.S. examining historical trends indicate that suicide rates increase during economic recessions marked by high unemployment rates, job losses, and economic instability and decrease during economic expansions and periods marked by low unemployment rates, particularly for working-age individuals 25 to 64 years old (Luo et al., 2011; Fowler et al., 2015). Economic and financial strain, such as job loss, long periods of unemployment, reduced income, difficulty covering medical, food, and housing expenses, and even the anticipation of such financial stress, increase an individual's risk for suicide; buffering these risks can therefore, potentially protect against suicide (Stack & Wasserman, 2007). For example, strengthening economic support systems can help people pay stay in their homes or obtain affordable housing while also paying for necessities such as food and medical care, job training, child care, among other expenses required for daily living. In providing this support, stress and anxiety and the potential for a crisis situation may be reduced, thereby preventing suicide.

### Approaches

Economic supports for individuals and families can be strengthened by targeting household financial security and ensuring stability in housing during periods of economic stress.

- **Strengthening household financial security** can potentially buffer the risk of suicide by providing individuals with the financial means to lessen the stress and hardship associated with a job loss or other unanticipated financial problems. The provision of unemployment benefits and other forms of temporary assistance, livable wages, medical benefits, and retirement and disability insurance to help cover the cost of necessities or to offset costs in the event of disability, are examples of ways to strengthen household financial security.
- **Housing stabilization policies** aim to keep people in their homes and provide housing options for those in need during times of financial insecurity. This may occur through programs that provide affordable housing such as through government subsidies or through other options available to potential homebuyers such as loan modification programs, move-out planning, or financial counseling services that help minimize the risk or impact of foreclosures and eviction.

### Potential Outcomes

- Reduced suicide rates
- Lower foreclosure rates
- Lower eviction rates
- Reduced emotional distress



## Evidence

There is evidence suggesting that strengthening household financial security and stabilizing housing can reduce suicide risk.

- **Strengthen household financial security.** An examination of variations in U.S. *unemployment benefit programs* across states demonstrated that the impact of unemployment on suicide was offset in those states that provided greater than average unemployment benefits (Cylus, Glymour, & Avendano, 2014). Another U.S. study examining the link between unemployment and suicide risk using monthly suicide data, length of unemployment, and job losses found that the duration of unemployment, as opposed to just the loss of job, predicted suicide risk (Classen & Dunn, 2012). Together, these results suggest that not only should state unemployment benefit programs be generous in their financial allocations, but also in their duration.

Other measures to strengthen household financial security (e.g., transfer payments related to retirement and disability insurance, unemployment insurance compensation, medical benefits, and other forms of family assistance) have also shown an impact on suicide. A study by Flavin and Radcliff (2009) examined the impact of states' per capita spending on transfer payments, medical benefits, and family assistance (Temporary Assistance to Needy Families – TANF) and total state spending on suicide rates between 1990-2000, controlling for a number of suicide risk factors (e.g., residential mobility, divorce rate, unemployment rate) at the state level. As per capita spending on total transfer payments, medical benefits, and family assistance increased there was an associated decrease in state suicide rates. Moreover, it wasn't spending in general that was associated with the reduction but spending on these types of assistance. In terms of lives saved, Flavin & Radcliff calculated the cost of reducing a state's suicide rate by a full point for the years studied. At the national level, they estimated that 3,000 fewer suicides would occur per year nationwide if every state increased their per capita spending on these types of assistance by \$45 per year (Flavin & Radcliff, 2009).

- **Housing stabilization policies.** The *National Neighborhood Stabilization Program* was designed to help neighborhoods suffering from high rates of foreclosure and abandonment by slowing the deterioration of the neighborhoods and providing affordable housing options for low, moderate, and middle-income homebuyers. This program also offers financial assistance to eligible individuals for the purchase of a new home. Although this program has not been rigorously evaluated for its impact on suicide outcomes, it addresses foreclosure and eviction, which are risk factors for suicide. A longitudinal analysis of annual data on suicides and foreclosures demonstrated that as the proportion of foreclosed properties increased in U.S. states, so did the state suicide rate, particularly among working-aged adults (Houle & Light, 2014). Another study of data from 16 U.S. states participating in the National Violent Death Reporting System found

that suicides precipitated by home foreclosures and evictions increased more than 100% from 2005 (before the housing crisis began) to 2010 (after it had peaked; Fowler, Gladden, Vagi, Barnes, and Frazier (2015)). Most of these suicides occurred prior to the actual loss of the decedent's home. These findings suggest that integrating suicide prevention resources, messaging, and referrals into financial, foreclosure, and move-out planning and counseling services may help to prevent suicide.



## Strengthen Access to Mental Health Care

### Rationale

While most people with mental health problems do not attempt or die by suicide (Olfson, Gerhard, Huang, Crystal, & Stroup, 2015; Owens, 2002), and risk conferred by mental illnesses differ (Arsenault-Lapierre, Kim, & Turecki, 2004; E. C. Harris & Barraclough, 1997; Tyrer, Reed, & Crawford, 2015), previous research indicates that mental illness is an important risk factor for suicide (E. C. Harris & Barraclough, 1998; World Health Organization, 2014). Studies suggest that up to 90% of people who die by suicide may have had a mental illness at the time of their deaths (Arsenault-Lapierre et al., 2004; Cavanagh, Carson, Sharpe, & Lawrie, 2003; Isometsa, 2001). State-level suicide rates have also been found to be correlated with general mental health measures such as depression (Lang, 2013; Mark, Shern, Bagalman, & Cao, 2007). Findings from the National Comorbidity Survey indicate that relatively few people in the U.S. with mental health disorders receive treatment for those conditions (Kessler et al., 2005). Lack of access to mental health care is one of the contributing factors related to the underuse of mental health services (Cunningham, 2009). Identifying ways to improve access to timely, affordable, and quality mental health care for people in need is a critical component to suicide prevention (World Health Organization, 2014). Apart from the treatment benefits, it can also serve to normalize help-seeking behavior and increase the use of such services.

### Approaches

One approach to strengthening access to mental health care is through the provision of mental health coverage in health insurance policies.

- **Coverage of mental health conditions in health insurance policies.** Federal and state laws include provisions for equal coverage of mental health services in health insurance plans that is on par with coverage for other health concerns (i.e., mental health parity). Benefits and services covered include such things as the number of visits, co-pays, deductibles, inpatient/outpatient services, prescription drugs, and hospitalizations. If a state has a stronger mental health parity law than the federal parity law, then insurance plans regulated by the state must follow the state parity law. Federal parity replaces the state law only in cases where the state law prevents the application of the federal parity law (e.g., includes coverage for some mental health conditions but not others). Equal coverage does not necessarily imply good coverage as health insurance plans vary in the extent to which benefits and services are offered to address various health conditions. Rather it helps to ensure that mental health services are covered on par with other health concerns.

### Potential Outcomes

- Increased utilization of mental health services

- Decreased symptoms of mental illnesses
- Decreased rates of suicide attempts
- Decreased rates of suicide

## Evidence

There is evidence suggesting that coverage of mental health conditions in health insurance policies can reduce risk factors associated with suicide and may directly impact suicide rates.

- **Coverage of mental health conditions in health insurance policies.** The National Survey of Drug Use and Health is a nationally representative survey of the U.S. population that provides data on substance use, mental health conditions, and services utilization. Using data from this survey, K. M. Harris, Carpenter, and Bao (2006) found that 12 months after states enacted *mental health parity laws*, self-reported use of mental healthcare services significantly increased. Moreover, subsequent research by Lang (2013) examined state mental health laws and suicide rates between 1990 and 2004 and found that mental health parity laws, specifically, were associated with an approximate 5% reduction in suicide rates. This reduction, in the 29 states with parity laws, equated to the prevention of 592 suicides per year and a cost savings of \$1.3-3.1 million per suicide prevented (Lang, 2013).



## Create Protective Environments

### Rationale

Prevention efforts that focus not only on individual behavior change (e.g., help-seeking, treatment interventions) but on changes to the environment can increase the likelihood of positive behavioral and health outcomes (Haddon, 1980). Creating environments that address risk and protective factors where individuals live, work, and play, can help prevent suicide (Dahlberg & Krug, 2002; U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). For example, rates of suicide and suicide attempts are elevated in certain occupational groups (Han et al., 2016; McIntosh et al., 2016), therefore, changes to the organizational culture in these occupations, by way of implementation of supportive policies or even physical modifications to the workplace environment, can change social norms, encourage help-seeking, and demonstrate that good health and mental health are valued and that stigma and other risk factors for suicide are not (K. L. Knox et al., 2010; National Action Alliance for Suicide Prevention Workplace Task Force, 2015). Similarly, modifying the characteristics of the environment to prevent harmful behavior such as access to lethal means can reduce suicide rates, particularly in times of crisis (Beautrais, Gibb, Fergusson, Horwood, & Larkin, 2009; Crosby, Espitia-Hardeman, Ortega, & Lozano, 2013; Kaplan et al., 2013; Miller, Warren, Hemenway, & Azrael, 2015; C. W. Runyan et al., 2016).

### Approaches

The current evidence suggests three promising approaches for creating environments that protect against suicide.

- **Reducing access to lethal means among persons at-risk of suicide.** Means of suicide such as firearms, hanging/suffocation, or jumping from heights provide little opportunity for rescue and, as such, have high case fatality rates (e.g., about 85% of people who use a firearm in a suicide attempt will die from the injury). Research also indicates that 1) the interval between thinking about and attempting suicide can be as short as 5 or 10 minutes (Deisenhammer et al., 2009; Simon et al., 2001) and 2) that people tend *not* to substitute a different method when a highly lethal method is unavailable or difficult to access (Hawton, 2007; Yip et al., 2012). Therefore, increasing the time interval between the thought and the suicide attempt, for example, by making it more difficult to access lethal means, can be lifesaving. The following are examples of approaches reducing access to lethal means for persons at-risk of suicide:
  - *Intervening at Suicide Hotspots.* Suicide hotspots, or places where suicides may take place relatively easily, include tall structures (e.g., bridges and cliffs), railway tracks, and isolated locations such as parks. Efforts to prevent suicide at these locations include

erecting barriers to prevent jumping and installing signs and telephones to encourage individuals who are considering suicide, to seek help (Cox et al., 2013).

- *Safe Storage Practices.* Safe storage of medications, firearms, and other household products can reduce the risk for suicide by separating individuals who may be vulnerable and/or impulsive from easy access to lethal means. Such practices may include education and counseling around storing firearms--locked in a secure place (e.g., in a gun safe or lock box), unloaded and separate from the ammunition--and keeping medicines in a locked cabinet or other secure location away from people who may be at risk or who have made prior attempts (Rowhani-Rahbar, Simonetti, & Rivara, 2016; C. W. Runyan et al., 2016).
- **Organizational policies and culture** that promote protective environments may be implemented in places of employment. Such policies and cultural values may promote prosocial behavior (e.g., asking for help), skill building, changing social norms, referral and access to helping services (e.g. mental health, substance abuse treatment, financial counseling), and encourage leadership support from the top down. Such policies and cultural shifts can positively impact organizational climate and morale and help prevent suicide and its related risk factors (e.g. depression, social isolation) (National Action Alliance for Suicide Prevention Workplace Task Force, 2015).
- **Community-based policies to reduce excessive alcohol use.** Research studies in the United States have found that greater alcohol availability is positively associated with alcohol-involved suicides (Escobedo & Ortiz, 2002; Giesbrecht et al., 2015). Policies to reduce excessive alcohol use broadly include zoning to limit alcohol outlet locations and density, taxes on alcohol, and bans on the sale of alcohol for individuals under the legal drinking age. These policies are important because acute alcohol use has been found to be associated with more than one-third of suicides and approximately 40% of suicide attempts (Cherpitel, Borges, & Wilcox, 2004).

### Potential Outcomes

- Increase in safe storage of means
- Reduction in suicide attempts
- Reduction in suicide deaths
- Increase in help-seeking
- Reduction in alcohol-related suicide deaths

### Evidence

The evidence for the effectiveness reducing access to lethal means for person at-risk of suicide and other ways to establish protective environments is some of the strongest in the field (Zalsman et al., 2016).



- **Reducing access to lethal means among persons at-risk of suicide.** A meta-analysis examining the impact of *suicide hotspot interventions* implemented in combination or in isolation, both in the U.S. and abroad, found associated reduced rates of suicide (Cox et al., 2013; Pirkis et al., 2015). For example, after erecting a barrier on the Jacques-Cartier bridge in Canada, the suicide rate from jumping from the bridge decreased from about 10 suicide deaths per year to about 3 deaths per year (Perron, Burrows, Fournier, Perron, & Ouellet, 2013). Moreover, the reduction in suicides by jumping was sustained even when all bridges and nearby jumping sites were considered, suggesting little to no displacement of suicides to other jumping sites (Perron et al., 2013). Further evidence for the effectiveness of bridge barriers was demonstrated by a study examining the impact of the *removal* of safety barriers from the Grafton Bridge in Auckland, New Zealand. After removal of the barrier, sadly, both the number and rate of suicide increased fivefold (Beautrais, 2001; Beautrais et al., 2009).

Another form of means reduction involves implementation of *safe storage practices*. In a case-control study of firearm-related events identified from 37 counties in Washington, Oregon, and Missouri, and from 5 trauma centers, Grossman et al. (2005) found that storing firearms unloaded, separate from ammunition, in a locked place and/or secured with a safety device was protective of suicide attempts among adolescents. Further, a recent systematic review of clinic and community-based education and counseling interventions suggested that the provision of safety devices significantly increased safe firearm storage practices compared to counseling alone or compared to the provision of economic incentives to acquire safety devices on one's own (Rowhani-Rahbar et al., 2016).

Another program, *The Emergency Department Counseling on Access to Lethal Means (ED CALM)*, trained psychiatric emergency clinicians in a large children's hospital to provide lethal means counseling and safe storage boxes to parents of patients under age 18 receiving care for suicidal behavior. In a pre-post quality improvement project, Runyan et al (2016) found that at post-test 76% (of the 55% of parents followed up, n=114) reported that all medications in the home were locked up as compared to fewer than 10% at the time of the initial emergency department visit. Among parents who indicated the presence of guns in the home at pre-test (i.e. 67%), all (100%) reported guns were currently locked up at post-test (C. W. Runyan et al., 2016).

- **Organizational policies and culture.** *Together for Life* is a workplace program of the Montreal Police Force implemented to address suicide among officers. Policy and program components were designed to foster an organizational culture that promoted mutual support and solidarity among all members of the Force. The program included training of supervisors, managers and all units to improve competencies in identifying suicidal risk and to improve use and awareness of existing resources. The program also included an education campaign to improve awareness and help-seeking (Mishara & Martin, 2012). Police suicides were tracked over 12 years and

compared to rates in the control city of Quebec. The suicide rate in the intervention group decreased significantly by 78.9% to a rate of 6.42 suicides per 100,000 population per year compared to an 11% increase in the control city (rate: 29.0 per 100,000) (Mishara & Martin, 2012).

Another example of this approach is the *United States Air Force Suicide Prevention Program (AFSPP)*. AFSPP included 11 policy and education initiatives and was designed to change the culture of the Air Force surrounding suicide. The program uses leaders as role models and agents of change, establishes expectations for behavior related to awareness of suicide risk, develops population skills and knowledge (i.e., education and training), and investigates every suicide (i.e., outcomes measurement). The program represents a fundamental shift from viewing suicide and mental illness solely as medical problem and instead sees them as larger service-wide problems impacting the whole community (K. L. Knox, Litts, Talcott, Feig, & Caine, 2003). Using a time-series design to examine the impact of the AFSPP program on various violence-related outcomes, researchers found that the program was associated with a 33% relative risk reduction in suicide (K. L. Knox et al., 2003). The program was also associated with relative risk reductions in related outcomes including moderate and severe family violence (30% and 54%, respectively), homicide (51%), and accidental death (18%) (K. L. Knox et al., 2003). A longitudinal assessment of the program over the period 1981 to 2008 (16 years before the 1997 launch of the program and 11 years post-launch) found significantly lower rates of suicide after the program was launched than before (K. L. Knox et al., 2010). These effects were sustained over time, except in 2004, which the authors found was associated with less rigorous implementation in that year than in the other years (K. L. Knox et al., 2010).

- **Community-based policies to reduce excessive alcohol use.** While multiple policies to limit alcohol use exist, several studies on alcohol outlet *density*, specifically, suggest that measures to reduce alcohol outlet density can potentially reduce alcohol-involved suicides. Additionally, a longitudinal analysis of alcohol outlet density, suicide mortality, and hospitalizations for suicide attempts over 6 years in 581 California zip codes indicated that the density of bars, specifically, is related to suicide and suicide attempts, particularly in rural areas (Johnson, Gruenewald, & Remer, 2009).



## Promote Connectedness

### Rationale

Sociologist, Emile Durkheim theorized in 1897 that weak social bonds, i.e. lack of connectedness, are among the chief causes for suicidality (Durkheim, 1897/1951). *Connectedness* is the degree to which an individual or group of individuals are socially close, interrelated, or share resources with others (Centers for Disease Control and Prevention, 2009). Social connections can be formed within and between multiple levels of the social ecology (Dahlberg & Krug, 2002), for instance between individuals (e.g. peers, neighbors, co-workers), families, schools, neighborhoods, workplace, faith communities, cultural groups, and society as a whole. Related to connectedness, *social capital* refers to a sense of trust in one's community and neighborhood, social integration, and also the availability and participation in social organizations (Beyer, Layde, Hamberger, & Laud, 2015; Muennig, Cohen, Palmer, & Zhu, 2013). Many ecological cross-sectional and longitudinal studies have examined the impact of aspects of social capital on depression symptoms, depressive disorder, mental health more generally, and suicide. While the evidence is still being built the pattern is towards an inverse association between social capital measured by social trust, community/ neighborhood engagement, and improved mental health. Connectedness and social capital together can serve to protect against suicidal behaviors by decreasing isolation, encouraging adaptive coping behaviors, increasing belongingness, personal value and worth all of which helps individuals to build resilience in the face of adversity. Connectedness can also provide individuals with better access to formal supports and resources, mobilize communities to meet the needs of its members and provide collective primary prevention activities to the community as a whole (Centers for Disease Control and Prevention, 2009).

### Approaches

Promoting connectedness among individuals and within communities through modeling peer norms and enhancing community engagement can protect against suicide.

- **Peer norm approaches** seek to normalize prosocial behaviors/protective factors for suicide such as help-seeking, reaching out and talking to trusted adults, and peer connectedness. These approaches typically target youth and are delivered in school settings but can also be implemented in community settings.

- **Community engagement activities.** Community engagement is an aspect of social capital. Community engagement approaches may involve residents participating in a range of activities, including religious activities, community clean-up and greening activities, and physical exercise. These activities provide opportunities for residents to become more involved in the community and to connect with other community members, organizations, and resources, resulting in enhanced overall physical health, reduced stress, and decreased depressive symptoms, thereby reducing risk of suicide.

### Potential Outcomes

- Reduction in maladaptive coping attitudes and behaviors
- Increase in healthy coping attitudes and behaviors
- Increase in referrals for youth in distressed
- Increase help-seeking behaviors
- Positive perception of adult support

### Evidence

Current evidence suggests that peer norm approaches and community engagement can reduce risk factors associated with suicidal behaviors.

- **Peer norm approaches.** Evaluations show that programs such as *Sources of Strength* can improve school norms and beliefs about suicide that are created and disseminated by student peers. In a randomized controlled trial of *Sources of Strength* conducted with 18 high-schools (6 metropolitan, 12 rural), Wyman et al. (2010) found that the program improved peer leaders' adaptive norms regarding suicide, their connectedness to adults, and school engagement. Peer leaders were also more likely than controls to refer a suicidal friend to an adult. Among students, the intervention increased perceptions of adult support for suicidal youths and the acceptability of seeking help. Perception of adult support increased most in students with a history of suicidal ideation. Finally, trained peer leaders also reported a greater decrease in maladaptive coping attitudes compared with untrained leaders (Wyman et al., 2010).
- **Community engagement activities.** A vacant lot greening initiative was undertaken in Philadelphia between 1999 and 2008. Local residents and community members worked together to green 4,436 lots (or 7.8 million square feet) in 4 areas of the city. Researchers found significant associated reductions in community residents' self-reported stress levels and engagement in more physical exercise than residents in control vacant lot areas. Other benefits included reductions in firearm assaults and vandalism (Branas et al., 2011).



## Teach Coping and Problem-Solving Skills

### Rationale

Building life skills prepares individuals to successfully tackle every day challenges and adapt to stress and adversity. Life skills encompasses many concepts, but most often include coping and problem-solving skills, conflict resolution, and critical thinking. Life skills are important in shielding individuals from suicidal behaviors (World Health Organization, 2014). Suicide prevention programs that focus on life and social skills training are drawn from social cognitive theories (Bandura, 1986), surmising that individuals who engage in suicidal behavior is attributed to either direct learning, modeling, and environmental and individual (e.g. hopelessness) characteristics. The literature linking life skills and suicide is robust--- The inability to employ adequate coping strategies to cope with immediate stressors or identify and find solutions for problems have been characterized among suicide attempters (Pollock & Williams, 2004). Treatments that include bolstering problem skills (Goldsmith, Pellmar, Kleinman, & Bunney, 2002) and include problem-solving techniques (Ghahramanlou-Holloway, Bhar, Brown, Olsen, & Beck, 2012; Townsend et al., 2001) appear to reduce suicidal ideation and attempts more effectively. Prevention programs focused on teaching these skills target youth, parents and families and have been used with both universal and at-risk populations. While many do not target suicidal behaviors directly, these programs strive to train youth and parents important life skills to offset the underlying vulnerabilities that contribute to engaging in high risk behaviors early in life.

### Approaches

Current evidence provides support for the following two approaches:

- **Social emotional learning programs** focus on developing and strengthening communication and problem-solving skills, emotion regulation, conflict resolution, help seeking and coping skills. These approaches address a range of risk and protective factors for suicidal behavior. They provide children and youth with skills to resolve problems in relationships, school, and with peers, and help youth to address other negative influences (e.g., substance use) associated with suicide. These approaches are typically delivered to all students in a particular grade or school, although some programs also focus on groups of students considered to be at high-risk for suicide. Opportunities to practice and reinforce skills are an important part of programs that work (Herman, Borden, Reinke, & Webster-Stratton, 2011).
- **Parenting skill and family relationship programs** are designed to strengthen parenting skills, enhance positive parent-child interactions, and improve children's behavioral and emotional skills and abilities. Several parenting and family relationship programs have been shown in rigorous evaluations to improve resilience and reduce risk factors for various behaviors, including



ones closely related to suicide, such as depression, internalizing behaviors, and substance abuse (M. S. Knox, Burkhart, & Hunter, 2010).

### Potential Outcomes

- Reduction in suicide attempts and suicide ideation
- Enhanced knowledge of risk and protective factors associated with suicide
- Reduction in suicide risk behaviors (i.e., depression, anxiety, conduct problems, substance abuse)
- Improve and normalize help-seeking behavior
- Enhance social competence and emotional regulation skills
- Enhance problem-solving and conflict management skills

### Evidence

There are several programs with evidence that support teaching social, emotional and parenting skills to reduce suicidal behaviors and associated risk factors.

- **Social emotional learning programs.** The *Youth Aware of Mental Health Program (YAM)* is a program developed for teenagers that uses interactive dialogue and role-playing to teach adolescents about the risk and protective factors associated with suicide (including knowledge about depression and anxiety) and enhances their problem-solving skills for dealing with adverse life events, stress, school and other problems. The program includes 3 hours of role-play sessions and interactive workshops combined with a booklet that students can keep, educational posters displayed in classroom, and interactive lectures about mental health at the beginning and end of the program (Wasserman et al., 2014). In a cluster-randomized controlled trial of YAM conducted across 10 European Union countries and 168 schools, students participating in the YAM program were significantly less likely to have an incident suicide attempt (OR 0.45, 95%CI 0.24–0.85;  $p=0.014$ ) and severe suicidal ideation (0.50, 0.27-0.92;  $p=0.025$ ) at the 12-month follow-up compared to the control group. Additionally, related to severe suicide ideation, in the YAM group absolute risk fell by 0.50% and RR fell by 49.6% (Wasserman et al., 2014).

*Signs of Suicide (SOS)* is another school-based prevention program for students aged 13-17. The program includes guided classroom discussions about suicide and depression. As part of the program, students are screened for depression and suicide risk and referred for professional help as indicated. The program is designed to increase knowledge about suicide and risk factors associated with suicidal behavior as well as improve and normalize help-seeking behavior (Schilling, Aseltine, & James, 2016). In a randomized controlled trial, SOS was shown to reduce self-reported suicide attempts at 3-months post intervention among



participating students compared to control students. The SOS program also increased students' knowledge of how to get help for themselves or friends for depression and/or suicidal thoughts, and favorable attitudes toward help-seeking. SOS participants with a lifetime history of suicide attempt were also less likely to report planning a suicide in the 3 months following the program compared to lower-risk participants (Schilling et al., 2016).

Finally, the *Good Behavior Game (GBG)* is a classroom-based program for elementary school children aged 6-10; it represents an example of upstream suicide prevention programming. The program uses a team-based behavior management strategy that promotes good behavior by setting clear expectations for good behavior and consequences for maladaptive behavior. The goal of the GBG is to create an integrated classroom social system that is supportive of all children being able to learn with little aggressive or disruptive behavior (Wilcox et al., 2008). In an outcome evaluation of the GBG, first graders assigned to GBG reported half the adjusted odds of suicidal ideation and suicide attempts. The beneficial effect of the program was consistent for suicidal ideation regardless of whether baseline covariates were included. The GBG effect on attempts was less robust in some adjusted models including caregiver mental health. In the second cohort of GBG students, neither suicidal ideation nor suicide attempts were significantly different between GBG and the control interventions (Wilcox et al., 2008). This finding likely arose due to the lack of implementation fidelity and pointed to the need for GBG to be delivered with precision, consistency, and teacher support. GBG was also found to be associated with reduced risk of later substance abuse, a risk factor for suicide (Kellam et al., 2008).

- **Parenting skill and family relationship programs.** Parenting and family skills training approaches have shown promising impacts in preventing key risk factors associated with suicide. For example, the *Incredible Years (IY)* is a comprehensive group training program for parents, teachers and children designed to reduce conduct and substance abuse problems, two important suicide risk factors, in youth by improving protective factors such as responsive and positive parent-teacher-child interactions and relationships, emotion self-regulation and social competence (all protective factors for suicide) (Herman et al., 2011). The program includes 9- 20 sessions offered in community-based settings (e.g., religious, recreation centers, mental health treatment centers, and hospitals). Several studies have demonstrated the effect of the IY program on reducing internalizing symptoms, such as anxiety and depression, and child conduct problems (C. H. Webster-Stratton, Reid, & Beauchaine, 2011; Webster-Stratton, Jamila Reid, & Stoolmiller, 2008). The program is also associated with improved problem-solving and conflict management; these skills were maintained at 1-year follow-up (Reid, Webster-Stratton, & Hammond, 2003; C. Webster-Stratton & Hammond,

1997; C. Webster-Stratton, Reid, & Hammond, 2001). The program demonstrated greater benefits as the dosage of the intervention increased (Herman et al., 2011).

Additionally, *Strengthening Families 10-14* is a program that involves sessions between parents, youth, and family with the goal of improving parents' skills for disciplining, managing emotions and conflict, and communicating with their children; promoting youths' interpersonal and problem-solving skills; and creating family activities to build cohesion and positive parent-child interactions. The premise of the program is that developing these skills for both parents and children will reduce internalizing behavior and adolescent substance abuse, two important risk factors for suicide (Spoth, Gyll, & Day, 2002). *Strengthening Families* has been shown to decrease externalizing behaviors, alcohol use, and drug use among youth participants and reductions in depression, alcohol use, and drug use among participating families (Spoth et al., 2002).



## Identify and Support People At-Risk

### Rationale

In order to decrease suicide, attention to people at increased or high risk is necessary as these individuals tend to experience suicidal behavior at higher than average rates. These vulnerable or disadvantaged populations include, but are not limited to, individuals with lower socio-economic status or who are living with a mental health problem; people who have attempted suicide previously, individuals who are institutionalized, have been victims of violence, or are homeless; and members of certain ethnic minority groups. Supporting these vulnerable groups requires proactive case finding along with access to, and retention in, mental health services. Finding effective ways of identifying at-risk or vulnerable groups, customizing services to make them accessible and maintaining care remain key challenges. For example, simply improving services does not guarantee that those services will be used by those most in need of them, nor will it necessarily increase the number of people who follow treatments that are recommended. People who are disadvantaged face social and economic issues that may adversely affect their ability to respond to the treatments or advice that are offered.

### Approaches

The following three approaches focus on identifying and supporting people at increased risk.

- **Gatekeeper training** is designed to train teachers, coaches, providers and others in the community to identify people who may be at risk of suicide and to respond effectively, including facilitating treatment seeking and support services. Gatekeeper training is typically implemented in schools to identify at-risk youth and within health care settings to identify adults (and youth).
- **Screening combined with care management and overall continuity of care** has been used in primary care and behavioral health care settings to assure that people who may be at high-risk of suicide are identified and receive ongoing treatment as needed, particularly after inpatient discharge and other transitions within the healthcare system so they don't 'slip through the cracks'. These approaches typically employ screening for depression and/or suicide combined with collaborative treatment planning between patients and their providers and patient follow-up.
- **Crisis intervention.** These approaches provide support and referral services, typically by connecting a person in crisis (or a friend or family member of someone at-risk) to trained volunteers and/or professional staff via telephone hotline, online chat, or text messaging. Crisis intervention approaches are intended to impact key risk factors for suicide, including feelings of depression, hopelessness, and subsequent mental health care utilization. Like means reduction,

crisis interventions can put space or time between an individual who may be considering suicide and harmful behavior.

### Potential Outcomes

- Reduction in suicide attempts
- Reduction in suicide deaths
- Increased identification of individuals at-risk for suicidal behavior
- Increased at-risk individuals in treatment
- Increased community members trained to identify at-risk individuals
- Increased referrals for health care

### Evidence

There is evidence that community gatekeeper programs are successful in reducing suicides and suicide attempts but the efforts must be maintained (Substance Abuse and Mental Health Services Administration, 2014). However, there is limited evidence for effectiveness screening programs, but at the same time, standard principles for public health screening make them promising (Pena & Caine, 2006). The number of studies evaluating crisis intervention services is limited, but a few studies do indicate that those who use the hotline services have decreased suicidal thoughts and behavior.

- **Gatekeeper training.** One example of gatekeeper training is the *Mental Health First Aid (MHFA)* program. This program is designed for the lay public and consists of three weekly sessions of three hours each. Participants learn the symptoms of people in mental health crises and/or in the early stages of mental health problems (i.e., those experiencing suicidal thoughts and behavior, acute stress reaction, panic attacks and acute psychotic behavior, and depression, anxiety, and psychotic disorders), possible risk factors, and where and how to get evidence-based effective help (Kitchener & Jorm, 2004). In a randomized controlled trial of 300 participants of *MHFA*, the intervention group reported greater confidence in providing help to others, greater likelihood of advising people to seek professional help, improved concordance with health professionals about treatments, and decreased stigmatizing attitudes. Additionally, the intervention resulted in improved mental health of the participants themselves. All results were statistically significant at  $p < .05$ . (Kitchener & Jorm, 2004). Additional research rigorously evaluating *MHFA* for its impact on the first aid recipients themselves and suicidal behavior is needed (Kitchener & Jorm, 2006).

Gatekeeper training has also been a core part of all *Garret Lee Smith (GLS) Suicide Prevention Program* which is in place in 49 states and 48 tribes. A multi-site evaluation assessed the



connection between community gatekeeper training and a reduction of suicide attempts and deaths by comparing the change in suicide mortality rates and nonfatal suicidal behavior among the population aged 10-24 in counties implementing *GLS* trainings, with the trajectory observed in similar counties that did not implement these trainings. Counties implementing *GLS* trainings had significantly lower youth suicide rates the year following the training implementation (-1.07,  $p=.03$ ) (Walrath, Garraza, Reid, Goldston, & McKeon, 2015). This finding represents a decrease of 1 suicide death per 100,000 10 to 24 year olds or the avoidance of approximately 237 deaths in this age group between 2007 and 2010. Counties implementing *GLS* program activities also had significantly lower suicide attempt rates among youths 16 to 23 years of age in the year following implementation of the *GLS* program than did similar counties that did not implement *GLS* program activities (4.9 fewer attempts per 1000 youths [95% CI, 1.8-8.0 fewer attempts per 1000 youths];  $p = .003$ ; (Godoy Garraza, Walrath, Goldston, Reid, & McKeon, 2015)). More than 79 000 suicide attempts may have been averted during the period studied following implementation of the *GLS* program.

- **Screening combined with care management and overall continuity of care.** The *Henry Ford Perfect Depression Care* program was the pre-cursor to *Zero Suicide*, and its overall goal was to eliminate suicide. More broadly, though, the aim was to completely redesign depression care delivery to achieve breakthrough improvement in quality and safety by focusing on six aims: effectiveness, safety, patient centeredness, timeliness, efficiency, and equity among patients. The program developed concrete measures to assess progress on each of these aims and began with screening and assessment of each patient for suicide risk with coordinated continuous follow-up care system wide (C. E. Coffey, 2006). An examination of the impact of the *Henry Ford Perfect Depression Care (Pre-cursor to Zero Suicide)* program found that there was a dramatic and statistically significant decrease in the rate of suicide between the baseline years prior to the intervention (1999 and 2000) to the intervention years (2002-2009). During this time period, the suicide rate fell 82% (C. E. Coffey, 2006; C. E. Coffey, Coffey, & Ahmedani, 2013). Further, suicide rates also declined among HMO members who participated in targeted suicide prevention efforts and received mental health specialty services. However, for those HMO members who accessed only general medical services as opposed to specialty mental health services, the suicide rate increased (M. Coffey, Coffey, & Ahmedani, 2015).
- **Crisis intervention.** Suicide prevention hotlines are one way to provide crisis intervention. In an evaluation of the effectiveness of the *National Suicide Prevention Lifeline (NSPL)* to prevent suicide, 1,085 suicidal individuals who called the hotline completed a standard risk assessment for suicide, and 380 of those completed a follow-up assessment between 1 and 52 days after the initial assessment. Researchers found that over half of the initial sample were seriously considering suicide when they called, and they had a plan for their suicide. Researchers also

found that participants experienced significant decreases in suicidality over the course of the telephone session, and that levels of hopelessness and psychological pain continued to decrease after their initial call (Gould, Kalafat, Harrismunfakh, & Kleinman, 2007).

In another study, this time employing a randomized controlled trial, Gould, Cross, Pisani, Munfakh, and Kleinman (2013) assessed the impact of the *Applied Suicide Intervention Skills Training (ASIST)*, a widely implemented training program that helps hotline counselors, emergency workers, and other gatekeepers to identify and connect with suicidal individuals, understand their reasoning for living and dying, and assist with safely connecting those in need to available resources. The training was evaluated across the NSPL network of hotlines over the period 2008-2009. Using data from 1,410 suicidal individuals who called 17 Lifeline centers, researchers found that compared to callers who spoke to counselors that received the usual care training, individuals who spoke with counselors trained in *ASIST* were significantly more likely to feel less depressed, less suicidal, less overwhelmed, and more hopeful by the end of their call to the hotline. Counselors trained in *ASIST* were also more skilled at keeping callers on the phone longer and establishing a connection with them. However, training in *ASIST* did not result in more comprehensive suicide risk assessments than usual care training (Gould et al., 2013).



## Intervene to Lessen Harms and Prevent Future Risk

### Rationale

Individuals who have experienced mental health challenges, suicidal ideation, and/or who have made suicide attempts and/or have engaged in non-suicidal self-injury are at increased risk of suicide (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). Risk of suicide can also increase among those who have lost a friend, family member, co-worker, or other acquaintance to suicide (Pitman, Osborn, King, & Erlangsen, 2014). Exposure to sensationalized or uninformed reporting regarding on suicide may heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to suicide contagion (Etzersdorfer & Sonneck, 1998; Niederkrotenthaler & Sonneck, 2007).

### Approaches

A broad array of approaches to lesson harms and reduce future risk of suicide among those at increased risk include the provision of mental health care and improved continuity of care, improving linkage to care through active post-discharge planning and follow-up that decreases barriers to ongoing therapeutic support, increasing connectedness to supportive others, addressing bereavement, and framing communications to emphasize resilience, decrease negative affect, and to prevent contagion.

- **Treatment for people at-risk of suicide** typically includes various forms of psychotherapy delivered by licensed providers to help individuals with mental health problems and other risk factors for suicide with problem-solving, impulsivity and emotion regulation.
- **Treatment to prevent re-attempts.** These approaches typically include follow-up contact and use diverse modalities (e.g., home visits, mail, telephone, e-mail) to engage recent suicide attempt survivors in continued treatment to prevent re-attempts. Treatment may focus on improved coping skills, mindfulness, and other emotional regulation skills, and may include case management home visits to increase adherence to treatment and continuity of care; and one-on-one interpersonal therapy and/or group therapy. Approaches that engage and connect attempters to peers and providers are especially important because many attempters do not present to aftercare; 12%-25% reattempt within a year, and 3%-9% of attempt survivors die by suicide within 1 to 5 years of their initial attempt (Inagaki et al., 2015)
- **Postvention** approaches are implemented *after* a suicide has taken place and may include debriefing sessions, counseling, and/or bereavement support groups for surviving friends and family members/loved ones. These programs have not typically been evaluated for their impact on suicide or suicidal behavior but may reduce survivors' guilt, feelings of depression, and complicated grief (Szumilas & Kutcher, 2011).

- **Safe messaging following a suicide.** The manner in which information on a recent suicide is communicated to the public (e.g. school assemblies, mass media, social media) can heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to suicide contagion. Therefore, responsible and safe reporting may help prevent suicide and/or suicide contagion.

### Potential Outcomes

- Reduction in mental health-related sequelae
- Increase connectedness
- Improved coping skills
- Improved messaging following suicide
- Reduction in re-attempts

### Evidence

The evidence addressing strategies to lesson harm and prevent future risk of suicide includes the evaluation of effects of specific approaches on risk and protective factors as well as suicide-related mortality. However, because the evaluation of suicide-related mortality requires large sample sizes and extended follow-up, much of the evidence in this area primarily focuses on risk and protective factors.

- **Treatment for people at-risk of suicide.** There are a number of treatments with evidence of impact on risk and protective factors for suicide. One example is the *Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)* program. *IMPACT* aims to prevent suicide among older primary care patients by reducing suicide ideation and depression in primary care settings. It facilitates the development of a therapeutic alliance, a personalized treatment plan that includes patient preferences, as well as proactive follow-up (biweekly during an acute phase and monthly during continuation phase) by a depression care manager (Hunkeler et al., 2006). The program has been shown to significantly improve quality of life, and to reduce functional impairment, depression and suicidal ideation over 24-months of follow-up (Hunkeler et al., 2006; Unutzer et al., 2006) relative to patients who received care as usual.

Another example is *Collaborative Assessment and Management of Suicidality (CAMS)*, which is a therapeutic approach for suicide-specific assessment and treatment of patient's suicide risk. This flexible approach can be used across treatment settings and clinician theoretical orientations and involves the clinician and patient working together in an interactive assessment process to develop patient-specific treatment plans. *CAMS* sessions are collaborative and involve constant



patient about what is and is not working with the ultimate goal of enhancing the therapeutic alliance and increasing treatment motivation in the suicidal patient. CAMS been tested and supported in 6 correlational studies (Jobes, 2012), in a variety of inpatient and outpatient settings and in one RCT with several additional RCTs under way. CAMS has been associated with significant improvements in suicidal ideation, overall symptom distress, and feelings of hopelessness at 12 month follow-up among a community-based sample of suicidal outpatients. (Comtois et al., 2011).

Other examples include *Dialectical Behavioral Therapy (DBT)* and *Attachment-Based Family Therapy (ABFT)*. DBT is a multicomponent therapy for individuals at high risk for suicide and who may struggle with impulsivity and emotional regulation. The components of DBT include individual therapy, group skills training, between-session telephone coaching and a therapist consultation team. In a randomized controlled trial of women with recent suicidal or self-injurious behavior, those receiving DBT were half as likely to make a suicide attempt at two-year follow-up than women receiving community treatment (23% vs 46%), required less hospitalization for suicide ideation, and had lower medical risk across all suicide attempts and self-injurious acts combined (Linehan et al., 2006).

ABFT is a program for adolescents aged 12-18 and is designed to treat clinically diagnosed major depressive disorder, eliminate suicidal ideation, and reduce dispositional anxiety (Diamond et al., 2010). A randomized controlled trial of ABFT found that suicidal adolescents assigned to ABFT experienced significantly greater improvement in suicidal ideation over 24 weeks of follow-up than did adolescents assigned to enhanced usual care (-4.37 vs. -2.34;  $p = .001$ ;  $d=0.97$ ). Additionally, a higher percentage of ABFT participants reported no suicidal ideation in the week prior to assessment at 12 weeks than did adolescents receiving enhanced usual care (69.2% vs. 34.6%;  $p = .01$ ; OR= 4.25) and at 24 weeks (82.1% vs. 46.2%;  $p = .006$ ; OR=5.37) (Diamond et al., 2010).

- **Treatment to prevent re-attempts.** Several strategies that aim to prevent re-attempts have demonstrated impact on reducing suicidal behavior. For example, *Emergency Department Brief Intervention with Follow-up Visits* is a program that involves a one-hour discharge information session that addresses suicidal behavior, distress, risk and protective factors, alternatives to suicidal behavior, and referral options, combined with nine follow-up contacts over 18-months (at 1, 2, 4, 7, 11 weeks and 4, 6, 12, 18 months). Follow-up contacts are either conducted by phone or through home visits according to a specific time line for up to 18-months. A randomized controlled trial that enrolled suicide attempters from eight hospital emergency departments in five culturally different sites found that a brief intervention combined with 9 follow-up visits over 18-months was associated with significantly fewer deaths from suicide relative to a treatment-

as-usual group (0.2% versus 2.2%, respectively;  $\chi^2 = 13.83$ ,  $P < 0.001$ ) (Fleischmann et al., 2008).

Another example of treatment to prevent re-attempts involves *active follow-up contact approaches* such as postcards, letters, and telephone calls, are intended to increase a patient's sense of connectedness with health care providers and decrease isolation. These approaches include expression of care and support and typically invite patients to reconnect with their provider. Contacts are made periodically (e.g., monthly or every few months in the first 12 months post-discharge with some programs continuing contact for 2 or more years). These approaches have been found in a meta-analysis conducted by Inagaki et al. (2015) to reduce reattempts by approximately 17% for up to 12 months post-discharge, however, the long-term effects of these approaches on reattempts has not yet been demonstrated. Also, because the number of trials and associated sample sizes included in this meta-analysis were small, it was not possible to determine the effect of active contact and follow-up approaches on death by suicide.

In a randomized controlled trial of post-crisis suicide prevention long-term follow-up contact approach, Motto and Bostrom (2001) found that patients who refused ongoing care but who were randomized to be contacted by letter four times per year had a lower rate of suicide over two years of follow-up than did patients in the control group who received no further contact. Other studies have also shown post-crisis letters and coping cards to be protective against suicide ideation and attempts (Hassanian-Moghaddam, Sarjami, Kolahi, & Carter, 2011; Wang et al., 2016).

Finally, *Cognitive Behavior Therapy for Suicide Prevention (CBT-SP)* is an example of a therapeutic approach to prevent re-attempts. It uses a risk reduction, relapse prevention approach that includes an analysis of proximal risk factors and stressors (e.g., relationship problems, school or work-related difficulties) leading up to and following the suicidal event; safety plan development; skill building; and psychoeducation. *CBT-SP* also has family skill modules focused on family support and communication patterns as well as improving the family's problem solving skills. A randomized controlled trial found of *CBT-SP* found that 10-session outpatient cognitive therapy designed to prevent repeat suicide attempts resulted in a 50% reduction in the likelihood of a suicide reattempt among adults who had been admitted to an emergency department for a suicide attempt relative to treatment as usual (Brown et al., 2005).

- **Postvention** programs are implemented with the goal of providing support to survivors of suicide to reduce their own risk of suicide. One example of a postvention program, *StandBy Response Service (StandBy)*, provides clients with face-to-face outreach and telephone support through a professional crisis response team. Site coordinators develop customized case management plans, referring clients to other existing community services matched to their needs (Visser, Comans, &



Scuffham, 2014). In a study by Visser et al. (2014), *StandBy* clients were significantly less likely to be at high risk for suicidality than a suicide bereaved comparison group who had not had contact with the *StandBy* program (48% and 64% respectively,  $p = 0.005$ ). Additionally, research suggests that active postvention approaches in which outreach to suicide survivors occurs at the scene of a suicide is associated with intake into treatment sooner, greater attendance at support group meetings, and attendance at more meetings compared to passive postvention (versus passive approaches where survivors self-refer for services) (J. Cerel & Campbell, 2008).

- **Safe messaging following a suicide.** Safe messaging after a suicide can help assure that reporting of the event is done in such a way to reduce risk to consumers of news media and other messaging who may be particularly vulnerable. One way to ensure safe messaging following a suicide is to encourage that reporters adhere to *media guidelines for reporting on suicides*. Reports that are both inclusive of suicide prevention messages, stories of hope and resilience, risk and protective factors, and links to helping resources (e.g., hotline) and that avoid sensationalizing events or reducing suicide to one cause can help reduce the likelihood of suicide contagion. The most compelling evidence supporting the effect of *media guidelines* on reduction in suicides comes from Austria. After a sharp increase in suicides on the Viennese subway, media guidelines were introduced and an interrupted time series design was used to evaluate the national impact of the guidelines on subsequent suicides. Changes in the quality and quantity of media reporting resulted in a reduction of 81 suicides annually (95% confidence interval: -149 to -13;  $t = -2.32$ ,  $df = 54$ ,  $p < 0.024$ ) in the Viennese subway system (Niederkrotenthaler & Sonneck, 2007)

## Sector Involvement

Public health can play an important and unique role in addressing suicide. Public health agencies, which typically place prevention at the forefront of efforts and work to create broad population-level impact, can bring critical leadership and resources to bear on this problem. For example, these agencies can serve as a convener, bringing together partners and stakeholders to plan, prioritize, and coordinate suicide prevention efforts. Public health agencies are also well positioned to collect and disseminate data, implement preventive measures, evaluate programs, and track progress. Although public health can play a leadership role in preventing suicide, the strategies and approaches outlined in this technical package cannot be accomplished by the public health sector alone. As noted in the National Strategy to Prevent Suicide, the integration and coordination of prevention activities across sectors and settings is critical for expanding the reach and impact of suicide prevention efforts.

Other sectors vital to implementing this package include, but are not limited to, education, government (local, state, and federal), social services, health services, business, labor, justice, housing, media, and organizations that comprise the civil society sector such as faith-based organizations, youth-serving organizations, foundations, and other non-governmental organizations. Collectively, these sectors can make a difference in preventing suicide by impacting the various contexts and underlying risks that contribute to suicide.

The strategies and approaches described in this technical package are summarized in Appendix A along with the relevant sectors that are well positioned to lead implementation efforts. For example, business and labor, health care insurers and providers, and government entities are in the best position to implement programs and policies that *Strengthen Economic Supports and Access to Mental Health Care*. These types of supports go beyond individual behavior change and require commitment and support from those sectors that can directly address some of the underlying risks and the environmental contexts that increase the risk for suicide. Public health entities can play an important role by gathering and synthesizing information to inform policy, raise awareness, and evaluate the effectiveness of various policies. Moreover, partnerships with non-governmental and community organizations can be instrumental in increasing awareness of and garnering support for policies affecting individuals and families.

The public health sector has been at the forefront of many community-based prevention efforts, working collaboratively with schools and community-based organizations, to change social norms and positively impact health behavior. Public health is well suited to take on a similar leadership role in *Promoting Connectedness* through peer norm and community engagement activities and supporting the development, evaluation, and adoption of effective programs that *Teach Coping and Problem-Solving Skills* to prevent suicide from happening in the first place. These programs are often delivered in school and community settings, making education and non-governmental organizations vital partners in prevention.



Businesses, workplaces, and local and state government entities, on the other hand, are in the best position to establish policies and support practices that *Create Protective Environments* where people live, work, and play. Public health entities can play an important role by gathering and synthesizing information, working with other agencies within the executive branch of their state or local government in support of policy and other approaches, and evaluating the effectiveness of measures taken. In a similar fashion, public health entities can partner with schools, workplaces, and community organizations to implement and evaluate prevention programs, policies and practices geared toward creating safe, healthy, and supportive environments.

Finally, this technical package includes a number of interventions delivered in hospital, primary care, behavioral health care, and community settings designed to *Identify and Support People At-Risk* and to *Lessen Harms and Prevent Future Risk*. The intensity and activities of these interventions require the expertise of professionals who are licensed and trained to deliver critical intervention support. The health care, social services, and justice sectors can work collaboratively to support individuals at high-risk for suicide and their families. These activities also require coordination of supports across various service providers and community organizations.

Regardless of strategy, action by many sectors will be necessary for the successful implementation of this package. In this regard, all sectors can play an important and influential role in preventing suicide from happening in the first place and lessening the immediate and long-term harms of suicidal behavior by helping those in times of crisis get the services and support they need.

## Monitoring and Evaluation

Monitoring and evaluation are necessary components of the public health approach to prevention. It is important to have timely and reliable data to monitor the extent of the problem and to evaluate the impact of prevention efforts. Data are necessary for program implementation; planning, implementation, and assessment all rely on accurate measurement of the problem.

Surveillance data helps researchers and practitioners track changes in the burden of suicide. Surveillance systems exist at the federal, state, and local levels. It is important to assess the availability of surveillance data and data systems across these levels to identify and address gaps in the systems. CDC's National Vital Statistics System and the National Violent Death Reporting System (NVDRS) are examples of surveillance systems that provide data on deaths from suicide. NVDRS, for example, is a state-based surveillance system that combines data from death certificates, law enforcement reports, and coroner or medical examiner reports to provide detailed information on the circumstances of violent deaths, including suicide, which can assist communities in guiding prevention approaches (Blair, Fowler, Jack, & Crosby, 2016). The National Electronic Injury Surveillance System-All Injury Program (NEISS-AIP) provides nationally representative data about all types and causes of nonfatal injuries treated in U.S. hospital emergency departments, and can be used to assess national rates of, and trends in, self-harm injuries by cause (e.g., falls, poisoning, etc.), age, race/ethnicity, sex, disposition (where the injured person goes when released from the Emergency Department).

In addition to information on deaths and nonfatal injuries, there are also surveillance systems that provide national, state, and some local estimates of suicidal behavior. The Youth Risk Behavior Surveillance System (YRBSS) collects information from a nationally representative sample of 9-12 grade students and is a key resource in monitoring health-risk behaviors among youth, including whether youth have seriously considered attempting suicide, attempted suicide, made a plan, or required treatment by a doctor or nurse for a suicide attempt that resulted in an injury, poisoning, or overdose (Brener et al., 2013). The YRBSS data are obtained from a national school-based survey conducted by CDC as well as school-based state, territorial, tribal, and large urban school district survey conducted by education and health agencies. The National Survey on Drug Use and Health (NSDUH) is an annual nationwide survey of individuals aged 12 years and older that provides national and state-level estimates of drug use and mental health-related issues, including suicide ideation and suicide attempts.

It is also important at all levels (local, state, and federal) to address gaps in responses, track progress of prevention efforts and evaluate the impact of those efforts, including the impact of this technical package. Evaluation data, produced through program implementation and monitoring, is essential to provide information on what does and does not work to reduce rates of suicide and its associated risk and protective factors. Theories of change and logic models that identify short, intermediate, and long-term outcomes are an important part of program evaluation.



The evidence-base for suicide prevention has advanced greatly over the last few decades. However, additional research is needed to understand the impact of prevention programs on preventing suicide, as opposed to merely examining the effectiveness of programs to impact risk factors associated with suicide. More research is also needed to examine the effectiveness of upstream and community-level strategies to prevent suicide at the population level. Lastly, it will be important for researchers to test the effectiveness of combinations of the strategies and approaches included in this package. Most existing evaluations focus on approaches implemented in isolation. However, there is potential to understand the synergistic effects within a comprehensive prevention approach. Additional research is needed to understand the extent to which combinations of strategies and approaches result in greater reductions in suicide than individual programs, practices, or policies.

## Conclusion

Suicide is a serious public health problem whose rates have been on the rise for more than a decade and whose costs stretch well into the billions of dollars each year. And while suicide is a rare outcome statistically, its human impact has a ripple effect that is far-reaching. Each of us likely interacts with suicide survivors, those with lived experience, and those with thoughts of suicide, on a daily basis—at home, at work, and in our communities. Suicide and suicide attempts are therefore public health issues of societal concern. Fortunately, like many public health problems, suicide is preventable, and fortunately more is being done to prevent suicide than ever before, as evidenced by the work of the National Action Alliance for Suicide Prevention, the release of the first world report on suicide, and more timely surveillance data, to name just a few examples. Unfortunately and unlike most other public health problems, suicide still struggles against stigma, shame, and secrecy related to help-seeking, mental illness, being a survivor, or someone with lived experience; misplaced fear of asking someone about their risk of suicide (versus the fear and consequence of not asking), and fear of taking up certain strategies known to be effective but perhaps unpopular; misinformation about suicide preventability, and disproportionate funding given the public health burden. Suicide also struggles against the right degree of awareness where too much information, for example by well-meaning reporters and others, may actually do harm.

In an effort to continue pushing the field and society further towards prevention, this technical package includes strategies and approaches that ideally would be used in a comprehensive fashion, in combination—in a multi-level, multi-sectoral way. This technical package includes strategies and approaches targeting upstream prevention, e.g., social emotional learning for children and youth, as well as strategies focused more downstream, e.g., cognitive behavioral treatment to prevent re-attempts. It includes universal, selective, and indicated strategies, or strategies that focus on the whole population regardless of risk to strategies that focus on those groups at highest risk. Importantly, this technical package extends the bounds of the typical prevention strategies to consider approaches at the outer

levels of the social ecology, e.g., policies to stabilize housing and community engagement initiatives. In short, care and attention has been paid to all aspects of suicide prevention.

While the evidence base continues to be built, the collection of programs, policies, and practices laid out here are available for implementation now. And in keeping with good public health practice, the intent is that monitoring and evaluation will play a key role in that implementation. Moreover, as new evidence becomes available, this technical package can be refined to reflect the current state of the science.

In closing, and in keeping with a message of resilience as spoken by those with lived experience, ‘hope, help, and healing is possible.’



## References

- Arsenault-Lapierre, G., Kim, C., & Turecki, G. (2004). Psychiatric diagnoses in 3275 suicides: a meta-analysis. *BMC Psychiatry*, 4, 37. doi:10.1186/1471-244X-4-37
- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*: Prentice-Hall, Inc.
- Basile, K. C., Espelage, D. L., Rivers, I., McMahon, P. M., & Simon, T. R. (2009). The theoretical and empirical links between bullying behavior and male sexual violence perpetration. *Aggression and violent behavior*, 14(5), 336-347.
- Basile, K. C., Hamburger, M. E., Swahn, M. H., & Choi, C. (2013). Sexual violence perpetration by adolescents in dating versus same-sex peer relationships: differences in associated risk and protective factors. *Western Journal of Emergency Medicine*, 14(4), 329.
- Beautrais, A. L. (2001). Effectiveness of barriers at suicide jumping sites: A case study. *Aust NZ J Psychiat*, 35. doi:10.1080/0004867010060501
- Beautrais, A. L., Gibb, S. J., Fergusson, D. M., Horwood, L. J., & Larkin, G. L. (2009). Removing bridge barriers stimulates suicides: An unfortunate natural experiment. *Aust NZ J Psychiat*, 43. doi:10.1080/00048670902873714
- Beyer, K. M., Layde, P. M., Hamberger, L. K., & Laud, P. W. (2015). Does neighborhood environment differentiate intimate partner femicides from other femicides? *Violence Against Women*, 21(1), 49-64. doi:10.1177/1077801214564075
- Blair, J. M., Fowler, K. A., Jack, S. P., & Crosby, A. E. (2016). The National Violent Death Reporting System: overview and future directions. *Inj Prev*, 22 Suppl 1, i6-i11. doi:10.1136/injuryprev-2015-041819
- Borowsky, I. W., Hogan, M., & Ireland, M. (1997). Adolescent sexual aggression: risk and protective factors. *Pediatrics*, 100(6), E7.
- Branas, C. C., Cheney, R. A., MacDonald, J. M., Tam, V. W., Jackson, T. D., & Ten Have, T. R. (2011). A difference-in-differences analysis of health, safety, and greening vacant urban space. *Am J Epidemiol*, 174(11), 1296-1306. doi:10.1093/aje/kwr273
- Brown, G. K., Ten Have, T., Henriques, G. R., Xie, S. X., Hollander, J. E., & Beck, A. T. (2005). Cognitive therapy for the prevention of suicide attempts: a randomized controlled trial. *JAMA*, 294(5), 563-570. doi:10.1001/jama.294.5.563
- Butchart, A., Phinney, A., Check, P., & Villaveces, A. (2004). *Preventing Violence: A Guide to Implementing the Recommendations of the World Report on Violence and Health*. Geneva, Switzerland: World Health Organization.
- Capaldi, D. M., Knoble, N. B., Shortt, J. W., & Kim, H. K. (2012). A Systematic Review of Risk Factors for Intimate Partner Violence. *Partner Abuse*, 3(2), 231-280. doi:10.1891/1946-6560.3.2.231
- Carter, M., McGee, R., Taylor, B., & Williams, S. (2007). Health outcomes in adolescence: associations with family, friends and school engagement. *J Adolesc*, 30(1), 51-62. doi:10.1016/j.adolescence.2005.04.002
- Cavanagh, J. T., Carson, A. J., Sharpe, M., & Lawrie, S. M. (2003). Psychological autopsy studies of suicide: a systematic review. *Psychol Med*, 33(3), 395-405.
- Centers for Disease Control and Prevention. (2009). Strategic direction for the prevention of suicidal behavior: Promoting individual, family, and community connectedness to prevent suicidal behavior. Retrieved from Available at: [http://www.cdc.gov/ViolencePrevention/pdf/Suicide\\_Strategic\\_Direction\\_Full\\_version-a.pdf](http://www.cdc.gov/ViolencePrevention/pdf/Suicide_Strategic_Direction_Full_version-a.pdf)
- Centers for Disease Control and Prevention. (2016a). Child Maltreatment: Risk and Protective Factors. Retrieved from Available at: <http://www.cdc.gov/violenceprevention/childmaltreatment/riskprotectivefactors.html>
- Centers for Disease Control and Prevention. (2016b). Elder Maltreatment: Risk and Protective Factors. Retrieved from Available at: <http://www.cdc.gov/ViolencePrevention/eldermaltreatment/riskprotectivefactors.html>

- Centers for Disease Control and Prevention. (2016c). Sexual Violence: Risk and Protective Factors. Retrieved from Available at: <http://www.cdc.gov/ViolencePrevention/sexualviolence/riskprotectivefactors.html>
- Centers for Disease Control and Prevention. (2016d). Web-Based Injury Statistics Query and Reporting System (WISQARS). Retrieved June 3, 2016 Available at: <http://www.cdc.gov/injury/wisqars/index.html>
- Centers for Disease Control and Prevention. (2016e). Youth Violence: Risk and Protective Factors. Retrieved from Available at: <http://www.cdc.gov/violenceprevention/youthviolence/riskprotectivefactors.html>
- Cerel, J., & Campbell, F. R. (2008). Suicide survivors seeking mental health services: a preliminary examination of the role of an active postvention model. *Suicide Life Threat Behav*, 38(1), 30-34. doi:10.1521/suli.2008.38.1.30
- Cerel, J., McIntosh, J. L., Neimeyer, R. A., Maple, M., & Marshall, D. (2014). The Continuum of "Survivorship": Definitional Issues in the Aftermath of Suicide. *Suicide and life-threatening behavior*, 44(6), 591-600. doi:10.1111/sltb.12093
- Chapman, A. L., & Dixon-Gordon, K. L. (2007). Emotional antecedents and consequences of deliberate self-harm and suicide attempts. *Suicide Life Threat Behav*, 37(5), 543-552. doi:10.1521/suli.2007.37.5.543
- Cherpitel, C. J., Borges, G. L. G., & Wilcox, H. C. (2004). Acute alcohol use and suicidal behavior: A review of the literature. *Alcoholism: Clinical and Experimental Research*, 28(5 SUPPL.), 18S-28S.
- Classen, T. J., & Dunn, R. A. (2012). The effect of job loss and unemployment duration on suicide risk in the United States: a new look using mass-layoffs and unemployment duration. *Health Econ*, 21(3), 338-350. doi:10.1002/hec.1719
- Coffey, C. E. (2006). Pursuing perfect depression care. *Psychiatr Serv*, 57(10), 1524-1526. doi:10.1176/ps.2006.57.10.1524
- Coffey, C. E., Coffey, M. J., & Ahmedani, B. K. (2013). An update on perfect depression care. *Psychiatr Serv*, 64(4), 396. doi:10.1176/appi.PS.640422
- Coffey, M., Coffey, C., & Ahmedani, B. K. (2015). Suicide in a health maintenance organization population. *JAMA Psychiatry*, 72(3), 294-296. doi:10.1001/jamapsychiatry.2014.2440
- Comtois, K. A., Jobes, D. A., S. O'Connor, S., Atkins, D. C., Janis, K., E. Chessen, C., . . . Yuodelis-Flores, C. (2011). Collaborative assessment and management of suicidality (CAMS): feasibility trial for next-day appointment services. *Depress Anxiety*, 28(11), 963-972. doi:10.1002/da.20895
- Coulton, C. J., Crampton, D. S., Irwin, M., Spilsbury, J. C., & Korbin, J. E. (2007). How neighborhoods influence child maltreatment: a review of the literature and alternative pathways. *Child Abuse Negl*, 31(11-12), 1117-1142. doi:10.1016/j.chiabu.2007.03.023
- Cox, G. R., Owens, C., Robinson, J., Nicholas, A., Lockley, A., Williamson, M., . . . Pirkis, J. (2013). Interventions to reduce suicides at suicide hotspots: a systematic review. *BMC Public Health*, 13(1), 1-12. doi:10.1186/1471-2458-13-214
- Crosby, A. E., Espitia-Hardeman, V., Ortega, L., & Lozano, B. (2013). Alcohol and suicide. *Alcohol: Science, Policy and Public Health*, 190.
- Crosby, A. E., Han, B., Ortega, L., Parks, S. E., & Gfroerer, J. (2011). Suicidal Thoughts and Behaviors Among Adults Aged ≥18 Years — United States, 2008–2009. *MMWR*, 60(No. SS-13), 1-22.
- Crosby, A. E., Ortega, L., & Melanson, C. (2011). *Self-directed Violence Surveillance: Uniform Definitions and Recommended Data Elements, Version 1.0*. Retrieved from Atlanta, GA:
- Cunningham, P. J. (2009). Beyond parity: primary care physicians' perspectives on access to mental health care. *Health Aff (Millwood)*, 28(3), w490-501. doi:10.1377/hlthaff.28.3.w490
- Curtin, S. C., Warner, M., & Hedegaard, H. (2016). *Increase in suicide in the United States, 1999-2014*. ( ). Hyattsville, MD: National Center for Health Statistics Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/25116188>.
- Cylus, J., Glymour, M. M., & Avendano, M. (2014). Do generous unemployment benefit programs reduce suicide rates? A state fixed-effect analysis covering 1968-2008. *Am J Epidemiol*, 180(1), 45-52. doi:10.1093/aje/kwu106



- Dahlberg, L. L., & Krug, E. G. (2002). Violence-a global public health problem. In E. Krug, L. L. Dahlberg, J. A. Mercy, A. B. Zwi, & R. Lozano (Eds.), *World Report on Violence and Health* (pp. 1-56). Geneva, Switzerland: World Health Organization.
- DeGue, S., Massetti, G. M., Holt, M. K., Tharp, A. T., Valle, L. A., Matjasko, J. L., & Lippy, C. (2013). Identifying links between sexual violence and youth violence perpetration: New opportunities for sexual violence prevention. *Psychology of violence*, 3(2), 140.
- Deisenhammer, E. A., Ing, C. M., Strauss, R., Kemmler, G., Hinterhuber, H., & Weiss, E. M. (2009). The duration of the suicidal process: how much time is left for intervention between consideration and accomplishment of a suicide attempt? *J Clin Psychiatry*, 70(1), 19-24.
- Desai, R. A., Dausey, D. J., & Rosenheck, R. A. (2005). Mental health service delivery and suicide risk: the role of individual patient and facility factors. *Am J Psychiatry*, 162(2), 311-318. doi:10.1176/appi.ajp.162.2.311
- Diamond, G. S., Wintersteen, M. B., Brown, G. K., Diamond, G. M., Gallop, R., Shelef, K., & Levy, S. (2010). Attachment-based family therapy for adolescents with suicidal ideation: a randomized controlled trial. *J Am Acad Child Adolesc Psychiatry*, 49(2), 122-131.
- Dunne, E. J., McIntosh, J. L., & Dunne-Maxim, K. (Eds.). (1987). *Suicide and its aftermath: Understanding and counseling the survivors*. New York: Norton.
- Durkheim, E. (1897/1951). *Suicide: A study in sociology* (JA Spaulding & G. Simpson, trans.). Glencoe, IL: Free Press. (Original work published 1897).
- Elgar, F. J., Craig, W., Boyce, W., Morgan, A., & Vella-Zarb, R. (2009). Income inequality and school bullying: multilevel study of adolescents in 37 countries. *J Adolesc Health*, 45(4), 351-359. doi:10.1016/j.jadohealth.2009.04.004
- Escobedo, L. G., & Ortiz, M. (2002). The relationship between liquor outlet density and injury and violence in New Mexico. *Accid Anal Prev*, 34(5), 689-694.
- Etzersdorfer, E., & Sonneck, G. (1998). Preventing suicide by influencing mass-media reporting: The Viennese experience, 1980-1996. *Arch Suicide Res*, 4.
- Ferdon, C., Crosby, A. E., Caine, E. D., Hindman J., Reed, G. A., & Iskander, J. (In press). CDC Public Health Grand Rounds: Preventing Suicide through a Comprehensive Public Health Approach. *MMWR*.
- Flavin, P., & Radcliff, B. (2009). Public policies and suicide rates in the American states. *Social Indicators Research*, 90(2), 195-209.
- Fleischmann, A., Bertolote, J. M., Wasserman, D., De Leo, D., Bolhari, J., Botega, N. J., . . . Thanh, H. T. (2008). Effectiveness of brief intervention and contact for suicide attempters: a randomized controlled trial in five countries. *Bulletin of the World Health Organization*, 86(9), 703-709. doi:S0042-96862008000900014 [pii]
- Fowler, K. A., Gladden, R. M., Vagi, K. J., Barnes, J., & Frazier, L. (2015). Increase in suicides associated with home eviction and foreclosure during the US housing crisis: findings from 16 National Violent Death Reporting System States, 2005-2010. *Am J Public Health*, 105(2), 311-316. doi:10.2105/AJPH.2014.301945
- Freisthler, B., Merritt, D. H., & LaScala, E. A. (2006). Understanding the ecology of child maltreatment: a review of the literature and directions for future research. *Child Maltreat*, 11(3), 263-280. doi:10.1177/1077559506289524
- Ghahramanlou-Holloway, M., Bhar, S., Brown, G., Olsen, C., & Beck, A. T. (2012). Changes in problem-solving appraisal after cognitive therapy for the prevention of suicide. *Psychological Medicine*, 42(06), 1185-1193.
- Giesbrecht, N., Huguette, N., Ogden, L., Kaplan, M. S., McFarland, B. H., Caetano, R., . . . Nolte, K. B. (2015). Acute alcohol use among suicide decedents in 14 US states: impacts of off-premise and on-premise alcohol outlet density. *Addiction*, 110(2), 300-307. doi:10.1111/add.12762
- Godoy Garraza, L., Walrath, C., Goldston, D. B., Reid, H., & McKeon, R. (2015). Effect of the Garrett Lee Smith Memorial Suicide Prevention Program on Suicide Attempts Among Youths. *JAMA Psychiatry*, 72(11), 1143-1149. doi:10.1001/jamapsychiatry.2015.1933

- Goldsmith, S. K., Pellmar, T. C., Kleinman, A. M., & Bunney, W. E. (2002). *Reducing suicide: A national imperative*: National Academies Press.
- Gould, M. S., Cross, W., Pisani, A. R., Munfakh, J. L., & Kleinman, M. (2013). Impact of Applied Suicide Intervention Skills Training on the National Suicide Prevention Lifeline. *Suicide Life Threat Behav*, 43(6), 676-691. doi:10.1111/sltb.12049
- Gould, M. S., Kalafat, J., Harrismunfakh, J. L., & Kleinman, M. (2007). An evaluation of crisis hotline outcomes. Part 2: Suicidal callers. *Suicide Life Threat Behav*, 37(3), 338-352. doi:10.1521/suli.2007.37.3.338
- Grossman, D. C., Mueller, B. A., Riedy, C., Dowd, M. D., Villaveces, A., Prodzinski, J., . . . Harruff, R. (2005). Gun storage practices and risk of youth suicide and unintentional firearm injuries. *JAMA*, 293(6), 707-714. doi:10.1001/jama.293.6.707
- Haddon, W. (1980). Advances in the epidemiology of injuries as a basis for public policy. *Public Health Reports*, 95(5), 411-421.
- Han, B., Crosby, A. E., Ortega, L. A., Parks, S. E., Compton, W. M., & Gfroerer, J. (2016). Suicidal ideation, suicide attempt, and occupations among employed adults aged 18–64years in the United States. *Comprehensive psychiatry*, 66, 176-186.
- Harris, E. C., & Barraclough, B. (1997). Suicide as an outcome for mental disorders. A meta-analysis. *Br J Psychiatry*, 170, 205-228.
- Harris, E. C., & Barraclough, B. (1998). Excess mortality of mental disorder. *Br J Psychiatry*, 173, 11-53.
- Harris, K. M., Carpenter, C., & Bao, Y. (2006). The effects of state parity laws on the use of mental health care. *Med Care*, 44(6), 499-505. doi:10.1097/01.mlr.0000215813.16211.00
- Hassanian-Moghaddam, H., Sarjami, S., Kolahi, A. A., & Carter, G. L. (2011). Postcards in Persia: randomised controlled trial to reduce suicidal behaviours 12 months after hospital-treated self-poisoning. *British Journal of Psychiatry*, 198(4), 309-316.
- Hawton, K. (2007). Restricting access to methods of suicide: Rationale and evaluation of this approach to suicide prevention. *Crisis*, 28. doi:10.1027/0227-5910.28.s1.4
- Heise, L., & Garcia-Moreno, C. (2002). Violence by Intimate Partners. In E. Krug, L. L. Dahlberg, J. A. Mercy, A. B. Zwi, & R. Lozano (Eds.), *World Report on Violence and Health* (pp. 87-121). Geneva, Switzerland: World Health Organization.
- Herman, K. C., Borden, L. A., Reinke, W. M., & Webster-Stratton, C. (2011). The Impact of the Incredible Years Parent, Child, and Teacher Training Programs on Children's Co-Occurring Internalizing Symptoms. *Sch Psychol Q*, 26(3), 189-201. doi:10.1037/a0025228
- Hong, J. S., Kral, M. J., Espelage, D. L., & Allen-Meares, P. (2012). The social ecology of adolescent-initiated parent abuse: a review of the literature. *Child Psychiatry Hum Dev*, 43(3), 431-454. doi:10.1007/s10578-011-0273-y
- Houle, J. N., & Light, M. T. (2014). The home foreclosure crisis and rising suicide rates, 2005 to 2010. *Am J Public Health*, 104(6), 1073-1079. doi:10.2105/AJPH.2013.301774
- Hunkeler, E. M., Katon, W., Tang, L., Williams, J. W., Jr., Kroenke, K., Lin, E. H., . . . Unutzer, J. (2006). Long term outcomes from the IMPACT randomised trial for depressed elderly patients in primary care. *BMJ*, 332(7536), 259-263. doi:10.1136/bmj.38683.710255.BE
- Inagaki, M., Kawashima, Y., Kawanishi, C., Yonemoto, N., Sugimoto, T., Furuno, T., . . . Yamada, M. (2015). Interventions to prevent repeat suicidal behavior in patients admitted to an emergency department for a suicide attempt: a meta-analysis. *J Affect Disord*, 175, 66-78. doi:10.1016/j.jad.2014.12.048
- Isometsa, E. T. (2001). Psychological autopsy studies--a review. *Eur Psychiatry*, 16(7), 379-385.
- Jobes, D. A. (2012). The Collaborative Assessment and Management of Suicidality (CAMS): an evolving evidence-based clinical approach to suicidal risk. *Suicide Life Threat Behav*, 42(6), 640-653. doi:10.1111/j.1943-278X.2012.00119.x
- Johnson, F. W., Gruenewald, P. J., & Remer, L. G. (2009). Suicide and alcohol: do outlets play a role? *Alcohol Clin Exp Res*, 33(12), 2124-2133. doi:10.1111/j.1530-0277.2009.01052.x



- Kaplan, M. S., McFarland, B. H., Huguet, N., Conner, K., Caetano, R., Giesbrecht, N., & Nolte, K. B. (2013). Acute alcohol intoxication and suicide: a gender-stratified analysis of the National Violent Death Reporting System. *Inj Prev*, 19(1), 38-43. doi:10.1136/injuryprev-2012-040317
- Kellam, S. G., Brown, C. H., Poduska, J. M., Ialongo, N. S., Wang, W., Toyinbo, P., . . . Wilcox, H. C. (2008). Effects of a universal classroom behavior management program in first and second grades on young adult behavioral, psychiatric, and social outcomes. *Drug Alcohol Depend*, 95 Suppl 1, S5-S28. doi:10.1016/j.drugalcdep.2008.01.004
- Kessler, R. C., Demler, O., Frank, R. G., Olfson, M., Pincus, H. A., Walters, E. E., . . . Zaslavsky, A. M. (2005). Prevalence and treatment of mental disorders, 1990 to 2003. *N Engl J Med*, 352(24), 2515-2523. doi:10.1056/NEJMSa043266
- Kitchener, B. A., & Jorm, A. F. (2004). Mental health first aid training in a workplace setting: a randomized controlled trial [ISRCTN13249129]. *BMC Psychiatry*, 4, 23. doi:10.1186/1471-244X-4-23
- Kitchener, B. A., & Jorm, A. F. (2006). Mental health first aid training: review of evaluation studies. *Aust N Z J Psychiatry*, 40(1), 6-8. doi:10.1111/j.1440-1614.2006.01735.x
- Kleiman, E. M., Riskind, J. H., Schaefer, K. E., & Weingarden, H. (2012). The moderating role of social support on the relationship between impulsivity and suicide risk. *Crisis*, 33(5), 273-279. doi:10.1027/0227-5910/a000136
- Klevens, J., Simon, T. R., & Chen, J. (2012). Are the perpetrators of violence one and the same? Exploring the co-occurrence of perpetration of physical aggression in the United States. *J Interpers Violence*, 27(10), 1987-2002. doi:10.1177/0886260511431441
- Knox, K. L., Litts, D. A., Talcott, G. W., Feig, J. C., & Caine, E. D. (2003). Risk of suicide and related adverse outcomes after exposure to a suicide prevention programme in the US Air Force: cohort study. *BMJ*, 327(7428), 1376.
- Knox, K. L., Pflanz, S., Talcott, G. W., Campise, R. L., Lavigne, J. E., Bajorska, A., . . . Caine, E. D. (2010). The US Air Force suicide prevention program: implications for public health policy. *Am J Public Health*, 100(12), 2457-2463. doi:10.2105/ajph.2009.159871
- Knox, M. S., Burkhart, K., & Hunter, K. E. (2010). ACT against violence parents raising safe kids program: Effects on maltreatment-related parenting behaviors and beliefs. *Journal of Family Issues*.
- Lang, M. (2013). The impact of mental health insurance laws on state suicide rates. *Health Econ*, 22(1), 73-88. doi:10.1002/hec.1816
- Linehan, M. M., Comtois, K. A., Murray, A. M., Brown, M. Z., Gallop, R. J., Heard, H. L., . . . Lindenboim, N. (2006). Two-year randomized controlled trial and follow-up of dialectical behavior therapy vs therapy by experts for suicidal behaviors and borderline personality disorder. *Arch Gen Psychiatry*, 63(7), 757-766. doi:10.1001/archpsyc.63.7.757
- Losel, F., & Farrington, D. P. (2012). Direct protective and buffering protective factors in the development of youth violence. *Am J Prev Med*, 43(2 Suppl 1), S8-S23. doi:10.1016/j.amepre.2012.04.029
- Luo, F., Florence, C. S., Quispe-Agnoli, M., Ouyang, L., & Crosby, A. E. (2011). Impact of business cycles on US suicide rates, 1928-2007. *Am J Public Health*, 101(6), 1139-1146. doi:10.2105/ajph.2010.300010
- Maimon, D., Browning, C. R., & Brooks-Gunn, J. (2010). Collective efficacy, family attachment, and urban adolescent suicide attempts. *J Health Soc Behav*, 51(3), 307-324. doi:10.1177/0022146510377878
- Mark, T. L., Shern, D. L., Bagalman, J. E., & Cao, Z. (2007). Ranking America's mental health: An analysis of depression across the states. Alexandria, VA: Mental Health America.
- McIntosh, W. L., Spies, E., Stone, D. M., Lokey, C. N., Trudeau, A. R., & Bartholow, B. (2016). Suicide Rates by Occupational Group - 17 States, 2012. *MMWR Morb Mortal Wkly Rep*, 65(25), 641-645. doi:10.15585/mmwr.mm6525a1
- Miller, M., Warren, M., Hemenway, D., & Azrael, D. (2015). Firearms and suicide in US cities. *Inj Prev*, 21(e1), e116-119. doi:10.1136/injuryprev-2013-040969
- Mishara, B. L. (Ed.) (1995). *The Impact of Suicide*. New York: Springer.

- Mishara, B. L., & Martin, N. (2012). Effects of a comprehensive police suicide prevention program. *Crisis: Journal of Crisis Intervention & Suicide*, 33(3), 162-168.
- Mitchell, A. M., Kim, Y., Prigerson, H. G., & Mortimer-Stephens, M. (2004). Complicated grief in survivors of suicide. *Crisis*, 25(1), 12-18. doi:10.1027/0227-5910.25.1.12
- Motto, J. A., & Bostrom, A. G. (2001). A randomized controlled trial of postcrisis suicide prevention. *Psychiatr Serv*, 52(6), 828-833.
- Muennig, P., Cohen, A. K., Palmer, A., & Zhu, W. (2013). The relationship between five different measures of structural social capital, medical examination outcomes, and mortality. *Soc Sci Med*, 85, 18-26. doi:10.1016/j.socscimed.2013.02.007
- National Action Alliance for Suicide Prevention. (2014). Research Prioritization Task Force.(2014). *A prioritized research agenda for suicide prevention: An action plan to save lives*.
- National Action Alliance for Suicide Prevention Workplace Task Force. (2015). *Comprehensive Blueprint for Workplace Suicide Prevention*. Washington, D.C. : Author.
- National Action Alliance for Suicide Prevention: Suicide Attempt Survivors Task Force. (2014). *The Way Forward: Pathways to hope, recovery, and wellness with insights from lived experience*. Washington, D.C. : Author.
- National Action Alliance for Suicide Prevention: Survivors of Suicide Loss Task Force. (2015). *Responding to Grief, Trauma, and Distress After a Suicide: U.S. National Guidelines*. Washington, D.C. : Author.
- Niederkrotenthaler, T., & Sonneck, G. (2007). Assessing the impact of media guidelines for reporting on suicides in Austria: Interrupted time series analysis. *Aust N Z J Psychiatry*, 41. doi:10.1080/00048670701266680
- Olfson, M., Gerhard, T., Huang, C., Crystal, S., & Stroup, T. S. (2015). Premature Mortality Among Adults With Schizophrenia in the United States. *JAMA Psychiatry*, 72(12), 1172-1181. doi:10.1001/jamapsychiatry.2015.1737
- Owens, D. (2002). Fatal and non-fatal repetition of self-harm: Systematic review. *British Journal of Psychiatry*, 181(3), 193-199.
- Pena, J. B., & Caine, E. D. (2006). Screening as an approach for adolescent suicide prevention. *Suicide Life Threat Behav*, 36(6), 614-637. doi:10.1521/suli.2006.36.6.614
- Perron, S., Burrows, S., Fournier, M., Perron, P. A., & Ouellet, F. (2013). Installation of a bridge barrier as a suicide prevention strategy in Montreal, Quebec, Canada. *Am J Public Health*, 103(7), 1235-1239. doi:10.2105/ajph.2012.301089
- Pinchevsky, G. M., & Wright, E. M. (2012). The impact of neighborhoods on intimate partner violence and victimization. *Trauma Violence Abuse*, 13(2), 112-132. doi:10.1177/1524838012445641
- Pirkis, J., Too, L. S., Spittal, M. J., Krysinska, K., Robinson, J., & Cheung, Y. T. D. (2015). Interventions to reduce suicides at suicide hotspots: a systematic review and meta-analysis. *The Lancet Psychiatry*, 2(11), 994-1001. doi:http://dx.doi.org/10.1016/S2215-0366(15)00266-7
- Pitman, A., Osborn, D., King, M., & Erlangsen, A. (2014). Effects of suicide bereavement on mental health and suicide risk. *Lancet Psychiatry*, 1, 86-94.
- Pollock, L. R., & Williams, J. M. (2004). Problem-solving in suicide attempters. *Psychol Med*, 34(1), 163-167.
- Reeves, A., Stuckler, D., McKee, M., Gunnell, D., Chang, S. S., & Basu, S. (2012). Increase in state suicide rates in the USA during economic recession. *Lancet*, 380(9856), 1813-1814. doi:10.1016/S0140-6736(12)61910-2
- Reid, M. J., Webster-Stratton, C., & Hammond, M. (2003). Follow-up of children who received the Incredible Years intervention for oppositional-defiant disorder: Maintenance and prediction of 2-year outcome. *Behavior Therapy*, 34(4), 471-491.
- Resnick, M. D., Ireland, M., & Borowsky, I. (2004). Youth violence perpetration: what protects? What predicts? Findings from the National Longitudinal Study of Adolescent Health. *J Adolesc Health*, 35(5), 424 e421-410. doi:10.1016/j.jadohealth.2004.01.011
- Rowhani-Rahbar, A., Simonetti, J. A., & Rivara, F. P. (2016). Effectiveness of Interventions to Promote Safe Firearm Storage. *Epidemiol Rev*, 38(1), 111-124. doi:10.1093/epirev/mxv006



- Runyan, C. W., Becker, A., Brandspigel, S., Barber, C., Trudeau, A., & Novins, D. (2016). Lethal Means Counseling for Parents of Youth Seeking Emergency Care for Suicidality. *West J Emerg Med*, 17(1), 8-14. doi:10.5811/westjem.2015.11.28590
- Runyan, D., Wattam, C., Ikeda, R., Hassan, F., & Ramiro, L. (2002). Child abuse and neglect by parents and other caregivers. In E. Krug, L. L. Dahlberg, J. A. Mercy, A. B. Zwi, & R. Lozano (Eds.), *World Report on Violence and Health* (pp. 59-86). Geneva, Switzerland: World Health Organization.
- Sampson, R. J., Morenoff, J. D., & Gannon-Rowley, T. (2002). Assessing "Neighborhood Effects": Social Processes and New Directions in Research. *Annual Review of Sociology*, 28, 443-478.
- Schilling, E. A., Aseltine, R. H., Jr., & James, A. (2016). The SOS Suicide Prevention Program: Further Evidence of Efficacy and Effectiveness. *Prev Sci*, 17(2), 157-166. doi:10.1007/s11121-015-0594-3
- Shepard, D. S., Gurewich, D., Lwin, A. K., Reed, G. A., Jr., & Silverman, M. M. (2016). Suicide and Suicidal Attempts in the United States: Costs and Policy Implications. *Suicide Life Threat Behav*, 46(3), 352-362. doi:10.1111/sltb.12225
- Silverman, M. M., & Maris, R. W. (1995). The prevention of suicidal behaviors: An overview. *Suicide and life-threatening behavior*, 25(1), 10-21.
- Simon, O. R., Swann, A. C., Powell, K. E., Potter, L. B., Kresnow, M. J., & O'Carroll, P. W. (2001). Characteristics of impulsive suicide attempts and attempters. *Suicide Life Threat Behav*, 32(1 Suppl), 49-59.
- Spoth, R. L., Gyll, M., & Day, S. X. (2002). Universal family-focused interventions in alcohol-use disorder prevention: cost-effectiveness and cost-benefit analyses of two interventions. *J Stud Alcohol*, 63(2), 219-228.
- Stack, S., & Wasserman, I. (2007). Economic strain and suicide risk: a qualitative analysis. *Suicide and life-threatening behavior*, 37(1), 103-112.
- Substance Abuse and Mental Health Services Administration. (2014). *Report to Congress: Garrett Lee Smith Suicide Prevention Program*. Rockville, MD.
- Sudak, H., Maxim, K., & Carpenter, M. (2008). Suicide and stigma: a review of the literature and personal reflections. *Acad Psychiatry*, 32(2), 136-142. doi:10.1176/appi.ap.32.2.136
- Szumilas, M., & Kutcher, S. (2011). Post-suicide intervention programs: a systematic review. *Can J Public Health*, 102(1), 18-29.
- Townsend, E., Hawton, K., Altman, D. G., Arensman, E., Gunnell, D., Hazell, P., . . . Van Heeringen, K. (2001). The efficacy of problem-solving treatments after deliberate self-harm: meta-analysis of randomized controlled trials with respect to depression, hopelessness and improvement in problems. *Psychological Medicine*, 31(6), 979-988.
- Tyrer, P., Reed, G. M., & Crawford, M. J. (2015). Classification, assessment, prevalence, and effect of personality disorder. *Lancet*, 385(9969), 717-726. doi:10.1016/S0140-6736(14)61995-4
- U.S. Office of the Surgeon General, & National Action Alliance for Suicide Prevention. (2012). *2012 National Strategy for Suicide Prevention: Goals and Objectives for Action*. Washington, D.C.: HHS.
- U.S. Public Health Service. (1999). *The Surgeon General's Call to Action to Prevent Suicide*. Washington, D.C.
- Unutzer, J., Tang, L., Oishi, S., Katon, W., Williams, J. W., Jr., Hunkeler, E., . . . Langston, C. (2006). Reducing suicidal ideation in depressed older primary care patients. *J Am Geriatr Soc*, 54(10), 1550-1556.
- Visser, V. S., Comans, T. A., & Scuffham, P. A. (2014). Evaluation Of The Effectiveness Of A Community-Based Crisis Intervention Program For People Bereaved By Suicide. *Journal of Community Psychology*, 42(1), 19-28. doi:10.1002/jcop.21586
- Walrath, C., Garraza, L. G., Reid, H., Goldston, D. B., & McKeon, R. (2015). Impact of the Garrett Lee Smith youth suicide prevention program on suicide mortality. *Am J Public Health*, 105(5), 986-993. doi:10.2105/AJPH.2014.302496
- Wang, Y. C., Hsieh, L. Y., Wang, M. Y., Chou, C. H., Huang, M. W., & Ko, H. C. (2016). Coping Card Usage can Further Reduce Suicide Reattempt in Suicide Attempter Case Management Within 3-Month Intervention. *Suicide Life Threat Behav*, 46(1), 106-120. doi:10.1111/sltb.12177

- Wasserman, D., Hoven, C. W., Wasserman, C., Wall, M., Eisenberg, R., Hadlaczky, G., . . . Carli, V. (2014). School-based suicide prevention programmes: The SEYLE cluster-randomised, controlled trial. *The Lancet*, 385(9977), 1536-1544. doi:10.1016/S0140-6736(14)61213-7
- Webster-Stratton, C., & Hammond, M. (1997). Treating children with early-onset conduct problems: a comparison of child and parent training interventions. *J Consult Clin Psychol*, 65(1), 93-109.
- Webster-Stratton, C., Reid, M. J., & Hammond, M. (2001). Preventing conduct problems, promoting social competence: a parent and teacher training partnership in head start. *J Clin Child Psychol*, 30(3), 283-302. doi:10.1207/S15374424JCCP3003\_2
- Webster-Stratton, C. H., Reid, M. J., & Beauchaine, T. (2011). Combining parent and child training for young children with ADHD. *Journal of Clinical Child & Adolescent Psychology*, 40(2), 191-203.
- Webster-Stratton, C., Jamila Reid, M., & Stoolmiller, M. (2008). Preventing conduct problems and improving school readiness: evaluation of the incredible years teacher and child training programs in high-risk schools. *Journal of child psychology and psychiatry*, 49(5), 471-488.
- Widome, R., Sieving, R. E., Harpin, S. A., & Hearst, M. O. (2008). Measuring neighborhood connection and the association with violence in young adolescents. *J Adolesc Health*, 43(5), 482-489. doi:10.1016/j.jadohealth.2008.04.013
- Wilcox, H. C., Kellam, S. G., Brown, C. H., Poduska, J. M., Ialongo, N. S., Wang, W., & Anthony, J. C. (2008). The impact of two universal randomized first- and second-grade classroom interventions on young adult suicide ideation and attempts. *Drug Alcohol Depend*, 95 Suppl 1, S60-73.
- Wilson, W. J. (2011). *When work disappears: The world of the new urban poor*: Vintage.
- World Health Organization. (2014). *Suicide Prevention: A Global Imperative*. Geneva, Switzerland: WHO Press.
- Wyman, P. A., Brown, C. H., LoMurray, M., Schmeelk-Cone, K., Petrova, M., Yu, Q., . . . Wang, W. (2010). An outcome evaluation of the Sources of Strength suicide prevention program delivered by adolescent peer leaders in high schools. *Am J Public Health*, 100(9), 1653-1661. doi:
- Yip, P., Caine, E., Yousuf, S., Chang, S.-S., Wu, K., & Chen, Y.-Y. (2012). Means restriction for suicide prevention. *Lancet*, 379. doi:10.1016/s0140-6736(12)60521-2



## Appendix A: Summary of Strategies and Approaches to Prevent Suicide

Strategy	Approach/Program, Practice or Policy	Best Available Evidence			Lead Sectors <sup>1</sup>
		Suicide	Suicide Attempts or Ideation	Other Risk/Protective Factors for Suicide	
Strengthen economic supports	<b>Strengthen household financial security</b>				Government (local, state, Federal)
	<i>Unemployment benefit programs</i>	✓			
	<i>Other income supports</i>	✓			Business/labor
	<b>Housing stabilization policies</b>				Government (local, state, Federal)
	<i>The National Neighborhood Stabilization Program</i>			✓	
Strengthen access to mental health care	<b>Coverage of mental health conditions in health insurance policies</b>				Health care
	<i>Mental Health Parity Laws</i>	✓		✓	Government (state, Federal)
Establish protective environments	<b>Reducing access to lethal means among persons at-risk</b>				Government (local, state)
	<i>Intervening at hot spots</i>	✓			
	<i>Safe storage practices</i>		✓	✓	Public Health
	<b>Organizational policies and culture</b>				Business/Labor
	<i>Together for Life</i>	✓			Government (local, state, Federal)
	<i>US Air Force Suicide Prevention Program</i>	✓		✓	

		Best Available Evidence			
	<b>Community-based policies to reduce excessive alcohol use</b>				Government (local, state)
	<i>Alcohol outlet density</i>	✓		✓	Business/labor
<b>Promote connectedness to protect against suicide</b>	<b>Peer norm approaches</b>				Public Health
	<i>Sources of Strength</i>			✓	Education
	<b>Community-engagement activities</b>				Public Health
	<i>Greening vacant urban spaces</i>			✓	Government (local)
<b>Teach coping and problem-solving skills</b>	<b>Social emotional learning</b>				Public Health
	<i>Youth Aware of Mental Health Program</i>		✓		Education
	<i>Signs of Suicide</i>		✓	✓	
	<i>Good Behavior Game</i>		✓	✓	
	<b>Parenting skill and family relationship approaches</b>				Public Health
	<i>The Incredible Years</i>			✓	Education
	<i>Strengthening Families 10-14</i>			✓	
	<b>Gatekeeper training</b>				Public Health
	<i>Mental Health First Aid</i>			✓	Healthcare



		Best Available Evidence			
Identify and support people at-risk	Screening combined with care management				Healthcare
	Henry Ford Perfect Depression Care (Precursor to Zero Suicide)	✓		✓	Social Services
	Crisis Intervention				Public Health
	National Suicide Prevention Lifeline		✓	✓	Social Services
	Applied Suicide Intervention Skills Training		✓	✓	
Intervene to lessen harms and prevent future risk	Treatment for people at risk of suicide				Healthcare
	Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)		✓	✓	Social Services
	Collaborative Assessment and Management of Suicidality (CAMS)		✓	✓	Justice
	Dialectical Behavioral Therapy		✓	✓	
	Attachment-Based Family Therapy		✓		
	Treatment to prevent re-attempts				Healthcare
	ED Brief Intervention with Follow-up Visits	✓			Social Services
	Active follow-up contact approaches	✓	✓		
	CBT for Suicide Prevention				

		Best Available Evidence			
	<b>Postvention</b>				Healthcare
	<i>StandBy Response Service</i>		✓		
	<b>Safe messaging following a suicide</b>				Public Health
	<i>Media Guidelines</i>	✓			Media

<sup>1</sup>This column refers to the lead sectors well positioned to bring leadership and resources to implementation efforts. For each strategy, there are many other sectors such as non-governmental organizations that are instrumental to prevention planning and implementing the specific programmatic activities.



**Title...**

**A Technical Package to Prevent....**

**Prepared by:**

**Division of Violence Prevention  
National Center for Injury Prevention and Control (NCIPC)  
Centers for Disease Control and Prevention**

**2016**

**[Title] is a publication of the National Center for Injury Prevention and Control of the Centers for Disease Control and Prevention.**

Centers for Disease Control and Prevention  
Thomas R. Frieden, MD, MPH, Director

National Center for Injury Prevention and Control  
Debra E. Houry, MD, MPH, Director

Division of Violence Prevention  
James A. Mercy, PhD, Director

*Suggested Citation:* [authors] *A Technical Package to Prevent....* Atlanta, GA: National Center for Injury Prevention and Control, Centers for Disease Control and Prevention, 2016.



## Contents

## External Reviewers

[to be inserted later]



## Acknowledgments

[to be inserted later]

## Overview

This technical package represents a select group of strategies based on the best available evidence to help communities and states sharpen their focus on prevention activities with the greatest potential to prevent suicide. Broadly, the strategies represented include those with a focus on preventing suicide from happening in the first place as well as approaches to lessen the immediate and long-term effects of suicidal behavior for individuals, families, communities, and society. Specifically, the strategies include strengthening economic supports; strengthening access to mental health care; establishing protective environments; promoting connectedness to protect against suicide; teaching coping and problem-solving skills; identifying and supporting people at-risk; and intervening to lessen harms and prevent future risk.

This package supports the National Strategy for Suicide prevention, Goal 1, "Integrate and coordinate suicide prevention activities across multiple sectors and settings." (p.29) It also supports the National Action Alliance for Suicide Prevention's priority "To create and disseminate a framework for comprehensive community-based suicide prevention." (<http://actionallianceforsuicideprevention.org/priorities>)

Commitment, cooperation, and leadership from numerous sectors, including public health, education, justice, health care, social services, business/labor, and government can bring about the successful implementation of this package.

### What is a Technical Package?

A technical package is a compilation of a core set of strategies to achieve and sustain substantial reductions in a specific risk factor or outcome (Frieden, 2014). Technical packages help communities and states prioritize prevention activities based on the best available evidence. This technical package has three components. The first component is the **strategy** or the preventive direction or actions to achieve the goal of preventing suicide. The second component is the **approach**. The approach includes the specific ways to advance the strategy. This can be accomplished through *programs, policies, and practices*. The approaches included come primarily from studies based in the United States. The evidence for each of the approaches in preventing suicide or its associated risk factors is included as the third component. This package is intended as a resource to guide and inform prevention decision-making in communities and states.

### Preventing Suicide is a Priority

Suicide, as defined by the CDC, is part of a broader class of behavior called *self-directed violence*. Self-directed violence refers to behavior directed at oneself that deliberately results in injury or the potential for injury (1). Self-directed violence may be *suicidal* or *non-suicidal* in nature. For the purposes of this document, we refer only to behavior where suicide is intended.

Comment [A]: Changed the word "harms" here to effects since we use harms in the next sentence.

Comment [A]: New sentences

Comment [A]: New sentence



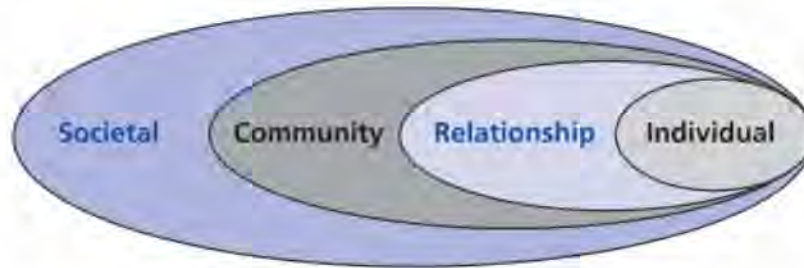
- **Suicide** is a death caused by self-directed injurious behavior with any intent to die as a result of the behavior.
- **Suicide attempt** is defined as a *non-fatal* self-directed and potentially injurious behavior with any intent to die as a result of the behavior. A suicide attempt may or may not result in injury.

### **Suicide is highly prevalent.**

Suicidal behavior presents a major challenge to public health in the United States and worldwide. It contributes to premature death, morbidity, lost productivity, and health care costs (2, 3). In 2014 in the U.S., the most recent death data available, suicide was responsible for 42,773 deaths, which is approximately a suicide every 12 minutes (4). In 2014, suicide ranked as the tenth leading cause of death and has been among the top twelve leading causes of death since 1975 in the U.S. (5) Overall suicide rates have increased from 1999 to 2014 (24% increase) (6). Suicide is a problem throughout the life span; it is the second leading cause of death among those aged 10–19 years, also second among persons in their 20s and 30s; it is the fourth leading cause among persons in their 40s and seventh among persons in their 50s (4).

Suicides reflect only a portion of the number of persons affected by suicidal thoughts and behaviors (7). Substantially more persons are hospitalized as a result of nonfatal suicidal behaviors than are fatally injured, and an even greater number are either treated in ambulatory settings or not treated at all (7). For example, during 2014, among adults aged  $\geq 18$  years, for every one suicide there were 9 adults treated in hospital emergency departments for self-inflicted injuries, 27 who reported making a suicide attempt, and over 227 who reported seriously considering suicide (8). Suicides, attempts, and ideation take an immense emotional, physical, and economic toll on individuals, families and communities. By one estimate, for every death by suicide six people are directly impacted (i.e. survivors). Based on this figure it is estimated that there are over 13 million survivors in the U.S. and unfortunately, survivorship itself is a risk factor for suicide (9).

**Suicide is associated with several risk and protective factors.** Suicide, like other human behaviors, is complex with no single determining cause. It occurs in response to multiple biological, psychological, interpersonal, environmental and societal influences that interact with one another and act cumulatively to increase one's vulnerability to think about or engage in suicidal behaviors. The social-ecological model is a useful framework for viewing and understanding suicidal risk factors that have been identified in the literature<sup>1</sup>:



#### Risk Factors for Suicide<sup>2,3</sup>

- ❑ **Individual:** History of depression and other mental illnesses, alcohol and drug abuse, previous suicide attempt, previous victimization, acute and chronic stressors (e.g. financial problems), genetic and biological determinants, hopelessness
- ❑ **Relationship:** High conflict or violent relationships, sense of isolation and lack of social support, family history of suicide, financial and work stress
- ❑ **Community:** Inadequate community connectedness, barriers to health care-- lack of access to providers or medications
- ❑ **Societal:** Availability of lethal means of suicide, unsafe media portrayals of suicide, stigma associated with help-seeking

An individual having or experiencing one or a number of risk factors does not always lead to suicide; for example, the vast majority of individuals who are depressed do not die by suicide. It is also important to note that these risk factors described above is not an exhaustive list. These and many other risk factors exist and can be arranged differently or contribute to multiple areas within the social-ecological model. Furthermore, the relevance of each risk factor can vary by age, race, gender, sexual orientation, residential geography, and socio-cultural and economic status<sup>2,3</sup>.

Protective factors for suicide: Protective factors, or those influences that guard against the risk for suicide, can also be found across the different levels of the social-ecological model and may vary in significance depending on the context in which the suicide occurs. Protective factors identified in the literature include: effective coping and problem solving skills, moral objections to suicide, strong and supportive relationships with partners, peers, and family, connectedness to school, community and other social institutions and the availability of physical and mental health care<sup>2,3</sup>. These protective factors can either counter a specific risk factor or guard against a number of risks associated with suicide.



### **Suicide is connected to other forms of violence.**

Suicide is connected to other forms of violence in a number of different ways. First, suicide and other forms of violence often share some of the same root causes. They can all take place under one roof, or in a given community or neighborhood and can happen at the same time or at different stages of life.<sup>i,ii</sup> For example, in neighborhoods where there is low cohesion, or where residents don't support and trust each other, people are at higher risk for suicide<sup>iii</sup> as well as perpetration of child maltreatment,<sup>iv,v</sup> teen dating violence,<sup>vi</sup> intimate partner violence,<sup>vii</sup> and youth violence.<sup>viii</sup> Lack of economic opportunities and unemployment are associated with suicide,<sup>ix,x</sup> as well as perpetration of child maltreatment,<sup>xi</sup> intimate partner violence,<sup>xii,xiii</sup> sexual violence<sup>xiv</sup> and youth violence.<sup>xv</sup> Also, while most people who are victims of violence do not act violently or die by suicide, people who experience or are exposed to suicide are at a higher risk for both being a victim of other forms of violence and for inflicting harm on others. For example, children who experience physical abuse or neglect early in their lives are at greater risk for suicide,<sup>xvi</sup> and also at greater risk for committing violence against peers (particularly for boys),<sup>xvii</sup> bullying,<sup>xviii</sup> teen dating violence,<sup>xix</sup> and committing child abuse,<sup>xx</sup> elder abuse,<sup>xxi</sup> intimate partner violence,<sup>xxii</sup> and sexual violence<sup>xxiii</sup> later in life. There are also a number of protective factors that pose an opportunity to protect individuals and communities from suicide and other forms of violence, and buffer the effects of shared risk factors. For example, connectedness increases peoples' and communities' resilience to suicide and other forms of violence, including connectedness to one's community,<sup>xxiv,xxv,xxvi,xxvii,xxviii,xxix,xxx</sup> school,<sup>xxxi,xxxii,xxxiii,xxxiv,xxxv,xxxvi</sup> family,<sup>xxxvii,xxxviii,xxxix, xl,xli</sup> caring adults,<sup>xlii,xliii,xliv</sup> and pro-social peers.<sup>xlvi,xlv</sup>

### **The health and economic consequences of suicide are substantial.**

Total lifetime costs associated with nonfatal injuries and deaths caused by self-directed violence in 2013 were approximately \$93.5 billion after adjusting for under-reporting of suicide (10).

### **Suicide can be prevented.**

Despite the myths surrounding suicide, like most public health problems, suicide is preventable. And while progress will continue to be made into the future, evidence for numerous programs, practices, and policies currently exist and are ready to be implemented now. Just as suicide is not caused by a single factor, research suggests that suicide will not be prevented by any single intervention taking place in any single setting. Rather, suicide prevention is best achieved by a focus across the individual-, relationship-, family-, community, and societal-levels and across all sectors, private and public (e.g., business, public health, physical and behavioral healthcare, justice, education, labor). According to CDC Director, Tom Frieden, successful public health programs also require political commitment, funding, communication, and performance monitoring.

## **Assessing the Evidence**



This technical package includes programs, practices, and policies with evidence of impact on suicide or risk or protective factors for suicide. To be considered for inclusion in the technical package, the program, practice, or policy selected had to meet at least one of these criteria: a) meta-analyses or systematic reviews showing impact on suicide; b) evidence from at least one rigorous (e.g., randomized controlled trial [RCT] or quasi-experimental design) evaluation study that found significant preventive effects on suicide; c) meta-analyses or systematic reviews showing impact on risk or protective factors for suicide, or d) evidence from at least one rigorous (e.g., RCT or quasi-experimental design) evaluation study that found significant impacts on risk or protective factors for suicide. Finally, consideration was also given to the likelihood of achieving beneficial effects on multiple forms of violence; no evidence of harmful effects on specific outcomes or with particular subgroups; and feasibility of implementation in a U.S. context if the program, policy, or practice has been evaluated in another country.

Within this technical package, some approaches do not yet have research evidence demonstrating impact on rates of suicide but instead are supported by evidence indicating impacts on risk or protective factors for suicide (e.g., help-seeking, stigma reduction, depression, connectedness). In terms of the strength of the evidence, programs that have demonstrated effects on suicidal behavior (e.g., reductions in deaths, attempts) provide a higher-level of evidence, but the evidence base is not that strong in all areas. For instance, there has been less evaluation of community engagement and family programs on suicidal behavior. Thus, approaches in this package that have effects on risk or protective factors reflect the developmental nature of the evidence base and the use of the best available evidence at a given time.

It is also important to note that there is often significant heterogeneity among the programs, policies, or practices that fall within one approach or strategy area in terms of the nature and quality of the available evidence. Not all programs, policies, or practices that utilize the same approach (e.g., gatekeeper training) are equally effective, and even those that are effective may not work across all populations. Tailoring programs and more evaluation may be necessary to address different population groups. The examples provided are not intended to be a comprehensive list of evidence-based programs, policies, or practices for each approach, but rather illustrate models that have been shown to impact suicide or have beneficial effects on risk or protective factors for suicide. In practice, the effectiveness of the programs, policies and practices identified in this package will be strongly dependent on the quality of their implementation and the communities in which they are implemented. Implementation guidance to assist practitioners, organizations and communities will be developed separately.

### Context and Cross-Cutting Themes

The strategies and approaches that have been included in this technical package represent different levels of the social ecology, with efforts intended to impact the community and societal levels, as well individual and relationship levels. The strategies and approaches are intended to work in combination and reinforce each other to prevent suicide (see box below). The strategies are arranged in order such



that those strategies hypothesized to have the greatest potential for broad public health impact on suicide are included first, followed by those that might impact more select populations (e.g., persons who have already made a suicide attempt).

Preventing Suicide	
Strategy	Approach
Strengthen economic supports	<ul style="list-style-type: none"> <li>Strengthen financial security</li> <li>Housing stabilization policies</li> </ul>
Strengthen access to mental health care	<ul style="list-style-type: none"> <li>Coverage of mental health conditions in health insurance policies</li> </ul>
Establish protective environments	<ul style="list-style-type: none"> <li>Means restriction</li> <li>Organizational policies and culture</li> <li>Community-based policies to reduce excessive alcohol use</li> </ul>
Promote connectedness to protect against suicide	<ul style="list-style-type: none"> <li>Peer norm approaches</li> <li>Community engagement activities</li> </ul>
Teach coping and problem-solving skills	<ul style="list-style-type: none"> <li>Social-emotional learning</li> <li>Parenting skill and family relationship approaches</li> </ul>
Identify and support people at risk	<ul style="list-style-type: none"> <li>Gatekeeper training</li> <li>Screening combined with care management</li> <li>Crisis intervention</li> </ul>
Intervene to lessen harms and prevent future risk	<ul style="list-style-type: none"> <li>Treatment for people at-risk of suicide</li> <li>Treatment to prevent re-attempts</li> <li>Postvention</li> <li>Safe messaging following a suicide</li> </ul>

The example programs, policies, and practices have been implemented within particular contexts. The social and cultural context of communities is critically important to take into account when selecting strategies and approaches. Practitioners in the field may be in the best position to assess the needs and strengths of their communities and work with community members to make decisions about the combination of approaches included here that are best suited to their context.

[Add text for other issues to potentially cover in this section. You may want to take a look at the other packages in this regard]

This package includes strategies where public health agencies are well positioned to bring leadership and resources to implementation efforts. It also includes strategies where public health can serve as an important collaborator (e.g., strategies addressing community and societal level risks), but where leadership and commitment from other sectors such as business/labor or health care is critical to implement a particular policy or program (e.g., workplace policies; screening combined with care management). The role of various sectors in the implementation of a strategy or approach in preventing suicide is described further in the section on *Sector Involvement*.

In the sections that follow, the strategies and approaches with the best available evidence for preventing suicide are described.



## Strengthen Economic Supports

### Rationale

### Approaches

Brief statement introducing the approaches (see example statements in the other technical packages).

- **Strengthen household financial security.** Research indicates that economic crises are related to suicide rates. Findings from the U.S. show that suicide rates increase during economic recessions marked by high unemployment rates, job losses, and economic instability and decrease during economic expansions and periods marked by low unemployment rates, particularly for working-age individuals 25 to 64 years old (Luo et al., 2011; Fowler et al., 2015). Policies that support financial security during difficult economic times have been shown to mitigate the risk of economic crises on suicide rates.
- **Housing stabilization policies** that aim to strengthen housing stability and security may help to buffer the impact of foreclosures and evictions on suicide, as recent research has drawn an association between housing instability and suicidal behavior. Programs that provide affordable housing and other options for homebuyers such as loan modification programs may be used in conjunction with move-out planning and financial counseling services to minimize the impact of foreclosures and evictions on suicide.

### Potential Outcomes

- 
- 
- 

### Evidence

Brief statement introducing the evidence [see example statements in the other technical packages].

- **Strengthen household financial security.**

- **Housing stabilization policies.**



## Strengthen Access to Mental Health Care

### Rationale

Mental illness is a risk factor for suicide. Studies suggest that up to 90% of people who die by suicide may have had a mental illness (Cavanaugh et al., 2003). Research on state-level suicide rates have been found to be correlated with general mental health measures such as depression (Arsenault-Lapierre, et al., 2004). While most people with mental health problems do not attempt or die by suicide, assuring access to quality mental health care is critical to suicide prevention.

### Approaches

A major approach to strengthening access to mental health care is to have health insurance policies that include coverage for such services.

- **Coverage of mental health conditions in health insurance policies.** Health insurance policies that allow people with mental health problems to access mental health treatment in the same way that they access health care for physical health concerns can increase use of mental health services, help normalize treatment seeking in the population, reduce symptoms of mental illnesses like depression and bipolar disorder, and in turn, reduce rates of suicide and suicide attempts.

### Potential Outcomes

- Increased access to mental health services
- Decreased symptoms of mental illnesses
- Decreased rates of suicide attempts
- Decreased rates of suicide

### Evidence

Brief statement introducing the evidence.

- **Coverage of mental health conditions in health insurance policies.**  
Using data from the National Survey of Drug Use and Health, Harris et al. (2006) found that 12 months after states enacted parity laws, self-reported use of mental healthcare services significantly increased. Subsequent research by Lang et al. (2011), suggests that mental health parity laws are associated with an approximate 5% reduction in suicide rates. This reduction (in 29 states) equated to the prevention of 592 suicides per year and a cost savings of \$1.3-3.1 million per suicide prevented (Lang, 2013).

## Establish Protective Environments

### Rationale

Suicide prevention efforts that focus on *both* the individual *and* his/her environment increase the likelihood of lives saved. Establishing protective environments helps ensure that all of the places where an individual lives, works, and plays are supportive. Limiting access to lethal means, be it at home or in nature, and particularly when an individual may be most vulnerable, can literally make the difference between life and death. Likewise, creating a work environment conducive to prevention and focused on employee well-being supports the large majority of the population where they spend much of their day. Finally, policies that reduce the availability of alcohol, a potent suicide risk factor, serve to support individuals and protect the environment further.

### Approaches

The current evidence suggests three approaches with promise for creating environments that protect against suicide. These include:

- **Means Restriction.** Modifying the environment to decrease access to lethal means is an important public health strategy for preventing suicide. Acute suicidal crises are often brief and impulsive. Previous research indicates that the interval between thinking about suicide and attempting can be as short as 5-10 minutes (Simon et al., 2001; Deisenhammer et al., 2009). Getting past the impulse by making it more difficult to access lethal means can be lifesaving. Highly lethal means such as firearms, hanging/suffocation, or jumping from heights provide little opportunity for rescue and have high fatality rates (e.g., about 85% of people who use a firearm in an attempt die from their injury). Research also indicates that most people tend not to substitute a different method when a highly lethal method is unavailable or difficult to access (Hawton, 2007; Yip et al., 2012). Removing or restricting access to lethal means changes the context of the potential suicide and whether the outcome will be fatal or non-fatal (Yip et al., 2012).
  - *Intervening at Suicide Hotspots.* These interventions are focused on preventing suicides at locations which offer direct means for suicide or a secluded place that prevents intervention. Suicide hotspots include tall structures (for example, bridges and cliffs), railway tracks, and isolated locations that are popular destinations for suicide (for example, parks). Interventions include barriers to prevent jumping and signs and telephones to encourage suicidal individuals to seek help.
  - *Safe Storage Practices* for medications, firearms, and other household products can reduce the risk for suicide by preventing impulsive action and separating individuals from easy access to lethal means. Safe storage practices include education and counseling around storing firearms locked in a secure place (e.g., in a gun safe or lock box), preferably unloaded and separate from the ammunition. Keeping medicines in a



locked cabinet or secure location can also prevent their misuse by children and adolescents.

- **Organizational policies and culture** that focus on prosocial behavior, skill building, changing social norms, referral and access to helping services (e.g. mental health, substance abuse treatment, financial counseling), and that have leadership support from the top down can positively impact organizational climate and morale and help prevent suicide and its related risk factors (e.g. depression, social isolation).
- **Community-based policies to reduce excessive alcohol use.** Acute alcohol use has been found to be associated with more than one-third of suicides and approximately 40% of suicide attempts (Cherpitel, Borges & Wilcox, 2004). While various community policies exist to reduce excessive alcohol use (e.g., zoning limits related to alcohol outlet locations and density, taxes on alcohol, and bans on the sale of alcohol for individuals under the legal drinking age), previous research indicates that policies related to outlet locations and density are more strongly associated with suicide, making these particular policies an important approach to preventing suicide.

### Potential Outcomes

- Increase in safe storage of lethal means
- Reduction in suicide attempts
- Reduction in suicide deaths
- Reduction in alcohol-related suicide deaths

### Evidence

The evidence for the effectiveness of means restriction and other ways to establish protective environments is some of the strongest in the field (Zalsman et al., 2016).

- **Means restriction**
  - *Intervening at suicide hotspots* A meta-analysis of suicide hotspot interventions implemented in combination or in isolation in the U.S. and abroad found they reduced suicide (Pirkis et al., 2015; Cox, 2013). For example, suicide deaths from jumping from the Jacques-Cartier bridge in Canada decreased after the installation of a bridge barrier (incidence rate ratio [IRR] = 0.24; 95% confidence interval [CI] = 0.13, 0.43), which persisted when all bridges (IRR = 0.39; 95% CI = 0.27, 0.55) and all jumping sites (IRR = 0.66; 95% CI = 0.54, 0.80) in the regions were considered, suggesting little or no displacement to other jumping sites (Perron, et. al., 2013). In contrast, the

removal of safety barriers on the Grafton Bridge in Auckland, New Zealand led to an immediate and substantial increase in both the numbers and rate of suicide by jumping from the bridge from 3 to 15 ( $p < 0.01$ ); the rate of such deaths also increased ( $p < 0.01$ ; Beautrais, 2001; Beautrais, et. al., 2009).

- *Safe storage practices* In a case-control study of firearm-related events identified by medical examiner and coroner offices from 37 counties in Washington, Oregon, and Missouri, and 5 trauma centers, Grossman et al., (2005) found that safe storage practices (i.e., storing firearms unloaded, separate from ammunition, in a locked place and/or secured with a safety device) were protective for suicide attempts among adolescents (Grossman et al., 2005). A recent systematic review of clinic and community-based education and counseling around safe storage of firearms found that the provision of safety devices significantly increases safe firearm storage practices compared to counseling alone or providing economic incentives to acquire safety devices (Rowhani-Rahbar, Simonetti, & Rivara, 2016). The *Emergency Department Counseling on Access to Lethal Means (ED CALM)* program trained psychiatric emergency clinicians in a large children's hospital to provide lethal means counseling and safe storage boxes to parents of patients under age 18 receiving care for suicidal behavior. In a pre-post study, Runyan et al (2015) found that among the parents contacted at follow-up, 76% reported all medications in the home were locked up as compared to fewer than 10% at the time of the initial emergency department visit. Among parents who indicated the presence of guns in the home at the time of the child's initial emergency department visit, all reported guns were currently locked, compared to 67% reporting this at the time of the initial visit.
- **Organizational policies and culture** *Together for Life* is a workplace program of the Montreal Police Force implemented to address suicide among officers. Policy and program components of *Together for Life* were designed to foster an organizational culture that promoted mutual support and solidarity among members of the Force, help for problems related to suicide, training of supervisors, managers and all units to improve competencies in identifying suicidal risk and in using existing resources, and an education campaign to improve awareness and help-seeking. After implementation of the program, police suicides were tracked over 12 years and compared to rates in the control city of Quebec. Pre-post assessments of learning, interviews, and focus groups were also included. The suicide rate in the intervention group decreased significantly by 78.9% ( $p < .008$ ) to 6.42 per 100,000 per year compared to 29.0 per 100,000 in the control city--a significant difference in rates ( $p < .007$ ) (Mishara & Martin, 2012).

*The United States Air Force Suicide Prevention Program (AFSPP)*, inclusive of 11 policy and education initiatives, was designed to change the culture of the Air Force surrounding suicide. The program uses leaders as role models and agents of change, establishes expectations for behavior related to awareness of suicide risk, develops population skills and knowledge (i.e., education and training), and investigates every suicide (i.e., outcomes measurement). The program represents a fundamental shift from viewing suicide and mental illness solely as medical problem and instead sees them as larger service-wide problems impacting the whole community. Using a time-series design, the *AFSPP* program



was associated with a 33% relative risk reduction in suicide (Knox et al., 2003). The program was also associated with relative risk reductions in related outcomes including moderate and severe family violence (30% and 54%, respectively), homicide (51%), and accidental death (18%); Knox et al., 2003). A longitudinal assessment of the program over the period 1981 to 2008 (16 years before the 1997 launch of the program and 11 years post-launch) found significantly lower rates of suicide after the program was launched than before (Knox et al., 2010). These effects were sustained over time, except in 2004, which the authors found was associated with less rigorous implementation in that year than in the other years (Knox et al., 2010).

- **Community-based policies to reduce excessive alcohol use** Several studies on alcohol outlet density in the United States have found that greater alcohol availability is positively associated with alcohol-involved suicides (Giesbrecht et al., 2014; Escobedo & Ortiz, 2002). For example, Giesbrecht et al. (2014) found that both on and off-premises alcohol outlets (i.e., restaurants where alcohol is served and stores where alcohol is available for purchase to go) were positively associated with alcohol-related suicides in 14 U.S. states, particularly among men (AOR 1.08, CI=1.03-1.13) and American Indian/Alaska Natives (AOR= 1.36; CI= 1/10-1.69). Additionally, a longitudinal analysis of alcohol outlet density, suicide mortality, and hospitalizations for suicide attempts over 6 years in 581 California zip codes indicated that the density of bars, specifically, is related to suicide and suicide attempts, particularly in rural areas (Johnson, Gruenewald & Remer, 2009). These findings suggest that measures to reduce alcohol outlet density can potentially reduce alcohol-involved suicides.

## Promote Connectedness to Protect Against Suicide

### Rationale

The quantity and quality of our social connection with others has been linked with suicide dating as far back to Durkheim, who first posited that the weakening social bonds is among the chief causes for suicidality<sup>1</sup>. Connectedness is the degree to which an individual or group of individuals are socially close, interrelated, or share resources with others<sup>2</sup>. Connectedness can be formed within and between multiple levels of the social ecology<sup>3</sup>; for instance between individuals (e.g. peers, neighbors, co-workers), families, schools, neighborhoods, workplace, faith communities, cultural groups, and society as a whole. Connectedness is also viewed as a broad term that encompasses several other concepts including social support, social participation, social isolation, social cohesion, social capital, social integration, all of which have been linked to suicidal behaviors either conceptually or scientifically within the literature. Connectedness can serve either to protect or mitigate suicidal behaviors by decreasing isolation, encouraging adaptive coping behaviors, increasing belongingness, personal value and worth all of which helps individuals to build resilience in the face of adversity. Connectedness can also provide individuals with better access to formal supports and resources, mobilize communities to meet the needs of its members and provide collective primary prevention activities to the community as a whole<sup>2</sup>.

[insert info on connectedness and include some or all of the following re social capital here]. Social capital refers to a sense of trust in one's community and neighborhood, social integration, and also the availability and participation in social organizations (Muenning et al., 2013; Beyer et al., 2014). Many ecological cross-sectional and longitudinal studies have examined the impact of aspects of social capital on depression symptoms, depressive disorder, mental health more generally, and suicide. While the evidence is still being built the pattern is towards an inverse association between social capital measured by social trust, community/neighborhood engagement, and improved mental health

### Approaches

The following two approaches are designed to promote connectedness among individuals and within communities to protect against suicide.

- **Peer norm approaches** seek to normalize help-seeking, encourage reaching out and talking to trusted adults, and promote supporting peers through building connectedness. These approaches are typically delivered in school settings but can also be implemented in community settings.

**Comment [A]:** This is what was in the table that Linda said could be added to the rationale.



- **Community engagement activities.** Community engagement is an aspect of social capital and involves residents participating in a range of activities, including religious activities, community clean-up and greening activities, and physical exercise. These activities provide opportunities for residents to become more involved in the community and to connect with other community members, organizations, and resources, resulting in enhanced overall physical health, reduced stress, and decreased depressive symptoms, thereby reducing risk of suicide.

### Potential Outcomes

- Reduction in maladaptive coping attitudes and behaviors
- Increase in healthy coping attitudes and behaviors
- Increase in referrals for youth in distressed
- Increase help-seeking behaviors
- Positive perception of adult support

### Evidence

Brief statement to introduce the evidence.

Current evidence provide some support for these types of approaches for reducing risk factors associated with suicidal behaviors.

- **Peer norm approaches.** Evaluations show that programs such as *Sources of Strength (SOS)* can improve school norms and beliefs about suicide that are created and disseminated by student peers. In a randomized controlled trial of the program conducted with 18 urban and rural high-schools Wyman et al., (2010)<sup>4</sup> found that *SOS* improved peer leaders' knowledge of adult supports for suicidal peers ( $p<.01$ ) and were more likely than untrained leaders to refer distressed peers to adult supports ( $p<.03$ ). Trained peer leaders also reported a greater decrease in maladaptive coping attitudes compared with untrained leaders ( $p<.01$ ).
- **Community-engagement activities.** *Greening vacant urban spaces* is an initiative that communities have adopted, particularly after the Great Recession (2007-2009) when many cities across the U.S. experienced urban abandonment. These initiatives engaged community members in the cleaning, greening, or beautifying vacant areas. One vacant lot greening initiative, which greened 4,436 lots in 4 areas of Philadelphia, PA, greening significantly reduced community residents' self-reported stress levels ( $p<.001$ ) and engaged in more physical exercise ( $p<.001$ ) than residents in control vacant lot areas. Other benefits included reductions in firearm assaults and vandalism<sup>5</sup>.

## Teach Coping and Problem-Solving Skills

### Rationale

Building life skills prepare individuals to successfully tackle every day challenges and adapt to stress and adversity. Life skills encompasses many concepts, but most often include coping and problem-solving skills, conflict resolution, and critical thinking. Life skills are important in shielding individuals from suicidal behaviors<sup>6</sup>. Suicide prevention programs that focus on life and social skills training are drawn from social cognitive theories<sup>7</sup>, surmising that individuals who engage in suicidal behavior is attributed to either direct learning, modeling, and environmental and individual (e.g. hopelessness) characteristics. The literature linking life skills and suicide is robust--- The inability to employ adequate coping strategies to cope with immediate stressors or identify and find solutions for problems have been characterized among suicide attempters<sup>8</sup>. Treatments that include bolstering problem skills<sup>9</sup> and include problem-solving techniques<sup>10,11</sup> appear to reduce suicidal ideation and attempts more effectively. Prevention programs focused on teaching these skills target youth, parents and families and have been used with both universal and at-risk populations. While many do not target suicidal behaviors directly, these programs strive to train youth and parents important life skills to offset the underlying vulnerabilities that contribute to engaging in high risk behaviors early in life.

### Approaches

Current evidence provides support for the following two approaches:

- **Social emotional learning programs** focus on developing and strengthening communication and problem-solving skills, emotion regulation, conflict resolution, help seeking and coping skills. These approaches address a range of risk and protective factors for suicidal behavior. They provide children and youth with skills to resolve problems in relationships, school, and with peers, and help youth to address other negative influences (e.g., substance use) associated with suicide. These approaches are typically delivered to all students in a particular grade or school, although some programs also focus on groups of students considered to be at high-risk for suicide. Opportunities to practice and reinforce skills are an important part of programs that work.
- **Parenting skill and family relationship programs** are designed to strengthen parenting skills, enhance positive parent-child interactions, and improve children's behavioral and emotional skills and abilities. Several parenting and family relationship programs have been shown in rigorous evaluations to improve resilience and reduce risk factors for various behaviors, including ones closely related to suicide, such as depression, internalizing behaviors, and substance abuse.



## Potential Outcomes

- Reduction in suicide attempts and suicide ideation
- Enhanced knowledge of risk and protective factors associated with suicide
- Reduction in suicide risk behaviors (i.e., depression, anxiety, conduct problems, substance abuse)
- Improve and normalize help-seeking behavior
- Enhance social competence and emotional regulation skills
- Enhance problem-solving and conflict management skills

## Evidence

There are several programs with evidence that supports teaching social, emotional and parenting skills to reduce suicidal behaviors and associated risk factors.

- **Social emotional learning programs.** These programs, commonly delivered in schools, overall have demonstrated success in preventing suicide risk. However, the evidence is mixed; while most models demonstrated strong effects, others were mixed. For example, *Signs of Suicide (SOS)* is a high school-based prevention program for students designed to increase knowledge about suicide improve and normalize help-seeking behaviors. After 3 months of participation, *SOS* has documented a 64% reduction in suicide attempts among its participants compared to controls. *SOS* participants with a lifetime history of suicide attempt were also significantly less likely to report planning a suicide in the 3 months following the program compared to lower-risk participants. Moreover, increased knowledge of how access help for themselves or friends for depression and/or suicidal thoughts, and favorable attitudes toward help-seeking were noted among students who participated in *SOS*<sup>12</sup>.

Another example is *The Good Behavior Game (GBG)*, which is a classroom-based program for elementary school children uses a behavior management strategy that promotes good behavior by setting clear expectations for good behavior and consequences for maladaptive behavior. In the evaluation of this program, several outcome behaviors were measured including suicide, given its association with externalizing behavior problems. Results from the first cohort evaluation found that first graders assigned to *GBG* reported half the adjusted odds of suicide ideation and suicide attempts than controls. After 14 years postvention, *GBG* was also found to significantly reduce risk of substance abuse<sup>13</sup>. However, in a replication trial, *GBG* did not produce the same reductions on suicide ideation or attempts as it did in the first cohort<sup>14</sup>. This finding likely arose due to the lack of implementation fidelity and pointed to the need for *GBG* to be delivered with precision, consistency, and teacher support (ref??).

Finally, the *Youth Aware of Mental Health Program (YAM)*, a school-based program rigorously evaluated in 10 European countries, teaches youth about suicide risk and protective factors and problem-solving skills. At 12 months, students participating in *YAM* were significantly less likely to have a suicide attempt and severe suicidal ideation compared to controls; Risk of suicide ideation and attempts fell by 49 to 54% among *YAM* participants<sup>15</sup>.

- **Parenting skill and family relationship programs**

Parenting and family skills training approaches have shown promising impacts in preventing key risk factors associated with suicide. One program, *The Incredible Years* is a universally delivered program for parents of children up to 12 years of age designed to improve responsive and positive parent-teacher-child interactions and relationships, emotion self-regulation and social competence and reduce problem behaviors in children. Several studies have demonstrated the effect of *The Incredible Years* program on reducing internalizing symptoms, such as anxiety and depression, and child conduct problems<sup>16,17,18,19</sup>. The program is also associated with improved problem-solving and conflict management, skills that were maintained at 1-year follow-up<sup>17,18,19</sup>. The program also demonstrated greater benefits as the dosage of the intervention increased<sup>20</sup>. *Strengthening Families 10-14 years* is a program that involves sessions between parents, youth, and family with the goals of: 1) improving parents' skills for disciplining, managing emotions and conflict, and communicating with their children; 2) promoting youths' interpersonal and problem-solving skills; and 3) creating family activities to build cohesion and positive parent-child interactions. The program has successfully shown to decrease externalizing behaviors, alcohol use, and drug use among youth participants and reductions in depression, alcohol use, and drug use among participating families<sup>21</sup>.



## Identify and Support People At-Risk

### Rationale

In order to be successful in decreasing suicidal behavior, attention must be paid to those who are at-risk or vulnerable. These persons experience risk and occurrence of suicidal behavior that is higher than average. This group requires particular focus on proactive case finding and retention and access to services. These vulnerable or disadvantaged populations include (but are not limited to): those living in lower socio-economic status; members of certain ethnic minority groups; those with a mental health problem; those who are institutionalized; those who have been victims of violence; and those who are homeless. Finding effective ways of identifying at-risk or vulnerable groups, customizing services to make them accessible and maintaining care are still key challenges. For example, simply improving services does not guarantee that those services will be used by those most in need of them. Nor will it necessarily increase the number of people who follow treatments that are recommended. People who are disadvantaged face social and economic issues that may adversely affect their ability to respond to the treatments or advice that are offered.

### Approaches

This document outlines three approaches that focus on identifying and supporting those who are at-risk.

- **Gatekeeper training** is typically implemented in schools and within health care settings and is designed to train teachers, coaches, providers and others in the community to identify people who may be at risk of suicide and to respond effectively, including facilitating treatment seeking and support services.
- **Screening combined with care management and overall continuity of care** has been used in primary care and behavioral health care to assure that people who may be at high-risk of suicide don't 'slip through the cracks'. These approaches typically employ screening for depression and/or suicide combined with collaborative treatment planning between patients and their providers and patient follow-up. Programs such as these have demonstrated beneficial effects on depression, suicide ideation, and suicide mortality.
- **Crisis intervention.** These approaches provide support and referral services, typically by connecting a person in crisis (or a friend or family member of someone at-risk) to trained volunteers and/or professional staff via telephone hotline, online chat, or text messaging. Crisis intervention approaches are intended to impact key risk factors for suicide, including feelings of depression, hopelessness, and subsequent mental health care utilization. Like means restriction,

crisis interventions can put space or time between an individual who may be considering suicide and harmful behavior.

### Potential Outcomes

- Reduction in suicide attempts
- Reduction in suicide deaths
- Increased identification of individuals at-risk for suicidal behavior
- Increased at-risk individuals in treatment
- Increased community members trained to identify at-risk individuals
- Increased referrals for health care

### Evidence

- There is evidence that community gatekeeper programs are successful in reducing suicides and suicide attempts but the efforts must be maintained. (Substance Abuse and Mental Health Services Administration, Center for Mental Health Services. Report to Congress: Garret Lee Smith Suicide Prevention Program. US Department of Health and Human Services: Rockville, MD, 2014). There is limited evidence for effectiveness screening programs but standard principles for public health screening make them promising. (Pena JB, Caine ED. Screening as an Approach for Adolescent Suicide Prevention. *Suicide and Life-Threatening Behavior*. 2006; 36(6):614-637. The number of studies evaluating crisis intervention services is limited but a few studies do indicate that those who use the hotline services have decreased suicidal thoughts and behavior.
- **Gatekeeper training.**  
*Mental Health First Aid (MHFA)*, designed for the lay public, consists of three weekly sessions of three hours each. The content covers helping people in mental health crises and/or in the early stages of mental health problems. The crisis situations covered included suicidal thoughts and behavior, acute stress reaction, panic attacks and acute psychotic behavior. The mental health problems discussed included depressive, anxiety and psychotic disorders. The co-morbidity with substance use disorders is also covered. Participants learn the symptoms of these disorders, possible risk factors, where and how to get help and evidence-based effective help. In a randomized controlled trial of 300 participants, the intervention group reported greater confidence in providing help to others, greater likelihood of advising people to seek professional help, improved concordance with health professionals about treatments, and decreased stigmatizing attitudes. An additional finding was an improvement in the mental health of the participants themselves. All results were statistically significant at  $p < .05$ . (Kitchener & Jorm,



2004). Additional research rigorously evaluating MHFA for its impact on the first aid recipients themselves and suicidal behavior is needed (Kitchener & Jorm, 2006).

*Garret Lee Smith (GLS) Suicide Prevention Program*, as of June 2014, 154 GLS grants had been awarded to 49 states and 48 tribes. Gatekeeper training has been a core part of all GLS programs, and grantees have consistently reported spending the largest proportion of their budget on this strategy. A multi-site evaluation assessed the connection between community gatekeeper training (activities such as the number of people trained and the intended mid- and long-term outcomes) and a reduction of suicide attempts and deaths. To address this question, the analysis compared the change in the suicide mortality rates and nonfatal suicidal behavior among the population aged youth and young adults in counties implementing GLS trainings, with the trajectory observed in similar counties that did not implement these trainings. Effect on fatal behavior - When compared with similar counties that did not implement GLS training, counties implementing GLS trainings presented significantly lower youth suicide rates the year following the training implementation (-1.07,  $p=.03$ ). This finding represents a decrease of 1 suicide death per 100,000 10 to 24 year olds or the avoidance of approximately 237 deaths in this age group between 2007 and 2010. Effect on nonfatal behavior - Counties implementing GLS program activities had significantly lower suicide attempt rates among youths 16 to 23 years of age in the year following implementation of the GLS program than did similar counties that did not implement GLS program activities (4.9 fewer attempts per 1000 youths [95% CI, 1.8-8.0 fewer attempts per 1000 youths];  $P = .003$ ). More than 79 000 suicide attempts may have been averted during the period studied following implementation of the GLS program.

Walrath C, Godoy-Garraza L, Reid H, Goldston DB, McKeon R. Impact of the Garrett Lee Smith Youth Suicide Prevention Program on Suicide Mortality. *American Journal of Public Health*: May 2015, Vol. 105, No. 5, pp. 986-993. doi: 10.2105/AJPH.2014.302496.

Godoy Garraza L, Walrath C, Goldston DB, Reid H, McKeon R. Effect of the Garrett Lee Smith Memorial Suicide Prevention Program on Suicide Attempts Among Youths. *JAMA Psychiatry*. 2015; 72:1143-1149. doi:10.1001/jamapsychiatry.2015.1933. I Brief statement introducing the evidence.

- **Screening combined with care management and overall continuity of care.**

*Henry Ford Perfect Depression Care (Pre-cursor to Zero Suicide)* The overall goal of the program was to eliminate suicide. More broadly, the aim of the program was to completely redesign depression care delivery to achieve breakthrough improvement in quality and safety. The redesign focused on six aims: effectiveness, safety, patient centeredness, timeliness, efficiency, and equity among patients. The program developed concrete measures to assess progress on each of these aims. The program began with screening and assessment of each patient for suicide

risk with coordinated continuous follow-up care system wide. On the basis of the combined total of 31 suicides for the 11-year observation period, the rate of suicide among patients was 97 per 100,000 (N=13) for the two baseline years (the average rate for 1999 and 2000). This rate is similar to that reported for a clinical population. For the start-up year (2001), the rate of suicide was 41 per 100,000 (N=3). For the follow-up interval (the average for 2002–2009), the rate was 19 per 100,000 (N=15). Poisson regression analysis showed a statistically significant decrease of 82% in the suicide death rate between the baseline (1999–2000) and intervention (2002–2009) years (rate ratio=.20; 95% confidence interval=.16–.24,  $p \leq .001$ ). Coffey et al., 2013; Coffey, 2006. Additionally, between 1999 and 2010, researchers found that suicide rates declined among HMO members who received mental health specialty services, in association with a target prevention effort, and increased among HMO members who accessed general medical services but not specialty MH services (Coffey et. al., 2015).

- **Crisis intervention.**

*National Suicide Prevention Lifeline (NSPL).* This is a nationwide hotline that operates 24/7 and is accessible by phone or a web-based chat function. Trained counselors are on-hand to listen, offer free and confidential emotional support, and provide referrals for mental health services in the local area. Suicide callers (N=1,085) were assessed during their calls to the hotline and 380 (35.0%) participated in the follow-up assessment. Results indicated that seriously suicidal individuals called the hotline. Significant decreases in suicidality were found during the course of the telephone session, with continuing decreases in hopelessness and psychological pain in the following weeks (Gould et al., 2007).

- *Applied Suicide Intervention Skills Training (ASIST).* This a training program for hotline counselors, emergency workers, clergy, caregivers and others in the community. The ASIST model has three phases of caregiving: connecting, understanding and assisting. The training helps participants identify people who are having thoughts of suicide and to recognize their invitation for help (connecting); to listen to the caller's reasons for dying and living (understanding); and how to conduct a safety assessment, develop a safety plan for the person at risk, and connect the person at risk to community resources (assisting). The ASIST training program has been field tested in a variety of settings. In a national randomized controlled trial, Gould et al (2013) assessed the impact of the ASIST training across the NSPL network of hotlines over the period 2008-2009. Data were derived from 1,507 monitored calls from 1,410 suicidal individuals to 17 Lifeline centers. Callers who spoke with ASIST-trained counselors were significantly more likely to feel less depressed, less suicidal, less overwhelmed, and more hopeful by the end of calls compared to those who spoke to counselors receiving usual care training. ASIST-trained counselors were also better able to keep callers on the phone longer and



establish a connection. ASIST training, however, did not yield more comprehensive suicide risk assessments than usual care training (Gould et al., 2013).

## Intervene to Lessen Harms and Prevent Future Risk

### Rationale

Individuals who have experienced mental health challenges, suicidal ideation, and have had non-fatal suicide attempts or have engaged in non-suicidal self-injury are at increased risk of subsequent suicide-related morbidity and mortality. Risk of suicidality can also increase among those who have lost a friend, family member, co-worker, or other acquaintance to suicide. Exposure to sensationalized or uninformed reporting regarding suicide-related deaths may heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to suicide contagion.

### Approaches

A broad array of approaches to lessen harms and reduce future risk of suicidality among those at increased risk include the provision of mental health care and improved continuity of care, improving linkage to care through active post-discharge planning and follow-up that decreases barriers to ongoing therapeutic support, increasing connectedness to supportive others, addressing bereavement, and framing communications to emphasize resilience, decrease negative affect, and to prevent contagion.

- **Treatment for people at-risk of suicide** typically includes various forms of psychotherapy delivered by licensed providers to help individuals with mental health problems and other risk factors for suicide with problem-solving, impulsivity and emotion regulation.
- **Treatment to prevent re-attempts.** These follow-up contact approaches use diverse modalities (e.g., home visits, mail, telephone, e-mail) to engage recent suicide attempt survivors to prevent reattempts. These approaches typically focus on coping and other emotional regulation skills and may include **case management home visits to increase adherence to and continuity of care**, one-on-one interpersonal therapy and/or group therapy. Approaches that engage and connect attempters to peers and providers are especially important because many attempters do not present to aftercare; 12%-25% reattempt within a year, and 3%-9% of attempt survivors die by suicide within 1 to 5 years of their initial attempt (Inagaki, et al., 2015).
- **Postvention** approaches are implemented after a suicide has taken place and may include debriefing of survivors (those who have lost a friend, peer, family member, co-worker to suicide), counseling, and/or bereavement support groups. The programs have not typically tested their impact on suicide or suicidal behavior but may reduce risk of guilt, feelings of depression, and complicated grief (Szumilas et al., 2011). Additionally, research suggests that active postvention approaches in which outreach to suicide survivors occurs at the scene of a suicide is associated with intake into treatment sooner, greater attendance at support group meetings, and attendance at more meetings compared to passive postvention (no outreach) (Cerel & Campbell, 2008).



- **Safe messaging following a suicide.** The manner in which information on a recent suicide is communicated to the public (e.g. school assemblies, mass media, social media) can heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to suicide contagion.

## Potential Outcomes

- Reduction in mental health-related sequelae
- Increase connectedness
- Improved coping skills
- Improved messaging following suicide
- Reduction in re-attempts

## Evidence

The evidence addressing strategies to lesson harm and prevent future risk of suicide includes the evaluation of effects of specific approaches on risk and protective factors as well as suicide-related mortality. However, because the evaluation of suicide-related mortality is a statistically rare event, evaluation of mortality outcomes requires large sample sizes and extended follow-up. Therefore, much of the evidence in this area primarily focuses on risk and protective factors.

- **Treatment for people at-risk of suicide.**

Psychotherapy has been demonstrated to help diverse individuals in different settings to reduce risks related to mental health problems such as depression and anxiety, and to reduce suicidal ideation and attempts. Evaluation evidence for selected psychotherapeutic approaches to prevent future suicide risk follow below.

**Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)** aims to prevent suicide among older primary care patients by reducing suicide ideation and depression in primary care settings. IMPACT facilitates the development of a therapeutic alliance, a personalized treatment plan that includes patient preferences, as well as proactive follow-up (biweekly during an acute phase and monthly during continuation phase) by a depression care manager. IMPACT has been shown to significantly improve quality of life, and to reduce functional impairment, depression (Hunkeler et al., 2006; Unützer et al., 2002) and suicidal ideation over 24-months of follow-up (Unützer et al., 2006) relative to patients who received care as usual.

**Collaborative Assessment and Management of Suicidality (CAMS)** is a therapeutic framework for suicide-specific assessment and treatment of patient's suicide risk. It is a flexible approach that can be used across treatment settings and clinician theoretical orientations. The clinician and patient work together in an interactive assessment process. The patient is highly engaged in the development of their own treatment plan. Every session of CAMS is collaborative and involves the patient's input about what is and is not working. Ultimately, this process is designed to enhance the therapeutic alliance and increase treatment motivation in the suicidal patient. CAMS has been tested and supported in 6 correlational studies (Jobes, 2012), in a variety of inpatient and outpatient settings and in one RCT with several additional RCTs under way. CAMS has been associated with significant improvements in suicidal ideation, overall symptom distress, and feelings of hopelessness at 12 month follow-up among a community-based sample of suicidal outpatients. (Comtois et al., 2011).

**Dialectical Behavioral Therapy** is a multicomponent therapy for individuals at high risk for suicide who may struggle with impulsivity and emotional regulation. The components of DBT include individual therapy, group skills training, between-session telephone coaching and a therapist consultation team. In a randomized controlled trial of women with recent suicidal or self-injurious behavior, those receiving DBT were half as likely to make a suicide attempt at two-year follow-up than women receiving community treatment (23% vs 46%), required less hospitalization for suicide ideation, and had lower medical risk across all suicide attempts and self-injurious acts combined (Linehan et al., 2006).

**Attachment-Based Family Therapy (ABFT)** is a program for adolescents ages 12-18 that is designed to treat clinically diagnosed major depressive disorder, eliminate suicidal ideation, and reduce dispositional anxiety. A randomized controlled trial of ABFT (Diamond et al., 2010) found that suicidal adolescents assigned to ABFT experienced significantly greater improvement regarding suicidal ideation over 24 weeks of follow-up than did adolescents assigned to enhanced usual care (-4.37 vs. -2.34;  $p = .001$ ;  $d=0.97$ ). A higher percentage of ABFT participants reported no suicidal ideation in the past week at 12 weeks than did adolescents receiving enhanced usual care (69.2% vs. 34.6%;  $p = .01$ ; OR= 4.25) and at 24 weeks (82.1% vs. 46.2%;  $p = .006$ ; OR=5.37).

- **Treatment to prevent re-attempts.**

Active contact and follow-up approaches intended to prevent reattempts among patients that have been hospitalized and subsequently discharged for suicide attempts have been found in a meta-analysis conducted by Inagaki et al., (2015) to reduce reattempts by approximately 17% for up to 12 months post-discharge, however, the long-term effects of these approaches on reattempts has not yet been demonstrated. Also, because the number of trials and associated sample sizes included in this meta-analysis were small, it was not possible to determine the effect



of active contact and follow-up approaches on death by suicide. In a randomized controlled trial of postcrisis suicide prevention long-term follow-up contact approach, Motto et al., (2001) found that patients who refused ongoing care but who were randomized to be contacted by letter four times per year had a lower rate of suicide over two years of follow-up than did patients in the control group who received no further contact. Other studies have also shown post-crisis letters and coping cards to be protective against suicide ideation and attempts (Hassanian-Moghaddam et al., 2011; Wang et al., 2016).

- **Postvention** approaches such as *StandBy Response Service* provide suicide bereavement support services to clients via face-to-face outreach and telephone support delivered by a professional crisis response team. A site coordinator develops a customized case management plan, referring clients to other existing community services matched to their needs. In a study by Visser et al. (2014), *StandBy* clients were significantly less likely to be at high risk for suicidality than a suicide bereaved comparison group who had not had contact with the *StandBy* program (48% and 64% respectively,  $p = 0.005$ ).
- **Safe messaging following a suicide.** *Media* guidelines for reporting on suicides can help assure that stories on suicide are communicated in a safe and effective way. Reports that are both inclusive of suicide prevention messages, stories of hope and resilience, risk and protective factors, and links to helping resources (e.g., hotline) and that avoid sensationalizing events or reducing suicide to one cause can help reduce the likelihood of suicide contagion. The most compelling evidence supporting the effect of media guidelines on reduction in suicides comes from Austria. After a sharp increase in suicides on the Viennese subway, media guidelines were introduced and an interrupted time series design was used to evaluate the national impact of the guidelines on subsequent suicides. Changes in the quality and quantity of media reporting resulted in a reduction of 81 suicides annually (95% confidence interval: -149 to -13;  $t = -2.32$ ,  $df = 54$ ,  $p < 0.024$ ) in the Viennese subway system (Niederkrötenhaller, T., & Sonneck, G., 2007)

## Sector Involvement

Public health can play an important and unique role in addressing suicide. Public health agencies, which typically place prevention at the forefront of efforts and work to create broad population-level impact, can bring critical leadership and resources to bear on this problem. For example, these agencies can serve as a convener, bringing together partners and stakeholders to plan, prioritize, and coordinate suicide prevention efforts. Public health agencies are also well positioned to collect and disseminate data, implement preventive measures, evaluate programs, and track progress. Although public health can play a leadership role in preventing suicide, the strategies and approaches outlined in this technical package cannot be accomplished by the public health sector alone.

Other sectors vital to implementing this package include, but are not limited to, education, government (local, state, and federal), social services, health services, business/labor, justice, housing, media, and organizations that comprise the civil society sector such as faith-based organizations, youth-serving organizations, foundations, and other non-governmental organizations. Collectively, these sectors can

make a difference in preventing suicide by impacting the various contexts and underlying risks that contribute to suicide.

The strategies and approaches described in this technical package are summarized in Appendix A along with the relevant sectors that are well positioned to lead implementation efforts.

[I can write the text specific to the strategies and approaches. I've done this for the other TPs and am happy to do the same here. This is the section where we distinguish the strategies where public health is best positioned to lead from those where leadership is necessary from other sectors and how public health can assist, etc.]

Regardless of strategy, action by many sectors will be necessary for the successful implementation of this package. In this regard, all sectors can play an important and influential role in.....



## Monitoring and Evaluation

Monitoring and evaluation are necessary components of the public health approach to prevention. It is important to have timely and reliable data to monitor the extent of the problem and to evaluate the impact of prevention efforts. Data are necessary for program implementation; planning, implementation, and assessment all rely on accurate measurement of the problem.

Surveillance data helps researchers and practitioners track changes in the burden of suicide. Surveillance systems exist at the federal, state, and local levels. It is important to assess the availability of surveillance data and data systems across these levels to identify and address gaps in the systems. CDC's National Vital Statistics System and the National Violent Death Reporting System (NVDRS) are examples of surveillance systems that provide data on deaths from suicide. NVDRS, for example, is a state-based surveillance system that combines data from death certificates, law enforcement reports, and coroner or medical examiner reports to provide detailed information on the circumstances of violent deaths, including suicide, which can assist communities in guiding prevention approaches (Blair et al., 2016). The National Electronic Injury Surveillance System-All Injury Program (NEISS-AIP) provides nationally representative data about all types and causes of nonfatal injuries treated in U.S. hospital emergency departments, and can be used to assess national rates of, and trends in, self-harm injuries by cause (e.g., falls, poisoning, etc.), age, race/ethnicity, sex, disposition (where the injured person goes when released from the Emergency Department (<http://www.cdc.gov/injury/wisqars/nonfatal.html>)).

In addition to information on deaths and nonfatal injuries, there are also surveillance systems that provide national, state, and some local estimates of suicidal behavior. The Youth Risk Behavior Surveillance System (YRBSS) collects information from a nationally representative sample of 9-12 grade students and is a key resource in monitoring health-risk behaviors among youth, including whether youth have seriously considered attempting suicide, attempted suicide, made a plan, or required treatment by a doctor or nurse for a suicide attempt that resulted in an injury, poisoning, or overdose (Brener et al., 2013). The YRBSS data are obtained from a national school-based survey conducted by CDC as well as school-based state, territorial, tribal, and large urban school district survey conducted by education and health agencies. The National Survey on Drug Use and Health (NSDUH) is an annual nationwide survey of individuals aged 12 years and older that provides national and state-level estimates of drug use and mental health-related issues, including suicide ideation and suicide attempts (<https://nsduhweb.rti.org/respweb/homepage.cfm>).

It is also important at all levels (local, state, and federal) to address gaps in responses, track progress of prevention efforts and evaluate the impact of those efforts, including the impact of this technical package. Evaluation data, produced through program implementation and monitoring, is essential to provide information on what does and does not work to reduce rates of suicide and its associated risk and protective factors. Theories of change and logic models that identify short, intermediate, and long-term outcomes are an important part of program evaluation.

The evidence-base for suicide prevention has advanced greatly over the last few decades. However, additional research is needed to..... Lastly, it will be important for researchers to test the effectiveness of combinations of the strategies and approaches included in this package. Most existing evaluations focus on approaches implemented in isolation. However, there is potential to understand the synergistic effects within a comprehensive prevention approach. Additional research is needed to understand the extent to which combinations of strategies and approaches result in greater reductions in suicide than individual programs, practices, or policies.

## Conclusion



## References

## Appendix A: Summary of Strategies and Approaches to Prevent Suicide

Strategy	Approach/Program, Practice or Policy	Best Available Evidence			Lead Sectors <sup>1</sup>
		Suicide	Suicide Attempts or Ideation	Other Risk/Protective Factors for Suicide	
Strengthen economic supports	<b>Strengthen financial security</b>				
	<i>Unemployment benefit programs</i>				
	<b>Housing stabilization policies</b>				
	<i>The National Neighborhood Stabilization Program</i>				
Strengthen access to mental health care	<b>Coverage of mental health conditions in health insurance policies</b>				
	<i>Mental Health Parity Laws</i>				
Establish protective environments	<b>Means restriction</b>				
	<i>Intervening at hot spots</i>	X			
	<i>Safe storage practices</i>		X (attempts)	X (Safe storage of firearms and medication)	
	<b>Organizational policies and culture</b>				
	<i>Together for Life</i>	X			
	<i>US Air Force Suicide Prevention Program</i>	X		X (family violence)	

**Comment [A]:** I'll help you complete the lead sector column. For the other columns, you just need to insert a check-mark based on the evidence you describe in the narrative for a particular program or policy. For example, if the evidence shows impact on suicide, then put a check-mark in that column. If the study also found effects on risk or protective factors, then put a check-mark in that column as well.



		Best Available Evidence			
	Community-based policies to reduce excessive alcohol use				
	Alcohol outlet density				
Promote connectedness to protect against suicide	Peer norm approaches				
	Sources of Strength			√	
	Community-engagement activities				
	Greening vacant urban spaces			√	
Teach coping and problem-solving skills	Social emotional learning				
	Youth Aware of Mental Health Program		√		
	Signs of Suicide		√	√	
	Good Behavior Game		√	√	
	Parenting skill and family relationship approaches				
	The Incredible Years			√	
	Strengthening Families 10-14			√	
	Gatekeeper training				
	Mental Health First Aid				

		Best Available Evidence			
Identify and support people at-risk	Screening combined with care management				
	Henry Ford Perfect Depression Care (Precursor to Zero Suicide)				
	Crisis Intervention				
	National Suicide Prevention Lifeline				
	Applied Suicide Intervention Skills Training				
Intervene to lessen harms and prevent future risk	Treatment for people at risk of suicide				
	Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)				
	Collaborative Assessment and Management of Suicidality (CAMS)				
	Dialectical Behavioral Therapy				
	Attachment-Based Family Therapy				
	Treatment to prevent re-attempts				
	ED Brief Intervention with Follow-up Visits				
	Active follow-up contact approaches				
	CBT for Suicide Prevention				



	Best Available Evidence				
	<b>Postvention</b>				
	<i>StandBy Response Service</i>				
	<b>Safe messaging following a suicide</b>				
	<i>Media Guidelines</i>				-

<sup>1</sup>This column refers to the lead sectors well positioned to bring leadership and resources to implementation efforts. For each strategy, there are many other sectors such as non-governmental organizations that are instrumental to prevention planning and implementing the specific programmatic activities.

<sup>i</sup> Butchart A, Phinney A, Check P, Villaveces A. *Preventing violence: a guide to implementing the recommendations of the World Report on Violence and Health*. Geneva, Switzerland: World Health Organization; 2004.

<sup>ii</sup> Kleven J, Simon TR, Chen J. Are the perpetrators of violence one and the same? Exploring the co-occurrence of perpetration of physical aggression in the United States. *J Interpers Violence*. 2012;27(10):1987-2002

<sup>iii</sup> Desai, R. A., Dausey, D. J., & Rosenheck, R. A. (2005). Mental health service delivery and suicide risk: the role of individual patient and facility factors. *American Journal of Psychiatry*.

<sup>iv</sup> Coulton CJ, Crampton DS, Irwin M, Spilsbury JC, Korbin JE. How neighborhoods influence child maltreatment: a review of the literature and alternative pathways. *Child Abuse Negl*. 2007;31(11-12):1117-1142.

<sup>v</sup> Freisthler B, Merritt DH, LaScala EA. Understanding the ecology of child maltreatment: a review of the literature and directions for future research. *Child Maltreat*. 2006;11(3):263-280.

<sup>vi</sup> Capaldi DM, Knoble NB, Shortt JW, Kim HK. A systematic review of risk factors for Intimate partner violence. *Partner Abuse*. 2012;3(2):231-280.

<sup>vii</sup> Pinchevsky GM, Wright EM. The impact of neighborhoods on intimate partner violence and victimization. *Trauma Violence Abuse*. 2012;13(2):112-132.

<sup>viii</sup> Sampson RJ, Morenoff JD, Gannon-Rowley T. Assessing "neighborhood effects": Social processes and new directions in research. *Annual review of sociology*. 2002;28:443-478.

<sup>ix</sup> Luo F, Florence CS, Quispe-Agnoli M, Ouyang L, Crosby AE. Impact of business cycles on US suicide rates, 1928-2007. *American journal of public health*. 2011;101(6):1139-1146.

<sup>x</sup> Reeves A, Stuckler D, McKee M, Gunnell D, Chang SS, Basu S. Increase in state suicide rates in the USA during economic recession. *The Lancet*. 2012;380(9856):1813-1814.

<sup>xi</sup> Runyan D, Wattam, C, Ikeda, R., Hassan, F, Ramiro, L. Child abuse and neglect by parents and caregivers. In: Krug E, Dahlberg LL, Mercy, JA, Zwi AB, Lozano R, ed. *World report on violence and health*. Geneva, Switzerland: World Health Organization; 2002:59-86.

<sup>xii</sup> Heise L, Garcia-Moreno C. Violence by intimate partners. In: In: Krug E, Dahlberg LL, Mercy, JA, Zwi AB, Lozano R, ed. *World report on violence and health*. Geneva, Switzerland: World Health Organization; 2002:87-121

- 
- <sup>xiii</sup> Pinchevsky GM, Wright EM. The impact of neighborhoods on intimate partner violence and victimization. *Trauma Violence Abuse*. 2012;13(2):112-132.
- <sup>xiv</sup> Centers for Disease Control and Prevention, Sexual Violence: Risk and Protective Factors. Available at: <http://www.cdc.gov/ViolencePrevention/sexualviolence/riskprotectivefactors.html> Accessed April 4, 2014.
- <sup>xv</sup> Wilson WJ. When work disappears: The world of the new urban poor. New York, NY: Random House LLC; 2011.
- <sup>xvi</sup> Briere, J., Madni, L. A., & Godbout, N. (2015). Recent Suicidality in the General Population Multivariate Association With Childhood Maltreatment and Adult Victimization. *Journal of interpersonal violence*, 0886260515584339.
- <sup>xvii</sup> Logan JE, Leeb RT, Barker LE. Gender-specific mental and behavioral outcomes among physically abused high-risk seventh-grade youths. *Public Health Reports*. 2009;124(2):234-245.
- <sup>xviii</sup> Duke NN, Pettingell SL, McMorris BJ, Borowsky IW. Adolescent violence perpetration: associations with multiple types of adverse childhood experiences. *Pediatrics*. 2010;125(4):e778-e786.
- <sup>xix</sup> Duke NN, Pettingell SL, McMorris BJ, Borowsky IW. Adolescent violence perpetration: associations with multiple types of adverse childhood experiences. *Pediatrics*. 2010;125(4):e778-e786.
- <sup>xx</sup> *Violence and the Family: Report of the American Psychological Association Presidential Task Force on Violence and the Family*. Washington, DC: American Psychological Association; 1996.
- <sup>xxi</sup> *Violence and the Family: Report of the American Psychological Association Presidential Task Force on Violence and the Family*. Washington, DC: American Psychological Association; 1996.
- <sup>xxii</sup> *Violence and the Family: Report of the American Psychological Association Presidential Task Force on Violence and the Family*. Washington, DC: American Psychological Association; 1996.
- <sup>xxiii</sup> Jewkes R. Rape perpetration: a review. *Pretoria, Sexual Violence Research Initiative*. 2012.
- <sup>xxiv</sup> Coulton, C. J., Crampton, D. S., Irwin, M., Spilsbury, J. C., & Korbin, J. E. (2007). How neighborhoods influence child maltreatment: A review of the literature and alternative pathways. *Child abuse & neglect*, 31(11), 1117-1142.
- <sup>xxv</sup> Pinchevsky GM, Wright EM. The impact of neighborhoods on intimate partner violence and victimization. *Trauma Violence Abuse*. 2012;13(2):112-132.
- <sup>xxvi</sup> Basile KC, Hamburger ME, Swahn MH, Choi C. Sexual violence perpetration by adolescents in dating versus same-sex peer relationships: differences in associated risk and protective factors. *The Western Journal of Emergency Medicine*. 2013;14(4):329-340.
- <sup>xxvii</sup> Widome R, Sieving RE, Harpin SA, Hearst MO. Measuring neighborhood connection and the association with violence in young adolescents. *Journal of Adolescent Health*. 2008;43(5):482-489.
- <sup>xxviii</sup> Kleiman, E. M., Riskind, J. H., Schaefer, K. E., & Weingarden, H. (2012). The moderating role of social support on the relationship between impulsivity and suicide risk. *Crisis*. 33(5):273-279
- <sup>xxix</sup> Centers for Disease Control and Prevention, Elder Maltreatment: Risk and Protective Factors. Available at: <http://www.cdc.gov/ViolencePrevention/eldermaltreatment/riskprotectivefactors.html>. Accessed April 4, 2014.
- <sup>xxx</sup> Borowsky IW, Hogan M, Ireland M. Adolescent sexual aggression: risk and protective factors. *Pediatrics*. 1997;100(6):e7-e7.
- <sup>xxxi</sup> Capaldi DM, Knoble NB, Shortt JW, Kim HK. A systematic review of risk factors for Intimate partner violence. *Partner Abuse*. 2012;3(2):231-280.
- <sup>xxxii</sup> DeGue S, Massetti GM, Holt MK, et al. Identifying links between sexual violence and youth violence perpetration. *Psychology of Violence*. 2013;3(2):140-156.
- <sup>xxxiii</sup> Basile KC, Espelage DL, Rivers I, McMahon PM, Simon TR. The theoretical and empirical links between bullying behavior and male sexual violence perpetration. *Aggression and Violent Behavior*. 2009;14(5):336-347.
- <sup>xxxiv</sup> Lösel F, Farrington DP. Direct protective and buffering protective factors in the development of youth violence. *American Journal of Preventive Medicine*. 2012;43(2):S8-S23.
- <sup>xxxv</sup> Hong JS, Espelage DL. A review of research on bullying and peer victimization in school: An ecological system analysis. *Aggression and Violent Behavior*.



---

2012;17(4):311-322.

<sup>xxxvi</sup> Carter, M., McGee, R., Taylor, B., & Williams, S. (2007). Health outcomes in adolescence: Associations with family, friends and school engagement. *Journal of adolescence*, 30(1), 51-62.

<sup>xxxvii</sup> Centers for Disease Control and Prevention. Child Maltreatment: Risk and Protective Factors. Available at:

<http://www.cdc.gov/violenceprevention/childmaltreatment/riskprotectivefactors.html>. Accessed April 4, 2014.

<sup>xxxviii</sup> Capaldi DM, Knoble NB, Shortt JW, Kim HK. A systematic review of risk factors for Intimate partner violence. *Partner Abuse*. 2012;3(2):231-280.

<sup>xxxix</sup> Resnick, M. D., Ireland, M., & Borowsky, I. (2004). Youth violence perpetration: what protects? What predicts? Findings from the National Longitudinal Study of Adolescent Health. *Journal of adolescent health*, 35(5), 424-e1.

<sup>xl</sup> Elgar FJ, Craig W, Boyce W, Morgan A, Vella-Zarb R. Income inequality and school bullying: multilevel study of adolescents in 37 countries. *Journal of Adolescent Health*. 2009;45(4):351-359.

<sup>xli</sup> Maimon, D., Browning, C. R., & Brooks-Gunn, J. (2010). Collective efficacy, family attachment, and urban adolescent suicide attempts. *Journal of health and social behavior*, 51(3), 307-324.

<sup>xlii</sup> Capaldi DM, Knoble NB, Shortt JW, Kim HK. A systematic review of risk factors for Intimate partner violence. *Partner Abuse*. 2012;3(2):231-280.

<sup>xliii</sup> Lösel F, Farrington DP. Direct protective and buffering protective factors in the development of youth violence. *American Journal of Preventive Medicine*. 2012;43(2):S8-S23.

<sup>xliv</sup> Maimon, D., Browning, C. R., & Brooks-Gunn, J. (2010). Collective efficacy, family attachment, and urban adolescent suicide attempts. *Journal of health and social behavior*, 51(3), 307-324.

<sup>xlv</sup> Capaldi DM, Knobel NB, Shortt JW, Kim HK. A systematic review of risk factors for intimate partner violence. *Partner Abuse*. 2012;2(2):231-280.

<sup>xlvi</sup> Lösel F, Farrington DP. Direct protective and buffering protective factors in the development of youth violence. *American Journal of Preventive Medicine*. 2012;43(2):S8-S23.

1. Crosby AE, Ortega L, Melanson C. Self-directed Violence Surveillance: Uniform Definitions and Recommended Data Elements, Version 1.0. Atlanta (GA): Centers for Disease Control and Prevention, National Center for Injury Prevention and Control; 2011.

2. World Health Organization. Suicide Prevention: A Global Imperative. Geneva, Switzerland: WHO Press. 2014.

3. U.S. Surgeon General, National Action Alliance for Suicide Prevention. 2012 National strategy for suicide prevention: Goals and Objectives for Action. 2012.Natl Strategy

4. Centers for Disease Control and Prevention, National Center for Injury Prevention and Control. Web-based Injury Statistics Query and Reporting System (WISQARS) [online]. (2005) Accessed on 2016 June 3. Available from URL: [www.cdc.gov/ncipc/wisqars](http://www.cdc.gov/ncipc/wisqars)

5. Centers for Disease Control and Prevention. Ten leading causes of death in the United States, 1975. Atlanta: Public Health Service; 1978.

6. Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999–2014. NCHS data brief, no 241. Hyattsville, MD: National Center for Health Statistics. 2016.

- 
7. Crosby AE, Han B, Ortega LAG, Parks SE, Gfroerer J. Suicidal Thoughts and Behaviors Among Adults Aged  $\geq 18$  Years — United States, 2008–2009. *MMWR* 2011;60(No. SS-13):1-22.
  8. Ferdon C, Crosby AE, Caine ED, Hindman J, Reed GA, Iskander J. CDC Public Health Grand Rounds: Preventing Suicide through a Comprehensive Public Health Approach. *MMWR* In press
  9. Crosby AE, Sacks JJ. Exposure to suicide: incidence and association with suicidal ideation and behavior: United States, 1994. *Suicide & life-threatening behavior*. Fall 2002;32(3):321-328.
  10. Shepard DS, Gurewicz D, Lwin AK, Reed GA Jr, Silverman MM. Suicide and Suicidal Attempts in the United States: Costs and Policy Implications. *Suicide Life Threat Behav*. 2016; 46:352-62. doi: 10.1111/sltb.12225. Epub 2015 Oct 29.
- Kann, McManus, Harris et al. Youth Risk Behavior Surveillance — United States, 2015. *MMWR Surveill Summ* 2016;65 (No. SS-6):1-174.

References for Shane's section of risk and protective factors:

1. Dahlberg LL, Krug EG. Violence—a global public health problem. In: Krug E, Dahlberg LL, Mercy JA, Zwi AB, Lozano R, eds. *World Report on Violence and Health*. Geneva, Switzerland: World Health Organization; 2002:1–56
2. World Health Organization. *World Health Organization*. Geneva, Switzerland: World Health Organization, 2014.
3. U.S. Department of Health and Human Services (HHS) Office of the Surgeon General and National Action Alliance for Suicide Prevention. *National Strategy for Suicide Prevention: Goals and Objectives for Action*. Washington, DC: HHS, September 2012.

Zalsman G, Hawton K, Wasserman D, et al. Suicide prevention strategies revisited: 10-year systematic review. *Lancet Psychiatry*. 2016;3(7):646-659.

NVDRS Ref:

Blair JM, Fowler KA, Jack SPD, Crosby AE. The National Violent Death Reporting System: overview and future directions. *Inj Prev* 2016;22:Suppl 1 i6-i11.

NEISS AIP Ref: CDC, Web-based Injury Statistics Query and Reporting System, Nonfatal Injury Reports, 2001-2014. Available at:

Shane's section:

1. Durkheim E. *Suicide: A study in sociology*. Glencoe Press: New York; 1951.
2. Centers for Disease Control and Prevention (CDC) (2011). Strategic direction for the prevention of suicidal behavior: Promoting individual, family, and community connectedness to prevent suicidal behavior. Retrieved from [http://www.cdc.gov/ViolencePrevention/pdf/Suicide\\_Strategic\\_Direction\\_Fu...](http://www.cdc.gov/ViolencePrevention/pdf/Suicide_Strategic_Direction_Fu...)



- 
3. Dahlberg LL, Krug EG. Violence-a global public health problem. In: Krug E, Dahlberg LL, Mercy JA, Zwi AB, Lozano R, eds. *World Report on Violence and Health*. Geneva, Switzerland: World Health Organization; 2002:1–56
  4. Wyman, P. A., Brown, C. H., LoMurray, M., Schmeelk-Cone, K., Petrova, M., Yu, Q., . . . Wang, W. (2010). An outcome evaluation of the Sources of Strength suicide prevention program delivered by adolescent peer leaders in high schools. *Am J Public Health, 100*(9), 1653-1661.
  5. Branas, C. C., Cheney, R. A., MacDonald, J. M., Tam, V. W., Jackson, T. D., & Ten Have, T. R. (2011). A difference-in-differences analysis of health, safety, and greening vacant urban space. *American Journal of Epidemiology, 174*(11), 1296-1306.
  6. World Health Organization. *World Health Organization*. Geneva, Switzerland: World Health Organization, 2014.
  7. Bandura A (1986) *Social Foundations of Thought and Action: A Social Cognitive Theory*. Englewood Cliffs: New Jersey: Prentice-Hall Publishers.
  8. Pollock, L.R. and Williams, M.G. (2004). Problem-solving in suicide attempters. *Psychological Medicine*, pp 163-167. doi:10.1017/S0033291703008092.
  9. Goldsmith, S. K., Pellmar, T. C., Kleinman, A. M., & Bunney, W. E. (2002). *Reducing suicide: A national imperative*: National Academies Press.
  10. Townsend, E., Hawton, K., Altman, D., Arensman, E., Gunnell, D., Hazell, P., . . . Van Heeringen, K. (2001). The efficacy of problem-solving treatments after deliberate self-harm: meta-analysis of randomized controlled trials with respect to depression, hopelessness and improvement in problems. *Psychological medicine, 31*(6), 979-988.
  11. M. Ghahramanlou-Holloway, S. S. Bhar, G. K. Brown, C. Olsen and A. T. Beck (2012). Changes in problem-solving appraisal after cognitive therapy for the prevention of suicide. *Psychological Medicine, 42*, pp 1185-1193. doi:10.1017/S0033291711002169.
  12. Schilling, E. A., Aseltine, R. H., Jr., & James, A. (2016). The SOS Suicide Prevention Program: Further Evidence of Efficacy and Effectiveness. *Prev Sci, 17*(2), 157-166.
  13. Kellam, S. G., Brown, C. H., Poduska, J. M., Ialongo, N. S., Wang, W., Toyinbo, P., et al. (2008). Effects of a universal classroom behavior management program in first and second grades on young adult behavioral, psychiatric, and social outcomes. *Drug and Alcohol Dependence, 95*(Suppl. 1), S5-S28.
  14. H.C. Wilcox, S.G. Kellam, C.H. Brown, J. Poduska, N.S. Ialongo, W. Wang, J. Anthony. The impact of two universal randomized first- and second-grade classroom interventions on young adult suicide ideation and attempts. *Drug Alcohol Depend., 95* (2008), pp. S60–S73

- 
15. Wasserman, D., Hoven, C. W., Wasserman, C., Wall, M., Eisenberg, R., Hadlaczky, G., . . . Carli, V. (2015). School-based suicide prevention programmes: The SEYLE cluster-randomised, controlled trial. *The Lancet*, 385(9977), 1536-1544. doi: 10.1016/S0140-6736(14)61213-7
  16. Webster-Stratton, C., Reid, M. J., & Stoolmiller, M. (2008). Preventing conduct problems and improving school readiness: Evaluation of the Incredible Years teacher and child training programs in high-risk schools. *Journal of Child Psychology and Psychiatry*, 49(5), 471-488.
  17. Reid, M. J., Webster-Stratton, C., & Hammond, M. (2003). Follow-up of children who received the Incredible Years intervention for oppositional-defiant disorder: Maintenance and prediction of 2-year outcome. *Behavior Therapy*, 34, 471-491.
  18. Webster-Stratton, C., & Hammond, M. (1997). Treating children with early-onset conduct problems: A comparison of child and parenting training interventions. *Journal of Consulting and Clinical Psychology*, 65(1), 93-109.
  19. Webster-Stratton, C., Reid, M. J., & Hammond, M. (2001). Preventing conduct problems, promoting social competence: A parent and teacher training partnership in Head Start. *Journal of Clinical Child Psychology*, 30(3), 283-302.
  20. Herman, K. C., Borden, L., Reinke, W. M., & Webster-Stratton, C. (2011). The impact of the Incredible Years Parent, Child, and Teacher Training Programs on children's co-occurring internalizing symptoms. *School Psychology Quarterly*, 26, 189-201. doi:10.1037/a0025228.
  21. Spoth, R., Gyll, M., & Day, S. X. (2002). Universal family-focused interventions in alcohol-use disorder prevention: Cost-effectiveness and cost-benefit analyses of two interventions. *Journal of Studies on Alcohol*, 63(2), 219-228.



**Title...**

**A Technical Package to Prevent....**

**Prepared by:**

**Division of Violence Prevention  
National Center for Injury Prevention and Control (NCIPC)  
Centers for Disease Control and Prevention**

**2016**

**[Title] is a publication of the National Center for Injury Prevention and Control of the  
Centers for Disease Control and Prevention.**

Centers for Disease Control and Prevention  
Thomas R. Frieden, MD, MPH, Director

National Center for Injury Prevention and Control  
Debra E. Houry, MD, MPH, Director

Division of Violence Prevention  
James A. Mercy, PhD, Director

*Suggested Citation:* [authors] *A Technical Package to Prevent....* Atlanta, GA: National Center for Injury Prevention and Control, Centers for Disease Control and Prevention, 2016.



## Contents

## External Reviewers

[to be inserted later]



## Acknowledgments

[to be inserted later]

## Overview

This technical package represents a select group of strategies based on the best available evidence to help communities and states sharpen their focus on prevention activities with the greatest potential to prevent suicide. Broadly, the strategies represented include those with a focus on preventing suicide from happening in the first place as well as approaches to lessen the immediate and long-term effects of suicidal behavior for individuals, families, communities, and society. Specifically, the strategies include strengthening economic supports; strengthening access to mental health care; establishing protective environments; promoting connectedness to protect against suicide; teaching coping and problem-solving skills; identifying and supporting people at-risk; and intervening to lessen harms and prevent future risk.

This package supports the National Strategy for Suicide prevention, Goal 1, "Integrate and coordinate suicide prevention activities across multiple sectors and settings." (p.29) It also supports the National Action Alliance for Suicide Prevention's priority "To create and disseminate a framework for comprehensive community-based suicide prevention." (<http://actionallianceforsuicideprevention.org/priorities>)

Commitment, cooperation, and leadership from numerous sectors, including public health, education, justice, health care, social services, business/labor, and government can bring about the successful implementation of this package.

### What is a Technical Package?

A technical package is a compilation of a core set of strategies to achieve and sustain substantial reductions in a specific risk factor or outcome (Frieden, 2014). Technical packages help communities and states prioritize prevention activities based on the best available evidence. This technical package has three components. The first component is the **strategy** or the preventive direction or actions to achieve the goal of preventing suicide. The second component is the **approach**. The approach includes the specific ways to advance the strategy. This can be accomplished through *programs, policies, and practices*. The approaches included come primarily from studies based in the United States. The evidence for each of the approaches in preventing suicide or its associated risk factors is included as the third component. This package is intended as a resource to guide and inform prevention decision-making in communities and states.

### Preventing Suicide is a Priority

Suicide, as defined by the CDC, is part of a broader class of behavior called *self-directed violence*. Self-directed violence refers to behavior directed at oneself that deliberately results in injury or the potential for injury (1). Self-directed violence may be *suicidal* or *non-suicidal* in nature. For the purposes of this document, we refer only to behavior where suicide is intended.

Comment [A]: Changed the word "harms" here to effects since we use harms in the next sentence.

Comment [A]: New sentences

Comment [A]: New sentence



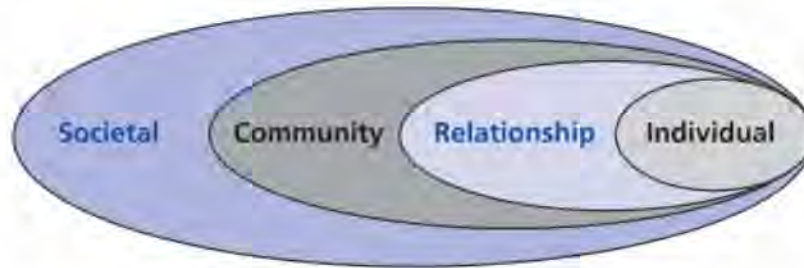
- **Suicide** is a death caused by self-directed injurious behavior with any intent to die as a result of the behavior.
- **Suicide attempt** is defined as a *non-fatal* self-directed and potentially injurious behavior with any intent to die as a result of the behavior. A suicide attempt may or may not result in injury.

### **Suicide is highly prevalent.**

Suicidal behavior presents a major challenge to public health in the United States and worldwide. It contributes to premature death, morbidity, lost productivity, and health care costs (2, 3). In 2014 in the U.S., the most recent death data available, suicide was responsible for 42,773 deaths, which is approximately a suicide every 12 minutes (4). In 2014, suicide ranked as the tenth leading cause of death and has been among the top twelve leading causes of death since 1975 in the U.S. (5) Overall suicide rates have increased from 1999 to 2014 (24% increase) (6). Suicide is a problem throughout the life span; it is the second leading cause of death among those aged 10–19 years, also second among persons in their 20s and 30s; it is the fourth leading cause among persons in their 40s and seventh among persons in their 50s (4).

Suicides reflect only a portion of the number of persons affected by suicidal thoughts and behaviors (7). Substantially more persons are hospitalized as a result of nonfatal suicidal behaviors than are fatally injured, and an even greater number are either treated in ambulatory settings or not treated at all (7). For example, during 2014, among adults aged  $\geq 18$  years, for every one suicide there were 9 adults treated in hospital emergency departments for self-inflicted injuries, 27 who reported making a suicide attempt, and over 227 who reported seriously considering suicide (8). Suicides, attempts, and ideation take an immense emotional, physical, and economic toll on individuals, families and communities. By one estimate, for every death by suicide six people are directly impacted (i.e. survivors). Based on this figure it is estimated that there are over 13 million survivors in the U.S. and unfortunately, survivorship itself is a risk factor for suicide (9).

**Suicide is associated with several risk and protective factors.** Suicide, like other human behaviors, is complex with no single determining cause. It occurs in response to multiple biological, psychological, interpersonal, environmental and societal influences that interact with one another and act cumulatively to increase one's vulnerability to think about or engage in suicidal behaviors. The social-ecological model is a useful framework for viewing and understanding suicidal risk factors that have been identified in the literature<sup>1</sup>:



#### Risk Factors for Suicide<sup>2,3</sup>

- ❑ **Individual:** History of depression and other mental illnesses, alcohol and drug abuse, previous suicide attempt, previous victimization, acute and chronic stressors (e.g. financial problems), genetic and biological determinants, hopelessness
- ❑ **Relationship:** High conflict or violent relationships, sense of isolation and lack of social support, family history of suicide, financial and work stress
- ❑ **Community:** Inadequate community connectedness, barriers to health care-- lack of access to providers or medications
- ❑ **Societal:** Availability of lethal means of suicide, unsafe media portrayals of suicide, stigma associated with help-seeking

An individual having or experiencing one or a number of risk factors does not always lead to suicide; for example, the vast majority of individuals who are depressed do not die by suicide. It is also important to note that these risk factors described above is not an exhaustive list. These and many other risk factors exist and can be arranged differently or contribute to multiple areas within the social-ecological model. Furthermore, the relevance of each risk factor can vary by age, race, gender, sexual orientation, residential geography, and socio-cultural and economic status<sup>2,3</sup>.

Protective factors for suicide: Protective factors, or those influences that guard against the risk for suicide, can also be found across the different levels of the social-ecological model and may vary in significance depending on the context in which the suicide occurs. Protective factors identified in the literature include: effective coping and problem solving skills, moral objections to suicide, strong and supportive relationships with partners, peers, and family, connectedness to school, community and other social institutions and the availability of physical and mental health care<sup>2,3</sup>. These protective factors can either counter a specific risk factor or guard against a number of risks associated with suicide.



### **Suicide is connected to other forms of violence.**

Suicide is connected to other forms of violence in a number of different ways. First, suicide and other forms of violence often share some of the same root causes. They can all take place under one roof, or in a given community or neighborhood and can happen at the same time or at different stages of life.<sup>1,2</sup> For example, in neighborhoods where there is low cohesion, or where residents don't support and trust each other, people are at higher risk for suicide<sup>3</sup> as well as perpetration of child maltreatment,<sup>4,5</sup> teen dating violence,<sup>6</sup> intimate partner violence,<sup>7</sup> and youth violence.<sup>8</sup> Lack of economic opportunities and unemployment are associated with suicide,<sup>9,10</sup> as well as perpetration of child maltreatment,<sup>11</sup> intimate partner violence,<sup>12,13</sup> sexual violence<sup>14</sup> and youth violence.<sup>15</sup> Also, while most people who are victims of violence do not act violently or die by suicide, people who experience or are exposed to suicide are at a higher risk for both being a victim of other forms of violence and for inflicting harm on others. For example, children who experience physical abuse or neglect early in their lives are at greater risk for suicide,<sup>16</sup> and also at greater risk for committing violence against peers (particularly for boys),<sup>17</sup> bullying,<sup>18</sup> teen dating violence,<sup>19</sup> and committing child abuse,<sup>20</sup> elder abuse,<sup>21</sup> intimate partner violence,<sup>22</sup> and sexual violence<sup>23</sup> later in life. There are also a number of protective factors that pose an opportunity to protect individuals and communities from suicide and other forms of violence, and buffer the effects of shared risk factors. For example, connectedness increases peoples' and communities' resilience to suicide and other forms of violence, including connectedness to one's community,<sup>24,25,26,27,28,29,30</sup> school,<sup>31,32,33,34,35,36</sup> family,<sup>37,38,39,40,41</sup> caring adults,<sup>42,43,44</sup> and pro-social peers.<sup>45,46</sup>

### **The health and economic consequences of suicide are substantial.**

Total lifetime costs associated with nonfatal injuries and deaths caused by self-directed violence in 2013 were approximately \$93.5 billion after adjusting for under-reporting of suicide (10).

### **Suicide can be prevented.**

Despite the myths surrounding suicide, like most public health problems, suicide is preventable. And while progress will continue to be made into the future, evidence for numerous programs, practices, and policies currently exist and are ready to be implemented now. Just as suicide is not caused by a single factor, research suggests that suicide will not be prevented by any single intervention taking place in any single setting. Rather, suicide prevention is best achieved by a focus across the individual-, relationship-, family-, community, and societal-levels and across all sectors, private and public (e.g., business, public health, physical and behavioral healthcare, justice, education, labor). According to CDC Director, Tom Frieden, successful public health programs also require political commitment, funding, communication, and performance monitoring.

## **Assessing the Evidence**



This technical package includes programs, practices, and policies with evidence of impact on suicide or risk or protective factors for suicide. To be considered for inclusion in the technical package, the program, practice, or policy selected had to meet at least one of these criteria: a) meta-analyses or systematic reviews showing impact on suicide; b) evidence from at least one rigorous (e.g., randomized controlled trial [RCT] or quasi-experimental design) evaluation study that found significant preventive effects on suicide; c) meta-analyses or systematic reviews showing impact on risk or protective factors for suicide, or d) evidence from at least one rigorous (e.g., RCT or quasi-experimental design) evaluation study that found significant impacts on risk or protective factors for suicide. Finally, consideration was also given to the likelihood of achieving beneficial effects on multiple forms of violence; no evidence of harmful effects on specific outcomes or with particular subgroups; and feasibility of implementation in a U.S. context if the program, policy, or practice has been evaluated in another country.

Within this technical package, some approaches do not yet have research evidence demonstrating impact on rates of suicide but instead are supported by evidence indicating impacts on risk or protective factors for suicide (e.g., help-seeking, stigma reduction, depression, connectedness). In terms of the strength of the evidence, programs that have demonstrated effects on suicidal behavior (e.g., reductions in deaths, attempts) provide a higher-level of evidence, but the evidence base is not that strong in all areas. For instance, there has been less evaluation of community engagement and family programs on suicidal behavior. Thus, approaches in this package that have effects on risk or protective factors reflect the developmental nature of the evidence base and the use of the best available evidence at a given time.

It is also important to note that there is often significant heterogeneity among the programs, policies, or practices that fall within one approach or strategy area in terms of the nature and quality of the available evidence. Not all programs, policies, or practices that utilize the same approach (e.g., gatekeeper training) are equally effective, and even those that are effective may not work across all populations. Tailoring programs and more evaluation may be necessary to address different population groups. The examples provided are not intended to be a comprehensive list of evidence-based programs, policies, or practices for each approach, but rather illustrate models that have been shown to impact suicide or have beneficial effects on risk or protective factors for suicide. In practice, the effectiveness of the programs, policies and practices identified in this package will be strongly dependent on the quality of their implementation and the communities in which they are implemented. Implementation guidance to assist practitioners, organizations and communities will be developed separately.

### **Context and Cross-Cutting Themes**

The strategies and approaches that have been included in this technical package represent different levels of the social ecology, with efforts intended to impact the community and societal levels, as well individual and relationship levels. The strategies and approaches are intended to work in combination and reinforce each other to prevent suicide (see box below). The strategies are arranged in order such



that those strategies hypothesized to have the greatest potential for broad public health impact on suicide are included first, followed by those that might impact more select populations (e.g., persons who have already made a suicide attempt).

Preventing Suicide	
Strategy	Approach
Strengthen economic supports	<ul style="list-style-type: none"> <li>Strengthen financial security</li> <li>Housing stabilization policies</li> </ul>
Strengthen access to mental health care	<ul style="list-style-type: none"> <li>Coverage of mental health conditions in health insurance policies</li> </ul>
Establish protective environments	<ul style="list-style-type: none"> <li>Means restriction</li> <li>Organizational policies and culture</li> <li>Community-based policies to reduce excessive alcohol use</li> </ul>
Promote connectedness to protect against suicide	<ul style="list-style-type: none"> <li>Peer norm approaches</li> <li>Community engagement activities</li> </ul>
Teach coping and problem-solving skills	<ul style="list-style-type: none"> <li>Social-emotional learning</li> <li>Parenting skill and family relationship approaches</li> </ul>
Identify and support people at risk	<ul style="list-style-type: none"> <li>Gatekeeper training</li> <li>Screening combined with care management</li> <li>Crisis intervention</li> </ul>
Intervene to lessen harms and prevent future risk	<ul style="list-style-type: none"> <li>Treatment for people at-risk of suicide</li> <li>Treatment to prevent re-attempts</li> <li>Postvention</li> <li>Safe messaging following a suicide</li> </ul>

The example programs, policies, and practices have been implemented within particular contexts. The social and cultural context of communities is critically important to take into account when selecting strategies and approaches. Practitioners in the field may be in the best position to assess the needs and strengths of their communities and work with community members to make decisions about the combination of approaches included here that are best suited to their context.

[Add text for other issues to potentially cover in this section. You may want to take a look at the other packages in this regard]

This package includes strategies where public health agencies are well positioned to bring leadership and resources to implementation efforts. It also includes strategies where public health can serve as an important collaborator (e.g., strategies addressing community and societal level risks), but where leadership and commitment from other sectors such as business/labor or health care is critical to implement a particular policy or program (e.g., workplace policies; screening combined with care management). The role of various sectors in the implementation of a strategy or approach in preventing suicide is described further in the section on *Sector Involvement*.

In the sections that follow, the strategies and approaches with the best available evidence for preventing suicide are described.



## Strengthen Economic Supports

### Rationale

### Approaches

Brief statement introducing the approaches (see example statements in the other technical packages).

- **Strengthen household financial security.** Research indicates that economic crises are related to suicide rates. Findings from the U.S. show that suicide rates increase during economic recessions marked by high unemployment rates, job losses, and economic instability and decrease during economic expansions and periods marked by low unemployment rates, particularly for working-age individuals 25 to 64 years old (Luo et al., 2011; Fowler et al., 2015). Policies that support financial security during difficult economic times have been shown to mitigate the risk of economic crises on suicide rates.
- **Housing stabilization policies** that aim to strengthen housing stability and security may help to buffer the impact of foreclosures and evictions on suicide, as recent research has drawn an association between housing instability and suicidal behavior. Programs that provide affordable housing and other options for homebuyers such as loan modification programs may be used in conjunction with move-out planning and financial counseling services to minimize the impact of foreclosures and evictions on suicide.

### Potential Outcomes

- 
- 
- 

### Evidence

Brief statement introducing the evidence [see example statements in the other technical packages].

- **Strengthen household financial security.**

- **Housing stabilization policies.**



## Strengthen Access to Mental Health Care

### Rationale

Mental illness is a risk factor for suicide. Studies suggest that up to 90% of people who die by suicide may have had a mental illness (Cavanaugh et al., 2003). Research on state-level suicide rates have been found to be correlated with general mental health measures such as depression (Arsenault-Lapierre, et al., 2004). While most people with mental health problems do not attempt or die by suicide, assuring access to quality mental health care is critical to suicide prevention.

### Approaches

A major approach to strengthening access to mental health care is to have health insurance policies that include coverage for such services.

- **Coverage of mental health conditions in health insurance policies.** Health insurance policies that allow people with mental health problems to access mental health treatment in the same way that they access health care for physical health concerns can increase use of mental health services, help normalize treatment seeking in the population, reduce symptoms of mental illnesses like depression and bipolar disorder, and in turn, reduce rates of suicide and suicide attempts.

### Potential Outcomes

- Increased access to mental health services
- Decreased symptoms of mental illnesses
- Decreased rates of suicide attempts
- Decreased rates of suicide

### Evidence

Brief statement introducing the evidence.

- **Coverage of mental health conditions in health insurance policies.**  
Using data from the National Survey of Drug Use and Health, Harris et al. (2006) found that 12 months after states enacted parity laws, self-reported use of mental healthcare services significantly increased. Subsequent research by Lang et al. (2011), suggests that mental health parity laws are associated with an approximate 5% reduction in suicide rates. This reduction (in 29 states) equated to the prevention of 592 suicides per year and a cost savings of \$1.3-3.1 million per suicide prevented (Lang, 2013).

## Establish Protective Environments

### Rationale

Suicide prevention efforts that focus on *both* the individual *and* his/her environment increase the likelihood of lives saved. Establishing protective environments helps ensure that all of the places where an individual lives, works, and plays are supportive. Limiting access to lethal means, be it at home or in nature, and particularly when an individual may be most vulnerable, can literally make the difference between life and death. Likewise, creating a work environment conducive to prevention and focused on employee well-being supports the large majority of the population where they spend much of their day. Finally, policies that reduce the availability of alcohol, a potent suicide risk factor, serve to support individuals and protect the environment further.

### Approaches

The current evidence suggests three approaches with promise for creating environments that protect against suicide. These include:

- **Means Restriction.** Modifying the environment to decrease access to lethal means is an important public health strategy for preventing suicide. Acute suicidal crises are often brief and impulsive. Previous research indicates that the interval between thinking about suicide and attempting can be as short as 5-10 minutes (Simon et al., 2001; Deisenhammer et al., 2009). Getting past the impulse by making it more difficult to access lethal means can be lifesaving. Highly lethal means such as firearms, hanging/suffocation, or jumping from heights provide little opportunity for rescue and have high fatality rates (e.g., about 85% of people who use a firearm in an attempt die from their injury). Research also indicates that most people tend not to substitute a different method when a highly lethal method is unavailable or difficult to access (Hawton, 2007; Yip et al., 2012). Removing or restricting access to lethal means changes the context of the potential suicide and whether the outcome will be fatal or non-fatal (Yip et al., 2012).
  - *Intervening at Suicide Hotspots.* These interventions are focused on preventing suicides at locations which offer direct means for suicide or a secluded place that prevents intervention. Suicide hotspots include tall structures (for example, bridges and cliffs), railway tracks, and isolated locations that are popular destinations for suicide (for example, parks). Interventions include barriers to prevent jumping and signs and telephones to encourage suicidal individuals to seek help.
  - *Safe Storage Practices* for medications, firearms, and other household products can reduce the risk for suicide by preventing impulsive action and separating individuals from easy access to lethal means. Safe storage practices include education and counseling around storing firearms locked in a secure place (e.g., in a gun safe or lock box), preferably unloaded and separate from the ammunition. Keeping medicines in a



locked cabinet or secure location can also prevent their misuse by children and adolescents.

- **Organizational policies and culture** that focus on prosocial behavior, skill building, changing social norms, referral and access to helping services (e.g. mental health, substance abuse treatment, financial counseling), and that have leadership support from the top down can positively impact organizational climate and morale and help prevent suicide and its related risk factors (e.g. depression, social isolation).
- **Community-based policies to reduce excessive alcohol use.** Acute alcohol use has been found to be associated with more than one-third of suicides and approximately 40% of suicide attempts (Cherpitel, Borges & Wilcox, 2004). While various community policies exist to reduce excessive alcohol use (e.g., zoning limits related to alcohol outlet locations and density, taxes on alcohol, and bans on the sale of alcohol for individuals under the legal drinking age), previous research indicates that policies related to outlet locations and density are more strongly associated with suicide, making these particular policies an important approach to preventing suicide.

### Potential Outcomes

- Increase in safe storage of lethal means
- Reduction in suicide attempts
- Reduction in suicide deaths
- Reduction in alcohol-related suicide deaths

### Evidence

The evidence for the effectiveness of means restriction and other ways to establish protective environments is some of the strongest in the field (Zalsman et al., 2016).

- **Means restriction**
  - *Intervening at suicide hotspots* A meta-analysis of suicide hotspot interventions implemented in combination or in isolation in the U.S. and abroad found they reduced suicide (Pirkis et al., 2015; Cox, 2013). For example, suicide deaths from jumping from the Jacques-Cartier bridge in Canada decreased after the installation of a bridge barrier (incidence rate ratio [IRR] = 0.24; 95% confidence interval [CI] = 0.13, 0.43), which persisted when all bridges (IRR = 0.39; 95% CI = 0.27, 0.55) and all jumping sites (IRR = 0.66; 95% CI = 0.54, 0.80) in the regions were considered, suggesting little or no displacement to other jumping sites (Perron, et. al., 2013). In contrast, the

removal of safety barriers on the Grafton Bridge in Auckland, New Zealand led to an immediate and substantial increase in both the numbers and rate of suicide by jumping from the bridge from 3 to 15 ( $p < 0.01$ ); the rate of such deaths also increased ( $p < 0.01$ ; Beautrais, 2001; Beautrais, et. al., 2009).

- *Safe storage practices* In a case-control study of firearm-related events identified by medical examiner and coroner offices from 37 counties in Washington, Oregon, and Missouri, and 5 trauma centers, Grossman et al., (2005) found that safe storage practices (i.e., storing firearms unloaded, separate from ammunition, in a locked place and/or secured with a safety device) were protective for suicide attempts among adolescents (Grossman et al., 2005). A recent systematic review of clinic and community-based education and counseling around safe storage of firearms found that the provision of safety devices significantly increases safe firearm storage practices compared to counseling alone or providing economic incentives to acquire safety devices (Rowhani-Rahbar, Simonetti, & Rivara, 2016). The *Emergency Department Counseling on Access to Lethal Means (ED CALM)* program trained psychiatric emergency clinicians in a large children's hospital to provide lethal means counseling and safe storage boxes to parents of patients under age 18 receiving care for suicidal behavior. In a pre-post study, Runyan et al (2015) found that among the parents contacted at follow-up, 76% reported all medications in the home were locked up as compared to fewer than 10% at the time of the initial emergency department visit. Among parents who indicated the presence of guns in the home at the time of the child's initial emergency department visit, all reported guns were currently locked, compared to 67% reporting this at the time of the initial visit.
- **Organizational policies and culture** *Together for Life* is a workplace program of the Montreal Police Force implemented to address suicide among officers. Policy and program components of *Together for Life* were designed to foster an organizational culture that promoted mutual support and solidarity among members of the Force, help for problems related to suicide, training of supervisors, managers and all units to improve competencies in identifying suicidal risk and in using existing resources, and an education campaign to improve awareness and help-seeking. After implementation of the program, police suicides were tracked over 12 years and compared to rates in the control city of Quebec. Pre-post assessments of learning, interviews, and focus groups were also included. The suicide rate in the intervention group decreased significantly by 78.9% ( $p < .008$ ) to 6.42 per 100,000 per year compared to 29.0 per 100,000 in the control city--a significant difference in rates ( $p < .007$ ) (Mishara & Martin, 2012).

*The United States Air Force Suicide Prevention Program (AFSPP)*, inclusive of 11 policy and education initiatives, was designed to change the culture of the Air Force surrounding suicide. The program uses leaders as role models and agents of change, establishes expectations for behavior related to awareness of suicide risk, develops population skills and knowledge (i.e., education and training), and investigates every suicide (i.e., outcomes measurement). The program represents a fundamental shift from viewing suicide and mental illness solely as medical problem and instead sees them as larger service-wide problems impacting the whole community. Using a time-series design, the *AFSPP* program



was associated with a 33% relative risk reduction in suicide (Knox et al., 2003). The program was also associated with relative risk reductions in related outcomes including moderate and severe family violence (30% and 54%, respectively), homicide (51%), and accidental death (18%); Knox et al., 2003). A longitudinal assessment of the program over the period 1981 to 2008 (16 years before the 1997 launch of the program and 11 years post-launch) found significantly lower rates of suicide after the program was launched than before (Knox et al., 2010). These effects were sustained over time, except in 2004, which the authors found was associated with less rigorous implementation in that year than in the other years (Knox et al., 2010).

- **Community-based policies to reduce excessive alcohol use** Several studies on alcohol outlet density in the United States have found that greater alcohol availability is positively associated with alcohol-involved suicides (Giesbrecht et al., 2014; Escobedo & Ortiz, 2002). For example, Giesbrecht et al. (2014) found that both on and off-premises alcohol outlets (i.e., restaurants where alcohol is served and stores where alcohol is available for purchase to go) were positively associated with alcohol-related suicides in 14 U.S. states, particularly among men (AOR 1.08, CI=1.03-1.13) and American Indian/Alaska Natives (AOR= 1.36; CI= 1/10-1.69). Additionally, a longitudinal analysis of alcohol outlet density, suicide mortality, and hospitalizations for suicide attempts over 6 years in 581 California zip codes indicated that the density of bars, specifically, is related to suicide and suicide attempts, particularly in rural areas (Johnson, Gruenewald & Remer, 2009). These findings suggest that measures to reduce alcohol outlet density can potentially reduce alcohol-involved suicides.

## Promote Connectedness to Protect Against Suicide

### Rationale

The quantity and quality of our social connection with others has been linked with suicide dating as far back to Durkheim, who first posited that the weakening social bonds is among the chief causes for suicidality<sup>1</sup>. Connectedness is the degree to which an individual or group of individuals are socially close, interrelated, or share resources with others<sup>2</sup>. Connectedness can be formed within and between multiple levels of the social ecology<sup>3</sup>; for instance between individuals (e.g. peers, neighbors, co-workers), families, schools, neighborhoods, workplace, faith communities, cultural groups, and society as a whole. Connectedness is also viewed as a broad term that encompasses several other concepts including social support, social participation, social isolation, social cohesion, social capital, social integration, all of which have been linked to suicidal behaviors either conceptually or scientifically within the literature. Connectedness can serve either to protect or mitigate suicidal behaviors by decreasing isolation, encouraging adaptive coping behaviors, increasing belongingness, personal value and worth all of which helps individuals to build resilience in the face of adversity. Connectedness can also provide individuals with better access to formal supports and resources, mobilize communities to meet the needs of its members and provide collective primary prevention activities to the community as a whole<sup>2</sup>.

[insert info on connectedness and include some or all of the following re social capital here]. Social capital refers to a sense of trust in one's community and neighborhood, social integration, and also the availability and participation in social organizations (Muenning et al., 2013; Beyer et al., 2014). Many ecological cross-sectional and longitudinal studies have examined the impact of aspects of social capital on depression symptoms, depressive disorder, mental health more generally, and suicide. While the evidence is still being built the pattern is towards an inverse association between social capital measured by social trust, community/neighborhood engagement, and improved mental health

### Approaches

The following two approaches are designed to promote connectedness among individuals and within communities to protect against suicide.

- **Peer norm approaches** seek to normalize help-seeking, encourage reaching out and talking to trusted adults, and promote supporting peers through building connectedness. These approaches are typically delivered in school settings but can also be implemented in community settings.

**Comment [A]:** This is what was in the table that Linda said could be added to the rationale.



- **Community engagement activities.** Community engagement is an aspect of social capital and involves residents participating in a range of activities, including religious activities, community clean-up and greening activities, and physical exercise. These activities provide opportunities for residents to become more involved in the community and to connect with other community members, organizations, and resources, resulting in enhanced overall physical health, reduced stress, and decreased depressive symptoms, thereby reducing risk of suicide.

### Potential Outcomes

- Reduction in maladaptive coping attitudes and behaviors
- Increase in healthy coping attitudes and behaviors
- Increase in referrals for youth in distressed
- Increase help-seeking behaviors
- Positive perception of adult support

### Evidence

Brief statement to introduce the evidence.

Current evidence provide some support for these types of approaches for reducing risk factors associated with suicidal behaviors.

- **Peer norm approaches.** Evaluations show that programs such as *Sources of Strength (SOS)* can improve school norms and beliefs about suicide that are created and disseminated by student peers. In a randomized controlled trial of the program conducted with 18 urban and rural high-schools Wyman et al., (2010)<sup>4</sup> found that *SOS* improved peer leaders' knowledge of adult supports for suicidal peers ( $p<.01$ ) and were more likely than untrained leaders to refer distressed peers to adult supports ( $p<.03$ ). Trained peer leaders also reported a greater decrease in maladaptive coping attitudes compared with untrained leaders ( $p<.01$ ).
- **Community-engagement activities.** *Greening vacant urban spaces* is an initiative that communities have adopted, particularly after the Great Recession (2007-2009) when many cities across the U.S. experienced urban abandonment. These initiatives engaged community members in the cleaning, greening, or beautifying vacant areas. One vacant lot greening initiative, which greened 4,436 lots in 4 areas of Philadelphia, PA, greening significantly reduced community residents' self-reported stress levels ( $p<.001$ ) and engaged in more physical exercise ( $p<.001$ ) than residents in control vacant lot areas. Other benefits included reductions in firearm assaults and vandalism<sup>5</sup>.

## Teach Coping and Problem-Solving Skills

### Rationale

Building life skills prepare individuals to successfully tackle every day challenges and adapt to stress and adversity. Life skills encompasses many concepts, but most often include coping and problem-solving skills, conflict resolution, and critical thinking. Life skills are important in shielding individuals from suicidal behaviors<sup>6</sup>. Suicide prevention programs that focus on life and social skills training are drawn from social cognitive theories<sup>7</sup>, surmising that individuals who engage in suicidal behavior is attributed to either direct learning, modeling, and environmental and individual (e.g. hopelessness) characteristics. The literature linking life skills and suicide is robust--- The inability to employ adequate coping strategies to cope with immediate stressors or identify and find solutions for problems have been characterized among suicide attempters<sup>8</sup>. Treatments that include bolstering problem skills<sup>9</sup> and include problem-solving techniques<sup>10,11</sup> appear to reduce suicidal ideation and attempts more effectively. Prevention programs focused on teaching these skills target youth, parents and families and have been used with both universal and at-risk populations. While many do not target suicidal behaviors directly, these programs strive to train youth and parents important life skills to offset the underlying vulnerabilities that contribute to engaging in high risk behaviors early in life.

### Approaches

Current evidence provides support for the following two approaches:

- **Social emotional learning programs** focus on developing and strengthening communication and problem-solving skills, emotion regulation, conflict resolution, help seeking and coping skills. These approaches address a range of risk and protective factors for suicidal behavior. They provide children and youth with skills to resolve problems in relationships, school, and with peers, and help youth to address other negative influences (e.g., substance use) associated with suicide. These approaches are typically delivered to all students in a particular grade or school, although some programs also focus on groups of students considered to be at high-risk for suicide. Opportunities to practice and reinforce skills are an important part of programs that work.
- **Parenting skill and family relationship programs** are designed to strengthen parenting skills, enhance positive parent-child interactions, and improve children's behavioral and emotional skills and abilities. Several parenting and family relationship programs have been shown in rigorous evaluations to improve resilience and reduce risk factors for various behaviors, including ones closely related to suicide, such as depression, internalizing behaviors, and substance abuse.



## Potential Outcomes

- Reduction in suicide attempts and suicide ideation
- Enhanced knowledge of risk and protective factors associated with suicide
- Reduction in suicide risk behaviors (i.e., depression, anxiety, conduct problems, substance abuse)
- Improve and normalize help-seeking behavior
- Enhance social competence and emotional regulation skills
- Enhance problem-solving and conflict management skills

## Evidence

There are several programs with evidence that supports teaching social, emotional and parenting skills to reduce suicidal behaviors and associated risk factors.

- **Social emotional learning programs.** These programs, commonly delivered in schools, overall have demonstrated success in preventing suicide risk. However, the evidence is mixed; while most models demonstrated strong effects, others were mixed. For example, *Signs of Suicide (SOS)* is a high school-based prevention program for students designed to increase knowledge about suicide improve and normalize help-seeking behaviors. After 3 months of participation, *SOS* has documented a 64% reduction in suicide attempts among its participants compared to controls. *SOS* participants with a lifetime history of suicide attempt were also significantly less likely to report planning a suicide in the 3 months following the program compared to lower-risk participants. Moreover, increased knowledge of how access help for themselves or friends for depression and/or suicidal thoughts, and favorable attitudes toward help-seeking were noted among students who participated in *SOS*<sup>12</sup>.

Another example is *The Good Behavior Game (GBG)*, which is a classroom-based program for elementary school children uses a behavior management strategy that promotes good behavior by setting clear expectations for good behavior and consequences for maladaptive behavior. In the evaluation of this program, several outcome behaviors were measured including suicide, given its association with externalizing behavior problems. Results from the first cohort evaluation found that first graders assigned to *GBG* reported half the adjusted odds of suicide ideation and suicide attempts than controls. After 14 years postvention, *GBG* was also found to significantly reduce risk of substance abuse<sup>13</sup>. However, in a replication trial, *GBG* did not produce the same reductions on suicide ideation or attempts as it did in the first cohort<sup>14</sup>. This finding likely arose due to the lack of implementation fidelity and pointed to the need for *GBG* to be delivered with precision, consistency, and teacher support (ref??).

Finally, the *Youth Aware of Mental Health Program (YAM)*, a school-based program rigorously evaluated in 10 European countries, teaches youth about suicide risk and protective factors and problem-solving skills. At 12 months, students participating in *YAM* were significantly less likely to have a suicide attempt and severe suicidal ideation compared to controls; Risk of suicide ideation and attempts fell by 49 to 54% among *YAM* participants<sup>15</sup>.

- **Parenting skill and family relationship programs**

Parenting and family skills training approaches have shown promising impacts in preventing key risk factors associated with suicide. One program, *The Incredible Years* is a universally delivered program for parents of children up to 12 years of age designed to improve responsive and positive parent-teacher-child interactions and relationships, emotion self-regulation and social competence and reduce problem behaviors in children. Several studies have demonstrated the effect of *The Incredible Years* program on reducing internalizing symptoms, such as anxiety and depression, and child conduct problems<sup>16,17,18,19</sup>. The program is also associated with improved problem-solving and conflict management, skills that were maintained at 1-year follow-up<sup>17,18,19</sup>. The program also demonstrated greater benefits as the dosage of the intervention increased<sup>20</sup>. *Strengthening Families 10-14 years* is a program that involves sessions between parents, youth, and family with the goals of: 1) improving parents' skills for disciplining, managing emotions and conflict, and communicating with their children; 2) promoting youths' interpersonal and problem-solving skills; and 3) creating family activities to build cohesion and positive parent-child interactions. The program has successfully shown to decrease externalizing behaviors, alcohol use, and drug use among youth participants and reductions in depression, alcohol use, and drug use among participating families<sup>21</sup>.



## Identify and Support People At-Risk

### Rationale

In order to be successful in decreasing suicidal behavior, attention must be paid to those who are at-risk or vulnerable. These persons experience risk and occurrence of suicidal behavior that is higher than average. This group requires particular focus on proactive case finding and retention and access to services. These vulnerable or disadvantaged populations include (but are not limited to): those living in lower socio-economic status; members of certain ethnic minority groups; those with a mental health problem; those who are institutionalized; those who have been victims of violence; and those who are homeless. Finding effective ways of identifying at-risk or vulnerable groups, customizing services to make them accessible and maintaining care are still key challenges. For example, simply improving services does not guarantee that those services will be used by those most in need of them. Nor will it necessarily increase the number of people who follow treatments that are recommended. People who are disadvantaged face social and economic issues that may adversely affect their ability to respond to the treatments or advice that are offered.

### Approaches

This document outlines three approaches that focus on identifying and supporting those who are at-risk.

- **Gatekeeper training** is typically implemented in schools and within health care settings and is designed to train teachers, coaches, providers and others in the community to identify people who may be at risk of suicide and to respond effectively, including facilitating treatment seeking and support services.
- **Screening combined with care management and overall continuity of care** has been used in primary care and behavioral health care to assure that people who may be at high-risk of suicide don't 'slip through the cracks'. These approaches typically employ screening for depression and/or suicide combined with collaborative treatment planning between patients and their providers and patient follow-up. Programs such as these have demonstrated beneficial effects on depression, suicide ideation, and suicide mortality.
- **Crisis intervention.** These approaches provide support and referral services, typically by connecting a person in crisis (or a friend or family member of someone at-risk) to trained volunteers and/or professional staff via telephone hotline, online chat, or text messaging. Crisis intervention approaches are intended to impact key risk factors for suicide, including feelings of depression, hopelessness, and subsequent mental health care utilization. Like means restriction,

crisis interventions can put space or time between an individual who may be considering suicide and harmful behavior.

### Potential Outcomes

- Reduction in suicide attempts
- Reduction in suicide deaths
- Increased identification of individuals at-risk for suicidal behavior
- Increased at-risk individuals in treatment
- Increased community members trained to identify at-risk individuals
- Increased referrals for health care

### Evidence

- There is evidence that community gatekeeper programs are successful in reducing suicides and suicide attempts but the efforts must be maintained. (Substance Abuse and Mental Health Services Administration, Center for Mental Health Services. Report to Congress: Garret Lee Smith Suicide Prevention Program. US Department of Health and Human Services: Rockville, MD, 2014). There is limited evidence for effectiveness screening programs but standard principles for public health screening make them promising. (Pena JB, Caine ED. Screening as an Approach for Adolescent Suicide Prevention. *Suicide and Life-Threatening Behavior*. 2006; 36(6):614-637. The number of studies evaluating crisis intervention services is limited but a few studies do indicate that those who use the hotline services have decreased suicidal thoughts and behavior.
- **Gatekeeper training.**  
*Mental Health First Aid (MHFA)*, designed for the lay public, consists of three weekly sessions of three hours each. The content covers helping people in mental health crises and/or in the early stages of mental health problems. The crisis situations covered included suicidal thoughts and behavior, acute stress reaction, panic attacks and acute psychotic behavior. The mental health problems discussed included depressive, anxiety and psychotic disorders. The co-morbidity with substance use disorders is also covered. Participants learn the symptoms of these disorders, possible risk factors, where and how to get help and evidence-based effective help. In a randomized controlled trial of 300 participants, the intervention group reported greater confidence in providing help to others, greater likelihood of advising people to seek professional help, improved concordance with health professionals about treatments, and decreased stigmatizing attitudes. An additional finding was an improvement in the mental health of the participants themselves. All results were statistically significant at  $p < .05$ . (Kitchener & Jorm,



2004). Additional research rigorously evaluating MHFA for its impact on the first aid recipients themselves and suicidal behavior is needed (Kitchener & Jorm, 2006).

*Garret Lee Smith (GLS) Suicide Prevention Program*, as of June 2014, 154 GLS grants had been awarded to 49 states and 48 tribes. Gatekeeper training has been a core part of all GLS programs, and grantees have consistently reported spending the largest proportion of their budget on this strategy. A multi-site evaluation assessed the connection between community gatekeeper training (activities such as the number of people trained and the intended mid- and long-term outcomes) and a reduction of suicide attempts and deaths. To address this question, the analysis compared the change in the suicide mortality rates and nonfatal suicidal behavior among the population aged youth and young adults in counties implementing GLS trainings, with the trajectory observed in similar counties that did not implement these trainings. Effect on fatal behavior - When compared with similar counties that did not implement GLS training, counties implementing GLS trainings presented significantly lower youth suicide rates the year following the training implementation (-1.07,  $p=.03$ ). This finding represents a decrease of 1 suicide death per 100,000 10 to 24 year olds or the avoidance of approximately 237 deaths in this age group between 2007 and 2010. Effect on nonfatal behavior - Counties implementing GLS program activities had significantly lower suicide attempt rates among youths 16 to 23 years of age in the year following implementation of the GLS program than did similar counties that did not implement GLS program activities (4.9 fewer attempts per 1000 youths [95% CI, 1.8-8.0 fewer attempts per 1000 youths];  $P = .003$ ). More than 79 000 suicide attempts may have been averted during the period studied following implementation of the GLS program.

Walrath C, Godoy-Garraza L, Reid H, Goldston DB, McKeon R. Impact of the Garrett Lee Smith Youth Suicide Prevention Program on Suicide Mortality. *American Journal of Public Health*: May 2015, Vol. 105, No. 5, pp. 986-993. doi: 10.2105/AJPH.2014.302496.

Godoy Garraza L, Walrath C, Goldston DB, Reid H, McKeon R. Effect of the Garrett Lee Smith Memorial Suicide Prevention Program on Suicide Attempts Among Youths. *JAMA Psychiatry*. 2015; 72:1143-1149. doi:10.1001/jamapsychiatry.2015.1933. I Brief statement introducing the evidence.

- **Screening combined with care management and overall continuity of care.**

*Henry Ford Perfect Depression Care (Pre-cursor to Zero Suicide)* The overall goal of the program was to eliminate suicide. More broadly, the aim of the program was to completely redesign depression care delivery to achieve breakthrough improvement in quality and safety. The redesign focused on six aims: effectiveness, safety, patient centeredness, timeliness, efficiency, and equity among patients. The program developed concrete measures to assess progress on each of these aims. The program began with screening and assessment of each patient for suicide

risk with coordinated continuous follow-up care system wide. On the basis of the combined total of 31 suicides for the 11-year observation period, the rate of suicide among patients was 97 per 100,000 (N=13) for the two baseline years (the average rate for 1999 and 2000). This rate is similar to that reported for a clinical population. For the start-up year (2001), the rate of suicide was 41 per 100,000 (N=3). For the follow-up interval (the average for 2002–2009), the rate was 19 per 100,000 (N=15). Poisson regression analysis showed a statistically significant decrease of 82% in the suicide death rate between the baseline (1999–2000) and intervention (2002–2009) years (rate ratio=.20; 95% confidence interval=.16–.24,  $p \leq .001$ ). Coffey et al., 2013; Coffey, 2006. Additionally, between 1999 and 2010, researchers found that suicide rates declined among HMO members who received mental health specialty services, in association with a target prevention effort, and increased among HMO members who accessed general medical services but not specialty MH services (Coffey et. al., 2015).

- **Crisis intervention.**

*National Suicide Prevention Lifeline (NSPL).* This is a nationwide hotline that operates 24/7 and is accessible by phone or a web-based chat function. Trained counselors are on-hand to listen, offer free and confidential emotional support, and provide referrals for mental health services in the local area. Suicide callers (N=1,085) were assessed during their calls to the hotline and 380 (35.0%) participated in the follow-up assessment. Results indicated that seriously suicidal individuals called the hotline. Significant decreases in suicidality were found during the course of the telephone session, with continuing decreases in hopelessness and psychological pain in the following weeks (Gould et al., 2007).

- *Applied Suicide Intervention Skills Training (ASIST).* This a training program for hotline counselors, emergency workers, clergy, caregivers and others in the community. The ASIST model has three phases of caregiving: connecting, understanding and assisting. The training helps participants identify people who are having thoughts of suicide and to recognize their invitation for help (connecting); to listen to the caller's reasons for dying and living (understanding); and how to conduct a safety assessment, develop a safety plan for the person at risk, and connect the person at risk to community resources (assisting). The ASIST training program has been field tested in a variety of settings. In a national randomized controlled trial, Gould et al (2013) assessed the impact of the ASIST training across the NSPL network of hotlines over the period 2008-2009. Data were derived from 1,507 monitored calls from 1,410 suicidal individuals to 17 Lifeline centers. Callers who spoke with ASIST-trained counselors were significantly more likely to feel less depressed, less suicidal, less overwhelmed, and more hopeful by the end of calls compared to those who spoke to counselors receiving usual care training. ASIST-trained counselors were also better able to keep callers on the phone longer and



establish a connection. ASIST training, however, did not yield more comprehensive suicide risk assessments than usual care training (Gould et al., 2013).

## Intervene to Lessen Harms and Prevent Future Risk

### Rationale

Individuals who have experienced mental health challenges, suicidal ideation, and have had non-fatal suicide attempts or have engaged in non-suicidal self-injury are at increased risk of subsequent suicide-related morbidity and mortality. Risk of suicidality can also increase among those who have lost a friend, family member, co-worker, or other acquaintance to suicide. Exposure to sensationalized or uninformed reporting regarding suicide-related deaths may heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to suicide contagion.

### Approaches

A broad array of approaches to lessen harms and reduce future risk of suicidality among those at increased risk include the provision of mental health care and improved continuity of care, improving linkage to care through active post-discharge planning and follow-up that decreases barriers to ongoing therapeutic support, increasing connectedness to supportive others, addressing bereavement, and framing communications to emphasize resilience, decrease negative affect, and to prevent contagion.

- **Treatment for people at-risk of suicide** typically includes various forms of psychotherapy delivered by licensed providers to help individuals with mental health problems and other risk factors for suicide with problem-solving, impulsivity and emotion regulation.
- **Treatment to prevent re-attempts.** These follow-up contact approaches use diverse modalities (e.g., home visits, mail, telephone, e-mail) to engage recent suicide attempt survivors to prevent reattempts. These approaches typically focus on coping and other emotional regulation skills and may include **case management home visits to increase adherence to and continuity of care**, one-on-one interpersonal therapy and/or group therapy. Approaches that engage and connect attempters to peers and providers are especially important because many attempters do not present to aftercare; 12%-25% reattempt within a year, and 3%-9% of attempt survivors die by suicide within 1 to 5 years of their initial attempt (Inagaki, et al., 2015).
- **Postvention** approaches are implemented after a suicide has taken place and may include debriefing of survivors (those who have lost a friend, peer, family member, co-worker to suicide), counseling, and/or bereavement support groups. The programs have not typically tested their impact on suicide or suicidal behavior but may reduce risk of guilt, feelings of depression, and complicated grief (Szumilas et al., 2011). Additionally, research suggests that active postvention approaches in which outreach to suicide survivors occurs at the scene of a suicide is associated with intake into treatment sooner, greater attendance at support group meetings, and attendance at more meetings compared to passive postvention (no outreach) (Cerel & Campbell, 2008).



- **Safe messaging following a suicide.** The manner in which information on a recent suicide is communicated to the public (e.g. school assemblies, mass media, social media) can heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to suicide contagion.

## Potential Outcomes

- Reduction in mental health-related sequelae
- Increase connectedness
- Improved coping skills
- Improved messaging following suicide
- Reduction in re-attempts

## Evidence

The evidence addressing strategies to lesson harm and prevent future risk of suicide includes the evaluation of effects of specific approaches on risk and protective factors as well as suicide-related mortality. However, because the evaluation of suicide-related mortality is a statistically rare event, evaluation of mortality outcomes requires large sample sizes and extended follow-up. Therefore, much of the evidence in this area primarily focuses on risk and protective factors.

- **Treatment for people at-risk of suicide.**

Psychotherapy has been demonstrated to help diverse individuals in different settings to reduce risks related to mental health problems such as depression and anxiety, and to reduce suicidal ideation and attempts. Evaluation evidence for selected psychotherapeutic approaches to prevent future suicide risk follow below.

**Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)** aims to prevent suicide among older primary care patients by reducing suicide ideation and depression in primary care settings. IMPACT facilitates the development of a therapeutic alliance, a personalized treatment plan that includes patient preferences, as well as proactive follow-up (biweekly during an acute phase and monthly during continuation phase) by a depression care manager. IMPACT has been shown to significantly improve quality of life, and to reduce functional impairment, depression (Hunkeler et al., 2006; Unützer et al., 2002) and suicidal ideation over 24-months of follow-up (Unützer et al., 2006) relative to patients who received care as usual.

**Collaborative Assessment and Management of Suicidality (CAMS)** is a therapeutic framework for suicide-specific assessment and treatment of patient's suicide risk. It is a flexible approach that can be used across treatment settings and clinician theoretical orientations. The clinician and patient work together in an interactive assessment process. The patient is highly engaged in the development of their own treatment plan. Every session of CAMS is collaborative and involves the patient's input about what is and is not working. Ultimately, this process is designed to enhance the therapeutic alliance and increase treatment motivation in the suicidal patient. CAMS has been tested and supported in 6 correlational studies (Jobes, 2012), in a variety of inpatient and outpatient settings and in one RCT with several additional RCTs under way. CAMS has been associated with significant improvements in suicidal ideation, overall symptom distress, and feelings of hopelessness at 12 month follow-up among a community-based sample of suicidal outpatients. (Comtois et al., 2011).

**Dialectical Behavioral Therapy** is a multicomponent therapy for individuals at high risk for suicide who may struggle with impulsivity and emotional regulation. The components of DBT include individual therapy, group skills training, between-session telephone coaching and a therapist consultation team. In a randomized controlled trial of women with recent suicidal or self-injurious behavior, those receiving DBT were half as likely to make a suicide attempt at two-year follow-up than women receiving community treatment (23% vs 46%), required less hospitalization for suicide ideation, and had lower medical risk across all suicide attempts and self-injurious acts combined (Linehan et al., 2006).

**Attachment-Based Family Therapy (ABFT)** is a program for adolescents ages 12-18 that is designed to treat clinically diagnosed major depressive disorder, eliminate suicidal ideation, and reduce dispositional anxiety. A randomized controlled trial of ABFT (Diamond et al., 2010) found that suicidal adolescents assigned to ABFT experienced significantly greater improvement regarding suicidal ideation over 24 weeks of follow-up than did adolescents assigned to enhanced usual care (-4.37 vs. -2.34;  $p = .001$ ;  $d=0.97$ ). A higher percentage of ABFT participants reported no suicidal ideation in the past week at 12 weeks than did adolescents receiving enhanced usual care (69.2% vs. 34.6%;  $p = .01$ ;  $OR= 4.25$ ) and at 24 weeks (82.1% vs. 46.2%;  $p = .006$ ;  $OR=5.37$ ).

- **Treatment to prevent re-attempts.**

Active contact and follow-up approaches intended to prevent reattempts among patients that have been hospitalized and subsequently discharged for suicide attempts have been found in a meta-analysis conducted by Inagaki et al., (2015) to reduce reattempts by approximately 17% for up to 12 months post-discharge, however, the long-term effects of these approaches on reattempts has not yet been demonstrated. Also, because the number of trials and associated sample sizes included in this meta-analysis were small, it was not possible to determine the effect



of active contact and follow-up approaches on death by suicide. In a randomized controlled trial of postcrisis suicide prevention long-term follow-up contact approach, Motto et al., (2001) found that patients who refused ongoing care but who were randomized to be contacted by letter four times per year had a lower rate of suicide over two years of follow-up than did patients in the control group who received no further contact. Other studies have also shown post-crisis letters and coping cards to be protective against suicide ideation and attempts (Hassanian-Moghaddam et al., 2011; Wang et al., 2016).

- **Postvention** approaches such as *StandBy Response Service* provide suicide bereavement support services to clients via face-to-face outreach and telephone support delivered by a professional crisis response team. A site coordinator develops a customized case management plan, referring clients to other existing community services matched to their needs. In a study by Visser et al. (2014), *StandBy* clients were significantly less likely to be at high risk for suicidality than a suicide bereaved comparison group who had not had contact with the *StandBy* program (48% and 64% respectively,  $p = 0.005$ ).
- **Safe messaging following a suicide.** *Media* guidelines for reporting on suicides can help assure that stories on suicide are communicated in a safe and effective way. Reports that are both inclusive of suicide prevention messages, stories of hope and resilience, risk and protective factors, and links to helping resources (e.g., hotline) and that avoid sensationalizing events or reducing suicide to one cause can help reduce the likelihood of suicide contagion. The most compelling evidence supporting the effect of media guidelines on reduction in suicides comes from Austria. After a sharp increase in suicides on the Viennese subway, media guidelines were introduced and an interrupted time series design was used to evaluate the national impact of the guidelines on subsequent suicides. Changes in the quality and quantity of media reporting resulted in a reduction of 81 suicides annually (95% confidence interval: -149 to -13;  $t = -2.32$ ,  $df = 54$ ,  $p < 0.024$ ) in the Viennese subway system (Niederkrötenhaller, T., & Sonneck, G., 2007)

## Sector Involvement

Public health can play an important and unique role in addressing suicide. Public health agencies, which typically place prevention at the forefront of efforts and work to create broad population-level impact, can bring critical leadership and resources to bear on this problem. For example, these agencies can serve as a convener, bringing together partners and stakeholders to plan, prioritize, and coordinate suicide prevention efforts. Public health agencies are also well positioned to collect and disseminate data, implement preventive measures, evaluate programs, and track progress. Although public health can play a leadership role in preventing suicide, the strategies and approaches outlined in this technical package cannot be accomplished by the public health sector alone.

Other sectors vital to implementing this package include, but are not limited to, education, government (local, state, and federal), social services, health services, business/labor, justice, housing, media, and organizations that comprise the civil society sector such as faith-based organizations, youth-serving organizations, foundations, and other non-governmental organizations. Collectively, these sectors can

make a difference in preventing suicide by impacting the various contexts and underlying risks that contribute to suicide.

The strategies and approaches described in this technical package are summarized in Appendix A along with the relevant sectors that are well positioned to lead implementation efforts.

[I can write the text specific to the strategies and approaches. I've done this for the other TPs and am happy to do the same here. This is the section where we distinguish the strategies where public health is best positioned to lead from those where leadership is necessary from other sectors and how public health can assist, etc.]

Regardless of strategy, action by many sectors will be necessary for the successful implementation of this package. In this regard, all sectors can play an important and influential role in.....



## Monitoring and Evaluation

Monitoring and evaluation are necessary components of the public health approach to prevention. It is important to have timely and reliable data to monitor the extent of the problem and to evaluate the impact of prevention efforts. Data are necessary for program implementation; planning, implementation, and assessment all rely on accurate measurement of the problem.

Surveillance data helps researchers and practitioners track changes in the burden of suicide. Surveillance systems exist at the federal, state, and local levels. It is important to assess the availability of surveillance data and data systems across these levels to identify and address gaps in the systems. CDC's National Vital Statistics System and the National Violent Death Reporting System (NVDRS) are examples of surveillance systems that provide data on deaths from suicide. NVDRS, for example, is a state-based surveillance system that combines data from death certificates, law enforcement reports, and coroner or medical examiner reports to provide detailed information on the circumstances of violent deaths, including suicide, which can assist communities in guiding prevention approaches (Blair et al., 2016). The National Electronic Injury Surveillance System-All Injury Program (NEISS-AIP) provides nationally representative data about all types and causes of nonfatal injuries treated in U.S. hospital emergency departments, and can be used to assess national rates of, and trends in, self-harm injuries by cause (e.g., falls, poisoning, etc.), age, race/ethnicity, sex, disposition (where the injured person goes when released from the Emergency Department (<http://www.cdc.gov/injury/wisqars/nonfatal.html>)).

In addition to information on deaths and nonfatal injuries, there are also surveillance systems that provide national, state, and some local estimates of suicidal behavior. The Youth Risk Behavior Surveillance System (YRBSS) collects information from a nationally representative sample of 9-12 grade students and is a key resource in monitoring health-risk behaviors among youth, including whether youth have seriously considered attempting suicide, attempted suicide, made a plan, or required treatment by a doctor or nurse for a suicide attempt that resulted in an injury, poisoning, or overdose (Brener et al., 2013). The YRBSS data are obtained from a national school-based survey conducted by CDC as well as school-based state, territorial, tribal, and large urban school district survey conducted by education and health agencies. The National Survey on Drug Use and Health (NSDUH) is an annual nationwide survey of individuals aged 12 years and older that provides national and state-level estimates of drug use and mental health-related issues, including suicide ideation and suicide attempts (<https://nsduhweb.rti.org/respweb/homepage.cfm>).

It is also important at all levels (local, state, and federal) to address gaps in responses, track progress of prevention efforts and evaluate the impact of those efforts, including the impact of this technical package. Evaluation data, produced through program implementation and monitoring, is essential to provide information on what does and does not work to reduce rates of suicide and its associated risk and protective factors. Theories of change and logic models that identify short, intermediate, and long-term outcomes are an important part of program evaluation.

The evidence-base for suicide prevention has advanced greatly over the last few decades. However, additional research is needed to..... Lastly, it will be important for researchers to test the effectiveness of combinations of the strategies and approaches included in this package. Most existing evaluations focus on approaches implemented in isolation. However, there is potential to understand the synergistic effects within a comprehensive prevention approach. Additional research is needed to understand the extent to which combinations of strategies and approaches result in greater reductions in suicide than individual programs, practices, or policies.

## Conclusion



## References

## Appendix A: Summary of Strategies and Approaches to Prevent Suicide

Strategy	Approach/Program, Practice or Policy	Best Available Evidence			Lead Sectors <sup>1</sup>
		Suicide	Suicide Attempts or Ideation	Other Risk/Protective Factors for Suicide	
Strengthen economic supports	<b>Strengthen financial security</b>				
	<i>Unemployment benefit programs</i>				
	<b>Housing stabilization policies</b>				
	<i>The National Neighborhood Stabilization Program</i>				
Strengthen access to mental health care	<b>Coverage of mental health conditions in health insurance policies</b>				
	<i>Mental Health Parity Laws</i>				
Establish protective environments	<b>Means restriction</b>				
	<i>Intervening at hot spots</i>	X			
	<i>Safe storage practices</i>		X (attempts)	X (Safe storage of firearms and medication)	
	<b>Organizational policies and culture</b>				
	<i>Together for Life</i>	X			
	<i>US Air Force Suicide Prevention Program</i>	X		X (family violence)	

**Comment [A]:** I'll help you complete the lead sector column. For the other columns, you just need to insert a check-mark based on the evidence you describe in the narrative for a particular program or policy. For example, if the evidence shows impact on suicide, then put a check-mark in that column. If the study also found effects on risk or protective factors, then put a check-mark in that column as well.



		Best Available Evidence			
	Community-based policies to reduce excessive alcohol use				
	Alcohol outlet density				
Promote connectedness to protect against suicide	Peer norm approaches				
	Sources of Strength			√	
	Community-engagement activities				
	Greening vacant urban spaces			√	
Teach coping and problem-solving skills	Social emotional learning				
	Youth Aware of Mental Health Program		√		
	Signs of Suicide		√	√	
	Good Behavior Game		√	√	
	Parenting skill and family relationship approaches				
	The Incredible Years			√	
	Strengthening Families 10-14			√	
	Gatekeeper training				
	Mental Health First Aid				

		Best Available Evidence			
Identify and support people at-risk	Screening combined with care management				
	Henry Ford Perfect Depression Care (Precursor to Zero Suicide)				
	Crisis Intervention				
	National Suicide Prevention Lifeline				
	Applied Suicide Intervention Skills Training				
Intervene to lessen harms and prevent future risk	Treatment for people at risk of suicide				
	Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)				
	Collaborative Assessment and Management of Suicidality (CAMS)				
	Dialectical Behavioral Therapy				
	Attachment-Based Family Therapy				
	Treatment to prevent re-attempts				
	ED Brief Intervention with Follow-up Visits				
	Active follow-up contact approaches				
	CBT for Suicide Prevention				



	Best Available Evidence				
	<b>Postvention</b>				
	<i>StandBy Response Service</i>				
	<b>Safe messaging following a suicide</b>				
	<i>Media Guidelines</i>				-

<sup>1</sup>This column refers to the lead sectors well positioned to bring leadership and resources to implementation efforts. For each strategy, there are many other sectors such as non-governmental organizations that are instrumental to prevention planning and implementing the specific programmatic activities.

<sup>1</sup> Butchart A, Phinney A, Check P, Villaveces A. *Preventing violence: a guide to implementing the recommendations of the World Report on Violence and Health*. Geneva, Switzerland: World Health Organization; 2004.

<sup>2</sup> Kleven J, Simon TR, Chen J. Are the perpetrators of violence one and the same? Exploring the co-occurrence of perpetration of physical aggression in the United States. *J Interpers Violence*. 2012;27(10):1987-2002

<sup>3</sup> Desai, R. A., Dausey, D. J., & Rosenheck, R. A. (2005). Mental health service delivery and suicide risk: the role of individual patient and facility factors. *American Journal of Psychiatry*.

<sup>4</sup> Coulton CJ, Crampton DS, Irwin M, Spilsbury JC, Korbin JE. How neighborhoods influence child maltreatment: a review of the literature and alternative pathways. *Child Abuse Negl*. 2007;31(11-12):1117-1142.

<sup>5</sup> Freisthler B, Merritt DH, LaScala EA. Understanding the ecology of child maltreatment: a review of the literature and directions for future research. *Child Maltreat*. 2006;11(3):263-280.

<sup>6</sup> Capaldi DM, Knoble NB, Shortt JW, Kim HK. A systematic review of risk factors for Intimate partner violence. *Partner Abuse*. 2012;3(2):231-280.

<sup>7</sup> Pinchevsky GM, Wright EM. The impact of neighborhoods on intimate partner violence and victimization. *Trauma Violence Abuse*. 2012;13(2):112-132.

<sup>8</sup> Sampson RJ, Morenoff JD, Gannon-Rowley T. Assessing "neighborhood effects": Social processes and new directions in research. *Annual review of sociology*. 2002;28:443-478.

<sup>9</sup> Luo F, Florence CS, Quispe-Agnoli M, Ouyang L, Crosby AE. Impact of business cycles on US suicide rates, 1928-2007. *American journal of public health*. 2011;101(6):1139-1146.

<sup>10</sup> Reeves A, Stuckler D, McKee M, Gunnell D, Chang SS, Basu S. Increase in state suicide rates in the USA during economic recession. *The Lancet*. 2012;380(9856):1813-1814.

<sup>11</sup> Runyan D, Wattam, C, Ikeda, R., Hassan, F, Ramiro, L. Child abuse and neglect by parents and caregivers. In: Krug E, Dahlberg LL, Mercy, JA, Zwi AB, Lozano R, ed. *World report on violence and health*. Geneva, Switzerland: World Health Organization; 2002:59-86.

<sup>12</sup> Heise L, Garcia-Moreno C. Violence by intimate partners. In: In: Krug E, Dahlberg LL, Mercy, JA, Zwi AB, Lozano R, ed. *World report on violence and health*. Geneva, Switzerland: World Health Organization; 2002:87-121



- 
- <sup>13</sup> Pinchevsky GM, Wright EM. The impact of neighborhoods on intimate partner violence and victimization. *Trauma Violence Abuse*. 2012;13(2):112-132.
- <sup>14</sup> Centers for Disease Control and Prevention, Sexual Violence: Risk and Protective Factors. Available at: <http://www.cdc.gov/ViolencePrevention/sexualviolence/riskprotectivefactors.html> Accessed April 4, 2014.
- <sup>15</sup> Wilson WJ. When work disappears: The world of the new urban poor. New York, NY: Random House LLC; 2011.
- <sup>16</sup> Briere, J., Madni, L. A., & Godbout, N. (2015). Recent Suicidality in the General Population Multivariate Association With Childhood Maltreatment and Adult Victimization. *Journal of interpersonal violence*, 0886260515584339.
- <sup>17</sup> Logan JE, Leeb RT, Barker LE. Gender-specific mental and behavioral outcomes among physically abused high-risk seventh-grade youths. *Public Health Reports*. 2009;124(2):234-245.
- <sup>18</sup> Duke NN, Pettingell SL, McMorris BJ, Borowsky IW. Adolescent violence perpetration: associations with multiple types of adverse childhood experiences. *Pediatrics*. 2010;125(4):e778-e786.
- <sup>19</sup> Duke NN, Pettingell SL, McMorris BJ, Borowsky IW. Adolescent violence perpetration: associations with multiple types of adverse childhood experiences. *Pediatrics*. 2010;125(4):e778-e786.
- <sup>20</sup> *Violence and the Family: Report of the American Psychological Association Presidential Task Force on Violence and the Family*. Washington, DC: American Psychological Association; 1996.
- <sup>21</sup> *Violence and the Family: Report of the American Psychological Association Presidential Task Force on Violence and the Family*. Washington, DC: American Psychological Association; 1996.
- <sup>22</sup> *Violence and the Family: Report of the American Psychological Association Presidential Task Force on Violence and the Family*. Washington, DC: American Psychological Association; 1996.
- <sup>23</sup> Jewkes R. Rape perpetration: a review. *Pretoria, Sexual Violence Research Initiative*. 2012.
- <sup>24</sup> Coulton, C. J., Crampton, D. S., Irwin, M., Spilsbury, J. C., & Korbin, J. E. (2007). How neighborhoods influence child maltreatment: A review of the literature and alternative pathways. *Child abuse & neglect*, 31(11), 1117-1142.
- <sup>25</sup> Pinchevsky GM, Wright EM. The impact of neighborhoods on intimate partner violence and victimization. *Trauma Violence Abuse*. 2012;13(2):112-132.
- <sup>26</sup> Basile KC, Hamburger ME, Swahn MH, Choi C. Sexual violence perpetration by adolescents in dating versus same-sex peer relationships: differences in associated risk and protective factors. *The Western Journal of Emergency Medicine*. 2013;14(4):329-340.
- <sup>27</sup> Widome R, Sieving RE, Harpin SA, Hearst MO. Measuring neighborhood connection and the association with violence in young adolescents. *Journal of Adolescent Health*. 2008;43(5):482-489.
- <sup>28</sup> Kleiman, E. M., Riskind, J. H., Schaefer, K. E., & Weingarden, H. (2012). The moderating role of social support on the relationship between impulsivity and suicide risk. *Crisis*. 33(5):273-279
- <sup>29</sup> Centers for Disease Control and Prevention, Elder Maltreatment: Risk and Protective Factors. Available at: <http://www.cdc.gov/ViolencePrevention/eldermaltreatment/riskprotectivefactors.html>. Accessed April 4, 2014.
- <sup>30</sup> Borowsky IW, Hogan M, Ireland M. Adolescent sexual aggression: risk and protective factors. *Pediatrics*. 1997;100(6):e7-e7.
- <sup>31</sup> Capaldi DM, Knoble NB, Shortt JW, Kim HK. A systematic review of risk factors for Intimate partner violence. *Partner Abuse*. 2012;3(2):231-280.
- <sup>32</sup> DeGue S, Massetti GM, Holt MK, et al. Identifying links between sexual violence and youth violence perpetration. *Psychology of Violence*. 2013;3(2):140-156.
- <sup>33</sup> Basile KC, Espelage DL, Rivers I, McMahon PM, Simon TR. The theoretical and empirical links between bullying behavior and male sexual violence perpetration. *Aggression and Violent Behavior*. 2009;14(5):336-347.
- <sup>34</sup> Lösel F, Farrington DP. Direct protective and buffering protective factors in the development of youth violence. *American Journal of Preventive Medicine*. 2012;43(2):S8-S23.
- <sup>35</sup> Hong JS, Espelage DL. A review of research on bullying and peer victimization in school: An ecological system analysis. *Aggression and Violent Behavior*.



2012;17(4):311-322.

<sup>36</sup> Carter, M., McGee, R., Taylor, B., & Williams, S. (2007). Health outcomes in adolescence: Associations with family, friends and school engagement. *Journal of adolescence*, 30(1), 51-62.

<sup>37</sup> Centers for Disease Control and Prevention. Child Maltreatment: Risk and Protective Factors. Available at: <http://www.cdc.gov/violenceprevention/childmaltreatment/riskprotectivefactors.html>. Accessed April 4, 2014.

<sup>38</sup> Capaldi DM, Knoble NB, Shortt JW, Kim HK. A systematic review of risk factors for Intimate partner violence. *Partner Abuse*. 2012;3(2):231-280.

<sup>39</sup> Resnick, M. D., Ireland, M., & Borowsky, I. (2004). Youth violence perpetration: what protects? What predicts? Findings from the National Longitudinal Study of Adolescent Health. *Journal of adolescent health*, 35(5), 424-e1.

<sup>40</sup> Elgar FJ, Craig W, Boyce W, Morgan A, Vella-Zarb R. Income inequality and school bullying: multilevel study of adolescents in 37 countries. *Journal of Adolescent Health*. 2009;45(4):351-359.

<sup>41</sup> Maimon, D., Browning, C. R., & Brooks-Gunn, J. (2010). Collective efficacy, family attachment, and urban adolescent suicide attempts. *Journal of health and social behavior*, 51(3), 307-324.

<sup>42</sup> Capaldi DM, Knoble NB, Shortt JW, Kim HK. A systematic review of risk factors for Intimate partner violence. *Partner Abuse*. 2012;3(2):231-280.

<sup>43</sup> Lösel F, Farrington DP. Direct protective and buffering protective factors in the development of youth violence. *American Journal of Preventive Medicine*. 2012;43(2):S8-S23.

<sup>44</sup> Maimon, D., Browning, C. R., & Brooks-Gunn, J. (2010). Collective efficacy, family attachment, and urban adolescent suicide attempts. *Journal of health and social behavior*, 51(3), 307-324.

<sup>45</sup> Capaldi DM, Knobel NB, Shortt JW, Kim HK. A systematic review of risk factors for intimate partner violence. *Partner Abuse*. 2012;2(2):231-280.

<sup>46</sup> Lösel F, Farrington DP. Direct protective and buffering protective factors in the development of youth violence. *American Journal of Preventive Medicine*. 2012;43(2):S8-S23.

#### References for Shane's section of risk and protective factors:

1. Dahlberg LL, Krug EG. Violence-a global public health problem. In: Krug E, Dahlberg LL, Mercy JA, Zwi AB, Lozano R, eds. *World Report on Violence and Health*. Geneva, Switzerland: World Health Organization; 2002:1-56
2. World Health Organization. *World Health Organization*. Geneva, Switzerland: World Health Organization, 2014.
3. U.S. Department of Health and Human Services (HHS) Office of the Surgeon General and National Action Alliance for Suicide Prevention. *National Strategy for Suicide Prevention: Goals and Objectives for Action*. Washington, DC: HHS, September 2012.

Zalsman G, Hawton K, Wasserman D, et al. Suicide prevention strategies revisited: 10-year systematic review. *Lancet Psychiatry*. 2016;3(7):646-659.

NVDRS Ref:



---

Blair JM, Fowler KA, Jack SPD, Crosby AE. The National Violent Death Reporting System: overview and future directions. *Inj Prev* 2016;22:Suppl 1 i6-i11.

NEISS AIP Ref: CDC, Web-based Injury Statistics Query and Reporting System, Nonfatal Injury Reports, 2001-2014. Available at:

Shane's section:

1. Durkheim E. Suicide: A study in sociology. Glencoe Press: New York; 1951.
2. Centers for Disease Control and Prevention (CDC) (2011). Strategic direction for the prevention of suicidal behavior: Promoting individual, family, and community connectedness to prevent suicidal behavior. Retrieved from [http://www.cdc.gov/ViolencePrevention/pdf/Suicide\\_Strategic\\_Direction\\_Fu...](http://www.cdc.gov/ViolencePrevention/pdf/Suicide_Strategic_Direction_Fu...)
3. Dahlberg LL, Krug EG. Violence-a global public health problem. In: Krug E, Dahlberg LL, Mercy JA, Zwi AB, Lozano R, eds. World Report on Violence and Health. Geneva, Switzerland: World Health Organization; 2002:1-56
4. Wyman, P. A., Brown, C. H., LoMurray, M., Schmeelk-Cone, K., Petrova, M., Yu, Q., . . . Wang, W. (2010). An outcome evaluation of the Sources of Strength suicide prevention program delivered by adolescent peer leaders in high schools. *Am J Public Health, 100*(9), 1653-1661.
5. Branas, C. C., Cheney, R. A., MacDonald, J. M., Tam, V. W., Jackson, T. D., & Ten Have, T. R. (2011). A difference-in-differences analysis of health, safety, and greening vacant urban space. *American Journal of Epidemiology, 174*(11), 1296-1306.
6. World Health Organization. World Health Organization. Geneva, Switzerland: World Health Organization, 2014.
7. Bandura A (1986) Social Foundations of Thought and Action: A Social Cognitive Theory. Englewood Cliffs: New Jersey: Prentice-Hall Publishers.
8. Pollock, L.R. and Williams, M.G. (2004). Problem-solving in suicide attempters. *Psychological Medicine*, pp 163-167. doi:10.1017/S0033291703008092.
9. Goldsmith, S. K., Pellmar, T. C., Kleinman, A. M., & Bunney, W. E. (2002). *Reducing suicide: A national imperative*: National Academies Press.
10. Townsend, E., Hawton, K., Altman, D., Arensman, E., Gunnell, D., Hazell, P., . . . Van Heeringen, K. (2001). The efficacy of problem-solving treatments after deliberate self-harm: meta-analysis of randomized controlled trials with respect to depression, hopelessness and improvement in problems. *Psychological medicine, 31*(6), 979-988.
11. M. Ghahramanlou-Holloway, S. S. Bhar, G. K. Brown, C. Olsen and A. T. Beck (2012). Changes in problem-solving appraisal after cognitive therapy for the prevention of suicide. *Psychological Medicine, 42*, pp 1185-1193. doi:10.1017/S0033291711002169.



- 
12. Schilling, E. A., Aseltine, R. H., Jr., & James, A. (2016). The SOS Suicide Prevention Program: Further Evidence of Efficacy and Effectiveness. *Prev Sci*, 17(2), 157-166.
  13. Kellam, S. G., Brown, C. H., Poduska, J. M., Ialongo, N. S., Wang, W., Toyinbo, P., et al. (2008). Effects of a universal classroom behavior management program in first and second grades on young adult behavioral, psychiatric, and social outcomes. *Drug and Alcohol Dependence*, 95(Suppl. 1), S5-S28.
  14. H.C. Wilcox, S.G. Kellam, C.H. Brown, J. Poduska, N.S. Ialongo, W. Wang, J. Anthony. The impact of two universal randomized first- and second-grade classroom interventions on young adult suicide ideation and attempts. *Drug Alcohol Depend.*, 95 (2008), pp. S60–S73
  15. Wasserman, D., Hoven, C. W., Wasserman, C., Wall, M., Eisenberg, R., Hadlaczky, G., . . . Carli, V. (2015). School-based suicide prevention programmes: The SEYLE cluster-randomised, controlled trial. *The Lancet*, 385(9977), 1536-1544. doi: 10.1016/S0140-6736(14)61213-7
  16. Webster-Stratton, C., Reid, M. J., & Stoolmiller, M. (2008). Preventing conduct problems and improving school readiness: Evaluation of the Incredible Years teacher and child training programs in high-risk schools. *Journal of Child Psychology and Psychiatry*, 49(5), 471-488.
  17. Reid, M. J., Webster-Stratton, C., & Hammond, M. (2003). Follow-up of children who received the Incredible Years intervention for oppositional-defiant disorder: Maintenance and prediction of 2-year outcome. *Behavior Therapy*, 34, 471-491.
  18. Webster-Stratton, C., & Hammond, M. (1997). Treating children with early-onset conduct problems: A comparison of child and parenting training interventions. *Journal of Consulting and Clinical Psychology*, 65(1), 93-109.
  19. Webster-Stratton, C., Reid, M. J., & Hammond, M. (2001). Preventing conduct problems, promoting social competence: A parent and teacher training partnership in Head Start. *Journal of Clinical Child Psychology*, 30(3), 283-302.
  20. Herman, K. C., Borden, L., Reinke, W. M., & Webster-Stratton, C. (2011). The impact of the Incredible Years Parent, Child, and Teacher Training Programs on children's co-occurring internalizing symptoms. *School Psychology Quarterly*, 26, 189-201. doi:10.1037/a0025228.
  21. Spoth, R., Gyll, M., & Day, S. X. (2002). Universal family-focused interventions in alcohol-use disorder prevention: Cost-effectiveness and cost-benefit analyses of two interventions. *Journal of Studies on Alcohol*, 63(2), 219-228.

**Preventing Suicide:  
A Technical Package of Policy, Programs, and Practices**

**Prepared by:**

**Deb Stone, ScD, MSW, MPH  
Kristin Holland, PhD, MPH  
Brad Bartholow, PhD  
Alex Crosby, MD, MPH  
Shane Davis, PhD  
Natalie Wilkins, PhD**

**Division of Violence Prevention  
National Center for Injury Prevention and Control (NCIPC)  
Centers for Disease Control and Prevention**

**2016**



*Policies, Programs, and Practices to Support Individuals, Families, & Communities:*  
*A Technical Package to Prevent Suicide* is a publication of the National Center for Injury Prevention  
and Control of the Centers for Disease Control and Prevention.

Centers for Disease Control and Prevention  
Thomas R. Frieden, MD, MPH, Director

National Center for Injury Prevention and Control  
Debra E. Houry, MD, MPH, Director

Division of Violence Prevention  
James A. Mercy, PhD, Director

*Suggested Citation:* Stone, D.M., Holland, K.M., Bartholow, B., Crosby, A.E., Davis, S., and Wilkins, N.  
Policies, Programs, and Practices to Support Individuals, Families, and Communities: *A Technical  
Package to Prevent Suicide*. Atlanta, GA: National Center for Injury Prevention and Control, Centers for  
Disease Control and Prevention, 2016.

## Contents

Acknowledgements.....	4
External Reviewers.....	5
Overview of Technical Package.....	6
Strengthen Economic Supports.....	13
Strengthen Access to Mental Health Care.....	16
Create Protective Environments.....	18
Promote Connectedness.....	22
Teach Coping and Problem-Solving Skills.....	24
Identify and Support People At-Risk.....	28
Intervene to Lessen Harms and Prevent Future Risk.....	32
Sector Involvement.....	37
Monitoring and Evaluation.....	39
Conclusion.....	40
References.....	42
Appendix A.....	50



## Acknowledgments

[to be inserted later]

## External Reviewers

[to be inserted later]



## Overview

This technical package represents a select group of strategies based on the best available evidence to help communities and states sharpen their focus on prevention activities with the greatest potential to prevent suicide. These strategies include strengthening economic supports; strengthening access to mental health care; creating protective environments; promoting connectedness; teaching coping and problem-solving skills; identifying and supporting people at-risk; and intervening to lessen harms and prevent future risk. The strategies represented in this package include those with a focus on preventing suicide from happening in the first place as well as approaches to lessen the immediate and long-term harms of suicidal behavior for individuals, families, communities, and society. The strategies in the technical package support the goals and objectives of the National Strategy for Suicide Prevention and the National Action Alliance for Suicide Prevention's priority to strengthen community-based prevention. Commitment, cooperation, and leadership from numerous sectors, including public health, education, justice, health care, social services, business, labor, and government can bring about the successful implementation of this package.

### What is a Technical Package?

A technical package is a compilation of a core set of strategies to achieve and sustain substantial reductions in a specific risk factor or outcome (Frieden, 2014). Technical packages help communities and states prioritize prevention activities based on the best available evidence. This technical package has three components. The first component is the **strategy** or the preventive direction or actions to achieve the goal of preventing suicide. The second component is the **approach**. The approach includes the specific ways to advance the strategy. This can be accomplished through *programs, policies, and practices*. The approaches included come primarily from studies based in the United States. The **evidence** for each of the approaches in preventing suicide or its associated risk factors is included as the third component. This package is intended as a resource to guide and inform prevention decision-making in communities and states.

### Preventing Suicide is a Priority

Suicide, as defined by the Centers for Disease Control and Prevention (CDC), is part of a broader class of behavior called *self-directed violence*. Self-directed violence refers to behavior directed at oneself that deliberately results in injury or the *potential* for injury (A.E. Crosby, Ortega, & Melanson, 2011). Self-directed violence may be *suicidal* or *non-suicidal* in nature. For the purposes of this document, we refer only to behavior where suicide is intended:

- **Suicide** is a death caused by self-directed injurious behavior with any intent to die as a result of the behavior.



- **Suicide attempt** is defined as a *non-fatal* self-directed and potentially injurious behavior with any intent to die as a result of the behavior. A suicide attempt may or may not result in injury.

**Suicide is highly prevalent.** Suicide presents a major challenge to public health in the United States and worldwide. It contributes to premature death, morbidity, lost productivity, and health care costs (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014). In 2014 (the most recent year of available death data), suicide was responsible for 42,773 deaths in the U.S., which is approximately one suicide every 12 minutes (Centers for Disease Control and Prevention, 2016d). In 2014, suicide ranked as the 10th leading cause of death and has been among the top 12 leading causes of death since 1975 in the U.S (Centers for Disease Control and Prevention, 2016d). Overall suicide rates have increased 24% from 1999 to 2014 (Curtin, Warner, & Hedegaard, 2016). Suicide is a problem throughout the life span; it is the second leading cause of death among those aged 10–34 years; it is the fourth leading cause among persons in their 40s and seventh among persons in their 50s. Suicide rates vary by race/ethnicity with the highest rates, across the lifespan, occurring among non-Hispanic American Indian/Alaska Native (AI/AN) (rate: 17.8/100,000). Among AI/AN, young people are disproportionately at increased risk of suicide with young males aged 25-29 experiencing the highest rates (rate: 56.9/100,000). Moreover, suicide rates among non-Hispanic AI/AN have increased by 48.7% since 1999 (Centers for Disease Control and Prevention, 2016d).

Suicides reflect only a portion of the problem (A.E. Crosby, Han, Ortega, Parks, & Gfroerer, 2011). Substantially more people are hospitalized as a result of nonfatal suicidal behavior (i.e. suicide attempts) than are fatally injured, and an even greater number are either treated in ambulatory settings (e.g., emergency departments) or not treated at all (A.E. Crosby, Han, et al., 2011). For example, during 2014, among adults aged 18 years and older, for every one suicide there were 9 adults treated in hospital emergency departments for self-harm injuries, 27 who reported making a suicide attempt, and over 227 who reported seriously considering suicide (i.e. ideation) (Ferdon et al., In press).

**Suicide is associated with several risk and protective factors.** Suicide, like other human behaviors, has no single determining cause. Instead, suicide occurs in response to multiple biological, psychological, interpersonal, environmental and societal influences that interact with one another, often over time. The social-ecological model-- encompassing multiple levels of focus from the individual, relationship, community, and societal-- is a useful framework for viewing and understanding suicide risk factors identified in the literature (Dahlberg & Krug, 2002). Risk and protective factors for suicide exist at each level. For example, risk factors include:

- **Individual level:** History of depression and other mental illnesses, hopelessness, substance abuse, certain health conditions, previous suicide attempt, violence victimization and perpetration, and genetic and biological determinants
- **Relationship level:** High conflict or violent relationships, sense of isolation and lack of social support, family/loved one's history of suicide, financial and work stress



- **Community level:** Inadequate community connectedness, barriers to health care (e.g., lack of access to providers and medications)
- **Societal level:** Availability of lethal means of suicide, unsafe media portrayals of suicide, stigma associated with help-seeking and mental illness (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014).

It is important to recognize that the vast majority of individuals who are depressed or who have other risk factors noted, do *not* die by suicide. Furthermore, the relevance of each risk factor can vary by age, race, gender, sexual orientation, residential geography, and socio-cultural and economic status (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014).

Protective factors, or those influences that guard *against* the risk for suicide, can also be found across the different levels of the social-ecological model. Protective factors identified in the literature include: effective coping and problem solving skills, moral objections to suicide, strong and supportive relationships with partners, friends, and family; connectedness to school, community and other social institutions; availability of quality and ongoing physical and mental health care, and reduced access to lethal means (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014). These protective factors can either counter a specific risk factor or guard against a number of risks associated with suicide.

**Suicide is connected to other forms of violence.** Suicide and other forms of violence often share some of the same root causes (Butchart, Phinney, Check, & Villaveces, 2004; Klevens, Simon, & Chen, 2012). For example, in neighborhoods where there is low social cohesion, or where residents don't support and trust each other, people are at higher risk for suicide (Desai, Dausey, & Rosenheck, 2005) as well as perpetration of child maltreatment (Coulton, Crampton, Irwin, Spilsbury, & Korbin, 2007; Freisthler, Merritt, & LaScala, 2006), teen dating violence (Capaldi, Knoble, Shortt, & Kim, 2012), intimate partner violence (Pinchevsky & Wright, 2012), and youth violence (Sampson, Morenoff, & Gannon-Rowley, 2002). Additionally, a lack of economic opportunities and unemployment are associated with suicide (Luo, Florence, Quispe-Agnoli, Ouyang, & Crosby, 2011; Reeves et al., 2012), as well as perpetration of child maltreatment (D. Runyan, Wattam, Ikeda, Hassan, & Ramiro, 2002), intimate partner violence (Heise & Garcia-Moreno, 2002; Pinchevsky & Wright, 2012), sexual violence (Centers for Disease Control and Prevention, 2016c) and youth violence (Wilson, 2011). Other shared risk factors for suicide and violence occur at the individual level and include substance abuse, mental health problems, witnessing violence, and a lack of problem-solving skills (Centers for Disease Control and Prevention, 2016a, 2016c, 2016e; U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012).

Just as risk factors may be shared across suicide and violence, so too may protective factors overlap. For example, ~~connectedness increases individual's and communities' resilience to suicide and other forms~~



~~(of violence, including connectedness to one's community)~~ (Basile, Hamburger, Swahn, & Choi, 2013; Borowsky, Hogan, & Ireland, 1997; Centers for Disease Control and Prevention, 2016b; Coulton et al., 2007; Kleiman, Riskind, Schaefer, & Weingarden, 2012; Pinchevsky & Wright, 2012; Widome, Sieving, Harpin, & Hearst, 2008), school (Basile, Espelage, Rivers, McMahon, & Simon, 2009; Capaldi et al., 2012; Carter, McGee, Taylor, & Williams, 2007; DeGue et al., 2013; Hong, Kral, Espelage, & Allen-Meares, 2012; Losel & Farrington, 2012), family (Capaldi et al., 2012; Centers for Disease Control and Prevention, 2016a; Elgar, Craig, Boyce, Morgan, & Vella-Zarb, 2009; Maimon, Browning, & Brooks-Gunn, 2010; Resnick, Ireland, & Borowsky, 2004), caring adults (Capaldi et al., 2012; Losel & Farrington, 2012; Maimon et al., 2010), and pro-social peers (Capaldi et al., 2012; Losel & Farrington, 2012) enhances resilience to suicide and other forms of violence.

**The health and economic consequences of suicide are substantial.** Suicide and suicide attempts have far-reaching consequences for individuals, families, and communities (Dunne, McIntosh, & Dunne-Maxim, 1987; Mishara, 1995; National Action Alliance for Suicide Prevention: Suicide Attempt Survivors Task Force, 2014; National Action Alliance for Suicide Prevention: Survivors of Suicide Loss Task Force, 2015). ~~By one conservative estimate, for every death by suicide six people are directly impacted (i.e. survivors). Based on this figure it is estimated that there are over 13 million survivors in the U.S. and unfortunately, survivorship itself is a risk factor for suicide (Crosby & Sacks, 2002).~~ Research indicates that the health consequences of suicide, are also much more extensive than injury and death. In an early study, Crosby and Sacks (2002) estimated that 7% of the U.S. adult population, or 13.2 million adults, knew someone in the prior 12 months who had died by suicide. They also estimated that for each suicide, 425 adults were exposed, or knew about the death. In a more recent study, in one state, Cerel et. al (2016) found that 48% of the weighted survey population knew at least one person who died by suicide in their lifetimes. Research indicates that the impact of knowing someone who died by suicide and/or having lived experience (i.e. having attempted suicide oneself) is much more extensive than injury and death. People with lived experience may suffer long-term health and mental health consequences ranging from anger, guilt, and physical impairment, depending on the means and severity of the attempt (Chapman & Dixon-Gordon, 2007). Similarly, survivors of a loved one's suicide may experience ongoing pain and suffering including complicated grief (Mitchell, Kim, Prigerson, & Mortimer-Stephens, 2004), stigma, depression, anxiety, post-traumatic stress disorder, and increased risk of suicidal ideation and suicide (Julie Cerel, McIntosh, Neimeyer, Maple, & Marshall, 2014; Sudak, Maxim, & Carpenter, 2008). Less discussed but no less important, are the financial and occupational effects for those left behind (Florence, Simon, Haegerich, Luo, & Zhou, 2015).

The economic toll of suicide is immense as well. According to conservative estimates, in 2013, suicide cost \$50.8 billion in estimated lifetime medical and work-loss costs (Florence et al., 2015). By another estimate, ~~the total lifetime costs associated with nonfatal injuries and deaths caused by self-directed violence in 2013 were approximately \$93.5 billion after adjusting for under-reporting of suicide (Shepard, Gurewich, Lwin, Reed, & Silverman, 2016).~~ The overwhelming burden of these costs results

**Comment [A]:** From TS: I found this wording somewhat awkward.

**Comment [A]:** From LLD: The Crosby & Sacks reference is missing from the reference list. I looked it up online and noticed that the 13 million estimate is based on knowing a suicide decedent in the past year. Knowing someone who died by suicide seems potentially broader to me than being directly impacted.

**Comment [A]:** From TS: Has anyone updated this? It would be good to check.

**Comment [A]:** From LLD: they may also be impacted in other ways (e.g., loss of family income, etc.)

**Comment [A]:** From TS: It seems like it would be appropriate to acknowledge the CDC estimate too. Consider using that as a minimum and then say that others have estimated that the costs could be considerably higher after adjusting for under-reporting of suicide.



from lost productivity over the life course, with the average cost per suicide being over \$1.3 million (Shepard et al., 2016).

**Suicide can be prevented.** Despite the myths surrounding suicide, like most public health problems, suicide is preventable (U.S. Public Health Service, 1999). And while progress will continue to be made into the future, evidence for numerous programs, practices, and policies currently exists, and many programs are ready to be implemented now. Just as suicide is not caused by a single factor, research suggests that suicide will not be prevented by any single intervention taking place in any single setting (Silverman & Maris, 1995; U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). Rather, suicide prevention is best achieved by a focus across the individual, relationship, family, community, and societal-levels and across all sectors, private and public (e.g., business, public health, physical and behavioral healthcare, justice, education, labor) (National Action Alliance for Suicide Prevention, 2014; World Health Organization, 2014).

### Assessing the Evidence

This technical package includes programs, practices, and policies with evidence of impact on suicide or risk or protective factors for suicide. To be considered for inclusion in the technical package, the program, practice, or policy selected had to meet at least one of these criteria: a) meta-analyses or systematic reviews showing impact on suicide; b) evidence from at least one rigorous (e.g., randomized controlled trial [RCT] or quasi-experimental design) evaluation study that found significant preventive effects on suicide; c) meta-analyses or systematic reviews showing impact on risk or protective factors for suicide, or d) evidence from at least one rigorous (e.g., RCT or quasi-experimental design) evaluation study that found significant impacts on risk or protective factors for suicide. Finally, consideration was also given to the likelihood of achieving beneficial effects on multiple forms of violence; no evidence of harmful effects on specific outcomes or with particular subgroups; and feasibility of implementation in a U.S. context if the program, policy, or practice has been evaluated in another country.

Within this technical package, some approaches do not yet have research evidence demonstrating impact on rates of suicide but instead are supported by evidence indicating impacts on risk or protective factors for suicide (e.g., help-seeking, stigma reduction, depression, connectedness). In terms of the strength of the evidence, programs that have demonstrated effects on suicidal behavior (e.g., reductions in deaths, attempts) provide a higher-level of evidence, but the evidence base is not that strong in all areas. For instance, there has been less evaluation of community engagement and family programs on suicidal behavior. Thus, approaches in this package that have effects on risk or protective factors reflect the (developing mental) nature of the evidence base and the use of the best available evidence at a given time.

It is also important to note that there is often significant heterogeneity among the programs, policies, or practices that fall within one approach or strategy area in terms of the nature and quality of the available

**Comment [A]:** From TS: “developmental nature” doesn’t seem correct. Do you mean the “current status”

evidence. Not all programs, policies, or practices that utilize the same approach (e.g., gatekeeper training) are equally effective, and even those that are effective may not work across all populations. Tailoring programs and more evaluation may be necessary to address different population groups. The examples provided are not intended to be a comprehensive list of evidence-based programs, policies, or practices for each approach, but rather illustrate models that have been shown to impact suicide or have beneficial effects on risk or protective factors for suicide. In practice, the effectiveness of the programs, policies and practices identified in this package will be strongly dependent on the quality of their implementation and the communities in which they are implemented. Implementation guidance to assist practitioners, organizations and communities will be developed separately.

### Context and Cross-Cutting Themes

The strategies and approaches that have been included in this technical package represent different levels of the social ecology, with efforts intended to impact the community and societal levels, as well individual and relationship levels. The strategies and approaches are intended to work in combination and reinforce each other to prevent suicide (see box below). The strategies are arranged in order such that those strategies hypothesized to have the greatest potential for broad public health impact on suicide are included first, followed by those that might impact more select populations (e.g., persons who have already made a suicide attempt).

Preventing Suicide	
Strategy	Approach
Strengthen economic supports	<ul style="list-style-type: none"> <li>Strengthen household financial security</li> <li>Housing stabilization policies</li> </ul>
Strengthen access to mental health care	<ul style="list-style-type: none"> <li>Coverage of mental health conditions in health insurance policies</li> </ul>
Create protective environments	<ul style="list-style-type: none"> <li>Reducing access to lethal means among persons at-risk of suicide</li> <li>Organizational policies and culture</li> <li>Community-based policies to reduce excessive alcohol use</li> </ul>
Promote connectedness	<ul style="list-style-type: none"> <li>Peer norm approaches</li> <li>Community engagement activities</li> </ul>
Teach coping and problem-solving skills	<ul style="list-style-type: none"> <li>Social-emotional learning</li> <li>Parenting skill and family relationship approaches</li> </ul>
Identify and support people at risk	<ul style="list-style-type: none"> <li>Gatekeeper training</li> <li>Screening combined with care management</li> </ul>



	<ul style="list-style-type: none"> <li>• Crisis intervention</li> </ul>
Intervene to lessen harms and prevent future risk	<ul style="list-style-type: none"> <li>• Treatment for people at-risk of suicide</li> <li>• Treatment to prevent re-attempts</li> <li>• Postvention</li> <li>• Safe messaging following a suicide</li> </ul>

The example programs, policies, and practices have been implemented within particular contexts. The social and cultural context of communities is critically important to take into account when selecting strategies and approaches. Practitioners in the field may be in the best position to assess the needs and strengths of their communities and work with community members to make decisions about the combination of approaches included here that are best suited to their context.

Suicide ideation, attempts, morbidity and mortality vary by gender, race/ethnicity, age, occupation, and other important population characteristics. Barriers to disclosure, help seeking, timely access to quality care, and ongoing support may also vary by population and community characteristics. Ideally, the availability of multiple approaches tailored to the economic, cultural, and environmental context of individuals and communities are desirable as they may increase the likelihood of removing barriers to supportive and effective care and provide opportunities to develop individual and community resilience. These culturally appropriate approaches can then be included in comprehensive strategies to maximize the public health impact on reducing suicide-related morbidity and mortality among individuals and within communities.

This package includes strategies where public health agencies are well positioned to bring leadership and resources to implementation efforts. It also includes strategies where public health can serve as an important collaborator (e.g., strategies addressing community and societal level risks), but where leadership and commitment from other sectors such as business, labor or health care is critical to implement a particular policy or program (e.g., workplace policies; screening combined with care management). The role of various sectors in the implementation of a strategy or approach in preventing suicide is described further in the section on *Sector Involvement*.

In the sections that follow, the strategies and approaches with the best available evidence for preventing suicide are described.

## Strengthen Economic Supports

### Rationale

Studies from the U.S. examining historical trends indicate that suicide rates increase during economic recessions marked by high unemployment rates, job losses, and economic instability and decrease during economic expansions and periods marked by low unemployment rates, particularly for working-age individuals 25 to 64 years old (Luo et al., 2011; Fowler et al., 2015). Economic and financial strain, such as job loss, long periods of unemployment, reduced income, difficulty covering medical, food, and housing expenses, and even the anticipation of such financial stress, can directly ~~or indirectly~~ increase an individual's risk for suicide or indirectly increase risk by exacerbating related physical and mental health problems; buffering these risks can therefore, potentially protect against suicide (Stack & Wasserman, 2007). For example, strengthening economic support systems can help people stay in their homes or obtain affordable housing while also paying for necessities such as food and medical care, job training, child care, among other expenses required for daily living. In providing this support, stress and anxiety and the potential for a crisis situation may be reduced, thereby preventing suicide.

### Approaches

Economic supports for individuals and families can be strengthened by targeting household financial security and ensuring stability in housing during periods of economic stress.

- **Strengthening household financial security** can potentially buffer the risk of suicide by providing individuals with the financial means to lessen the stress and hardship associated with a job loss or other unanticipated financial problems. The provision of unemployment benefits and other forms of temporary assistance, livable wages, medical benefits, and retirement and disability insurance to help cover the cost of necessities or to offset costs in the event of disability, are examples of ways to strengthen household financial security.
- **Housing stabilization policies** aim to keep people in their homes and provide housing options for those in need during times of financial insecurity. This may occur through programs that provide affordable housing such as through government subsidies or through other options available to potential homebuyers such as loan modification programs, move-out planning, or financial counseling services that help minimize the risk or impact of foreclosures and eviction.

### Potential Outcomes

- ~~Reduced~~ Reductions in suicide rates
- ~~Lower~~ Reductions in foreclosure rates
- Reductions in ~~Lower~~ eviction rates
- ~~Reduced~~ Reductions in emotional distress

**Comment [A]:** From TS: I was thinking that it might be good to work in a point about how these risks can be directly or indirectly associated with suicide risk because these stressors can exacerbate relationship as well physical and mental health problems.

**KH:** Agreed. Added some language.

**Comment [A]:** From JH: Consistent tense – reduced vs. reduce

**Comment [A]:** From LLD: the other packages use “Reductions in...”; you may want to consider using similar language for your potential outcomes.

**KH:** Made consistent throughout.



## Evidence

There is evidence suggesting that strengthening household financial security and stabilizing housing can reduce suicide risk.

- **Strengthen household financial security.** An examination of variations in U.S. *unemployment benefit programs* across states demonstrated that the impact of unemployment on suicide was offset in those states that provided greater than average unemployment benefits (Cylus, Glymour, & Avendano, 2014). Another U.S. study examining the link between unemployment and suicide risk using monthly suicide data, length of unemployment, and job losses found that the duration of unemployment, as opposed to just the loss of job, predicted suicide risk (Classen & Dunn, 2012). Together, these results suggest that not only should state unemployment benefit programs be generous in their financial allocations, but also in their duration.

Other measures to strengthen household financial security (e.g., transfer payments related to retirement and disability insurance, unemployment insurance compensation, medical benefits, and other forms of family assistance) have also shown an impact on suicide. A study by Flavin and Radcliff (2009) examined the impact of states' per capita spending on transfer payments, medical benefits, and family assistance (Temporary Assistance to Needy Families – TANF) and total state spending on suicide rates between 1990–2000, controlling for a number of suicide risk factors (e.g., residential mobility, divorce rate, unemployment rate) at the state level. As per capita spending on total transfer payments, medical benefits, and family assistance increased there was an associated decrease in state suicide rates. Moreover, it wasn't spending in general that was associated with the reduction but spending on these types of assistance. In terms of lives saved, Flavin & Radcliff calculated the cost of reducing a state's suicide rate by a full point for the years studied. At the national level, they estimated that 3,000 fewer suicides would occur per year nationwide if every state increased their per capita spending on these types of assistance by \$45 per year (Flavin & Radcliff, 2009). Although this was a correlational study, the results demonstrate the potential benefits of policies that reach particularly vulnerable individuals during periods of great need and increased risk for suicide. More evaluation studies are needed to further understand the outcomes impacted by programs such as these.

- **Housing stabilization policies.** The *National Neighborhood Stabilization Program* was designed to help neighborhoods suffering from high rates of foreclosure and abandonment by slowing the deterioration of the neighborhoods and providing affordable housing options for low, moderate, and middle-income homebuyers. This program also offers financial assistance to eligible individuals for the purchase of a new home. Although this program has not been rigorously evaluated for its impact on suicide outcomes, it addresses foreclosure and eviction, which are

**Comment [A]:** From TS: Consider including a point about this being a correlational study and more evaluation work is needed but it suggests the potential benefits of policies that reach those who are particularly vulnerable at the times when they are in greatest need.

KH: Added language to indicate this.

risk factors for suicide. A longitudinal analysis of annual data on suicides and foreclosures demonstrated that as the proportion of foreclosed properties increased in U.S. states, so did the state suicide rate, particularly among working-aged adults (Houle & Light, 2014). Another study of data from 16 U.S. states participating in the National Violent Death Reporting System found that suicides precipitated by home foreclosures and evictions increased more than 100% from 2005 (before the housing crisis began) to 2010 (after it had peaked; Fowler, Gladden, Vagi, Barnes, and Frazier (2015)). Most of these suicides occurred prior to the actual loss of the decedent's home. These findings suggest that integrating suicide prevention resources, messaging, and referrals into financial, foreclosure, and move-out planning and counseling services may help to prevent suicide.



## Strengthen Access to Mental Health Care

### Rationale

While most people with mental health problems do not attempt or die by suicide (Olfson, Gerhard, Huang, Crystal, & Stroup, 2015; Owens, 2002), ~~and the level of risk~~ conferred by ~~different types of mental illnesses differ~~ varies (Arsenault-Lapierre, Kim, & Turecki, 2004; E. C. Harris & Barraclough, 1997; Tyrer, Reed, & Crawford, 2015), previous research indicates that mental illness is an important risk factor for suicide (E. C. Harris & Barraclough, 1998; World Health Organization, 2014). Studies suggest that up to 90% of people who die by suicide may have had a mental ~~illness~~ or substance abuse problems at the time of their deaths (Arsenault-Lapierre et al., 2004; Cavanagh, Carson, Sharpe, & Lawrie, 2003; Isometsa, 2001). State-level suicide rates have also been found to be correlated with general mental health measures such as depression (Lang, 2013; Mark, Shern, Bagalman, & Cao, 2007). Findings from the National Comorbidity Survey indicate that relatively few people in the U.S. with mental health disorders receive treatment for those conditions (Kessler et al., 2005). Lack of access to mental health care is one of the contributing factors related to the underuse of mental health services (Cunningham, 2009). Identifying ways to improve access to timely, affordable, and quality mental health care for people in need is a critical component to suicide prevention (World Health Organization, 2014). Apart from the treatment benefits, it can also serve to normalize help-seeking behavior and increase the use of such services.

### Approaches

One approach to strengthening access to mental health care is through the provision of mental health coverage in health insurance policies.

- **Coverage of mental health conditions in health insurance policies.** Federal and state laws include provisions for equal coverage of mental health services in health insurance plans that is on par with coverage for other health concerns (i.e., mental health parity). Benefits and services covered include such things as the number of visits, co-pays, deductibles, inpatient/outpatient services, prescription drugs, and hospitalizations. If a state has a stronger mental health parity law than the federal parity law, then insurance plans regulated by the state must follow the state parity law. ~~Federal parity replaces the state law only in cases where the state law prevents the application of the federal parity law (e.g., includes coverage for some mental health conditions but not others).~~ If a state has a weaker parity law than the federal parity law (e.g., includes coverage for some mental health conditions but not others), then the federal parity law will replace the state law. Equal coverage does not necessarily imply good coverage as health insurance plans vary in the extent to which benefits and services are offered to address various health conditions. Rather it helps to ensure that mental health services are covered on par with other health concerns.

**Comment [A]:** From JM: I assume this means that different types of mental health problems pose different risks for suicide, but wasn't sure? May want to make the point more explicit

**KH:** Yes – added some language that I think helps to clarify this point.

**Comment [A]:** From TS: Isn't this including substance abuse disorder? It would be good to state this explicitly.

**Yes - Added.**

**Comment [A]:** From TS: I found this sentence confusing. Can you reword to simplify this.

From LLD: could say: "if a state has a weaker parity law than the federal parity law (e.g., includes coverage for some mental health conditions but not others), then the federal parity law will replace the state law."

**Thanks, Linda. Accepted your suggestion.**

### Potential Outcomes

- ~~Increased-Increases in~~ utilization of mental health services
- ~~Decreased-Reductions in~~ symptoms of mental illnesses
- ~~Decreased-Reductions in~~ rates of suicide attempts
- ~~Decreased-Reductions in~~ rates of suicide

### Evidence

There is evidence suggesting that coverage of mental health conditions in health insurance policies can reduce risk factors associated with suicide and may directly impact suicide rates.

- **Coverage of mental health conditions in health insurance policies.** The National Survey of Drug Use and Health is a nationally representative survey of the U.S. population that provides data on substance use, mental health conditions, and services utilization. Using data from this survey, K. M. Harris, Carpenter, and Bao (2006) found that 12 months after states enacted *mental health parity laws*, self-reported use of mental healthcare services significantly increased. Moreover, subsequent research by Lang (2013) examined state mental health laws and suicide rates between 1990 and 2004 and found that mental health parity laws, specifically, were associated with an approximate 5% reduction in suicide rates. This reduction, in the 29 states with parity laws, equated to the prevention of 592 suicides per year. Lang et. al (2013) estimated the cost of saving a life through such mandates as mental health parity by comparing the loss in wages attributable to the policy, via increased premiums, to the number of lives saved. Based on these calculations, the cost of saving one life was between a cost-savings of \$1.3-3.1 million per suicide prevented. However, this calculation did not take into account the saving associated with improved mental health among non-suicidal individuals, increases in productivity, or quality of life associated with increased mental health care. As such, this figure is considered the upper bounds on costs incurred and should be interpreted with caution (Lang, 2013).

**Comment [A]:** From TS: I don't think this is accurate. I was curious about this study and checked out the paper. I think they are saying that this is the cost incurred per suicide prevented. They go on to explain that this is the upper bound and does not reflect the benefits to non-suicidal individuals. Please confirm this. If you are going to include this then it will be important to explain it further.



## Create Protective Environments

### Rationale

Prevention efforts that focus not only on individual behavior change (e.g., help-seeking, treatment interventions) but on changes to the environment can increase the likelihood of positive behavioral and health outcomes (Haddon, 1980). Creating environments that address risk and protective factors where individuals live, work, and play, can help prevent suicide (Dahlberg & Krug, 2002; U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). For example, rates of suicide and suicide attempts are elevated in certain occupational groups (Han et al., 2016; McIntosh et al., 2016), therefore, changes to the organizational culture in these occupations, by way of implementation of supportive policies or even physical modifications to the workplace environment, can change social norms, encourage help-seeking, and demonstrate that good health and mental health are valued and that stigma and other risk factors for suicide are not (K. L. Knox et al., 2010; National Action Alliance for Suicide Prevention Workplace Task Force, 2015). Similarly, modifying the characteristics of the environment to prevent harmful behavior such as access to lethal means can reduce suicide rates, particularly in times of crisis (Beautrais, Gibb, Fergusson, Horwood, & Larkin, 2009; A.E. Crosby, Espitia-Hardeman, Ortega, & Lozano, 2013; Kaplan et al., 2013; Miller, Warren, Hemenway, & Azrael, 2015; C. W. Runyan et al., 2016).

### Approaches

The current evidence suggests three **promising** **potential** approaches for creating environments that protect against suicide.

- **Reducing access to lethal means among persons at-risk of suicide.** Means of suicide such as firearms, hanging/suffocation, or jumping from heights provide little opportunity for rescue and, as such, have high case fatality rates (e.g., about 85% of people who use a firearm in a suicide attempt will die from the injury). Research also indicates that 1) the interval between thinking about and attempting suicide can be as short as 5 or 10 minutes (Deisenhammer et al., 2009; Simon et al., 2001) and 2) that people tend *not* to substitute a different method when a highly lethal method is unavailable or difficult to access (Hawton, 2007; Yip et al., 2012). Therefore, increasing the time interval between the thought and the suicide attempt, for example, by making it more difficult to access lethal means, can be lifesaving. The following are examples of approaches reducing access to lethal means for persons at-risk of suicide:
  - *Intervening at Suicide Hotspots.* Suicide hotspots, or places where suicides may take place relatively easily, include tall structures (e.g., bridges and cliffs), railway tracks, and isolated locations such as parks. Efforts to prevent suicide at these locations include

**Comment [A]:** From JM: The word promising has certain connotations when using it around evidence. You say later that the evidence around this strategy is some of the strongest for suicide. These two statements seem somewhat inconsistent. I would use a different word here then promising if you truly believe there is strong evidence.

From JH: suggest deleting the word "promising"

From LLD: since we don't want to infer that these are the only approaches for creating protective environments, I might be inclined to change the word "promising" to "potential" or "possible" or something along those lines.

KH: Thank you for the suggestions.

erecting barriers to prevent jumping and installing signs and telephones to encourage individuals who are considering suicide, to seek help (Cox et al., 2013).

- *Safe Storage Practices.* Safe storage of medications, firearms, and other household products can reduce the risk for suicide by separating individuals who may be vulnerable and/or impulsive from easy access to lethal means. Such practices may include education and counseling around storing firearms--locked in a secure place (e.g., in a gun safe or lock box), unloaded and separate from the ammunition--and keeping medicines in a locked cabinet or other secure location away from people who may be at risk or who have made prior attempts (Rowhani-Rahbar, Simonetti, & Rivara, 2016; C. W. Runyan et al., 2016).
- **Organizational policies and culture** that promote protective environments may be implemented in places of employment. Such policies and cultural values may promote prosocial behavior (e.g., asking for help), skill building, changing social norms, referral and access to helping services (e.g. mental health, substance abuse treatment, financial counseling), and encourage leadership support from the top down. Such policies and cultural shifts can positively impact organizational climate and morale and help prevent suicide and its related risk factors (e.g. depression, social isolation) (National Action Alliance for Suicide Prevention Workplace Task Force, 2015).
- **Community-based policies to reduce excessive alcohol use.** Research studies in the United States have found that greater alcohol availability is positively associated with alcohol-involved suicides (Escobedo & Ortiz, 2002; Giesbrecht et al., 2015). Policies to reduce excessive alcohol use broadly include zoning to limit alcohol outlet locations and density, taxes on alcohol, and bans on the sale of alcohol for individuals under the legal drinking age. These policies are important because acute alcohol use has been found to be associated with more than one-third of suicides and approximately 40% of suicide attempts (Cherpitel, Borges, & Wilcox, 2004).

### Potential Outcomes

- Increases in safe storage of means
- Reductions in suicide attempts
- Reductions in suicide deaths
- Increases in help-seeking
- Reductions in alcohol-related suicide deaths

### Evidence

The evidence for the effectiveness of preventing suicide by reducing access to lethal means ~~for person at-risk of suicide~~ and ~~other ways to~~ otherwise establishing protective environments for individuals at



risk of suicide is strong, particularly compared to existing evidence for other prevention strategies ~~is some of the strongest~~ in the field (Zalsman et al., 2016).

- **Reducing access to lethal means among persons at-risk of suicide.** A meta-analysis examining the impact of *suicide hotspot interventions* implemented in combination or in isolation, both in the U.S. and abroad, found associated reduced rates of suicide (Cox et al., 2013; Pirkis et al., 2015). For example, after erecting a barrier on the Jacques-Cartier bridge in Canada, the suicide rate from jumping from the bridge decreased from about 10 suicide deaths per year to about 3 deaths per year (Perron, Burrows, Fournier, Perron, & Ouellet, 2013). Moreover, the reduction in suicides by jumping was sustained even when all bridges and nearby jumping sites were considered, suggesting little to no displacement of suicides to other jumping sites (Perron et al., 2013). Further evidence for the effectiveness of bridge barriers was demonstrated by a study examining the impact of the *removal* of safety barriers from the Grafton Bridge in Auckland, New Zealand. After removal of the barrier, both the number and rate of suicide increased fivefold (Beautrais, 2001; Beautrais et al., 2009).

Another form of means reduction involves implementation of *safe storage practices*. In a case-control study of firearm-related events identified from 37 counties in Washington, Oregon, and Missouri, and from 5 trauma centers, Grossman et al. (2005) found that storing firearms unloaded, separate from ammunition, in a locked place or secured with a safety device was protective of suicide attempts among adolescents. Further, a recent systematic review of clinic and community-based education and counseling interventions suggested that the provision of safety devices significantly increased safe firearm storage practices compared to counseling alone or compared to the provision of economic incentives to acquire safety devices on one's own (Rowhani-Rahbar et al., 2016).

Another program, *The Emergency Department Counseling on Access to Lethal Means (ED CALM)*, trained psychiatric emergency clinicians in a large children's hospital to provide lethal means counseling and safe storage boxes to parents of patients under age 18 receiving care for suicidal behavior. In a pre-post quality improvement project, Runyan et al (2016) found that at post-test 76% (of the 55% of parents followed up, n=114) reported that all medications in the home were locked up as compared to fewer than 10% at the time of the initial emergency department visit. Among parents who indicated the presence of guns in the home at pre-test (i.e. 67%), all (100%) reported guns were currently locked up at post-test (C. W. Runyan et al., 2016).

- **Organizational policies and culture.** *Together for Life* is a workplace program of the Montreal Police Force implemented to address suicide among officers. Policy and program components were designed to foster an organizational culture that promoted mutual support and solidarity among all members of the Force. The program included training of supervisors, managers and

**Comment [A]:** From JM: Consistent with promising used earlier? Is it the strongest?

I think it is consistent with promising, but we changed that to potential. The interpretation from the paper states "no single strategy clearly stands above the others", so I would be hesitant to call it out as the strongest evidence, but it definitely may be for certain populations. Modified to simply indicate that it is strong.

all units to improve competencies in identifying suicidal risk and to improve use and awareness of existing resources. The program also included an education campaign to improve awareness and help-seeking (Mishara & Martin, 2012). Police suicides were tracked over 12 years and compared to rates in the control city of Quebec. The suicide rate in the intervention group decreased significantly by 78.9% to a rate of 6.4 suicides per 100,000 population per year compared to an 11% increase in the control city (29.0 per 100,000) (Mishara & Martin, 2012).

Another example of this approach is the *United States Air Force Suicide Prevention Program (AFSPP)*. AFSPP included 11 policy and education initiatives and was designed to change the culture of the Air Force surrounding suicide. The program uses leaders as role models and agents of change, establishes expectations for behavior related to awareness of suicide risk, develops population skills and knowledge (i.e., education and training), and investigates every suicide (i.e., outcomes measurement). The program represents a fundamental shift from viewing suicide and mental illness solely as medical problem and instead sees them as larger service-wide problems impacting the whole community (K. L. Knox, Litts, Talcott, Feig, & Caine, 2003). Using a time-series design to examine the impact of the AFSPP program on various violence-related outcomes, researchers found that the program was associated with a 33% relative risk reduction in suicide (K. L. Knox et al., 2003). The program was also associated with relative risk reductions in related outcomes including moderate and severe family violence (30% and 54%, respectively), homicide (51%), and accidental death (18%) (K. L. Knox et al., 2003). A longitudinal assessment of the program over the period 1981 to 2008 (16 years before the 1997 launch of the program and 11 years post-launch) found significantly lower rates of suicide after the program was launched than before (K. L. Knox et al., 2010). These effects were sustained over time, except in 2004, which the authors found was associated with less rigorous implementation in that year than in the other years (K. L. Knox et al., 2010).

- **Community-based policies to reduce excessive alcohol use.** While multiple policies to limit excessive use of alcohol exist, several studies on alcohol outlet *density*, specifically, suggest that measures to reduce alcohol outlet density can potentially reduce alcohol-involved suicides. Additionally, a longitudinal analysis of alcohol outlet density, suicide mortality, and hospitalizations for suicide attempts over 6 years in 581 California zip codes indicated that the density of bars, specifically, is related to suicide and suicide attempts, particularly in rural areas (Johnson, Gruenewald, & Remer, 2009).



## Rationale

Sociologist, Emile Durkheim theorized in 1897 that weak social bonds, i.e. lack of connectedness, are among the chief causes for suicidality (Durkheim, 1897/1951). *Connectedness* is the degree to which an individual or group of individuals are socially close, interrelated, or share resources with others (Centers for Disease Control and Prevention, 2009). Social connections can be formed within and between multiple levels of the social ecology (Dahlberg & Krug, 2002), for instance between individuals (e.g. peers, neighbors, co-workers), families, schools, neighborhoods, workplace, faith communities, cultural groups, and society as a whole. Related to connectedness, *social capital* refers to a sense of trust in one's community and neighborhood, social integration, and also the availability and participation in social organizations (Beyer, Layde, Hamberger, & Laud, 2015; Muennig, Cohen, Palmer, & Zhu, 2013). Many ecological cross-sectional and longitudinal studies have examined the impact of aspects of social capital on depression symptoms, depressive disorder, mental health more generally, and suicide. While the evidence is still being built, limited, existing studies suggest the pattern is towards a positive n-inverse association between social capital measured by social trust, community/ neighborhood engagement, and improved mental health. Connectedness and social capital together can serve to protect against suicidal behaviors by decreasing isolation, encouraging adaptive coping behaviors, increasing belongingness, personal value and worth all of which helps individuals to build resilience in the face of adversity. Connectedness can also provide individuals with better access to formal supports and resources, mobilize communities to meet the needs of its members and provide collective primary prevention activities to the community as a whole (Centers for Disease Control and Prevention, 2009).

## Approaches

Promoting connectedness among individuals and within communities through modeling peer norms and enhancing community engagement can protect against suicide.

- **Peer norm approaches** seek to normalize prosocial behaviors/protective factors for suicide such as help-seeking, reaching out and talking to trusted adults, and promote peer connectedness. These approaches typically target youth and are delivered in school settings but can also be implemented in community settings.

**Comment [A]:** From JM: Seems like a nuance you can delete from this paragraph. You don't really pick up on this later and it probably requires more explanation

**Comment [A]:** From JH: Awkward wording. Consider, while the evidence is limited, existing studies suggest...

**Comment [A]:** From JM: This implies that prosocial behavior is currently abnormal. Maybe promote is a better word?

From JH: suggest deleting "seek to normalize" and say "Peer norm approaches encourage prosocial behavior..."

**Comment [A]:** I prefer to keep it as normalize and took out prosocial behavior. We want to normalize help-seeking versus making it seem like a personal weakness.



- **Community engagement activities.** Community engagement is an aspect of social capital. Community engagement approaches may involve residents participating in a range of activities, including religious activities, community clean-up and greening activities, and physical exercise. These activities provide opportunities for residents to become more involved in the community and to connect with other community members, organizations, and resources, resulting in enhanced overall physical health, reduced stress, and decreased depressive symptoms, thereby reducing risk of suicide.

### Potential Outcomes

- Reductions in maladaptive coping attitudes and behaviors
- Increases in healthy coping attitudes and behaviors
- Increases in referrals for youth in distressed
- Increases help-seeking behaviors
- Increases in positive perceptions of adult support

### Evidence

Current evidence suggests that peer norm approaches and community engagement can reduce risk factors associated with suicidal behaviors.

- **Peer norm approaches.** Evaluations show that programs such as *Sources of Strength* can improve school norms and beliefs about suicide that are created and disseminated by student peers. In a randomized controlled trial of *Sources of Strength* conducted with 18 high-schools (6 metropolitan, 12 rural), Wyman et al. (2010) found that the program improved peer leaders' adaptive norms regarding suicide among peer leaders, their connectedness to adults, and school engagement. Peer leaders were also more likely than controls to refer a suicidal friend to an adult. ~~Among students, the intervention~~ For students, the program resulted in increased perceptions of adult support for suicidal youths, particularly among those with a history of suicidal ideation, and the acceptability of help-seeking behaviors seeking help. Perception of adult support increased most in students with a history of suicidal ideation. Finally, trained peer leaders also reported a greater decrease in maladaptive coping attitudes compared with untrained leaders (Wyman et al., 2010). More evaluation research is needed to examine whether these improvements in factors that protect against suicidal behavior translate into reduced suicidal behavior and suicide.
- **Community engagement activities.** A vacant lot greening initiative was undertaken in Philadelphia between 1999 and 2008. Local residents and community members worked together to green 4,436 lots (or 7.8 million square feet) in 4 areas of the city. Researchers found significant associated reductions in community residents' self-reported level of stress, which is a risk factor

**Comment [A]:** From JH: Cite findings from Let's Connect intervention program? While the intervention didn't significantly reduce suicidal behavior, there were significant improvements in connectedness (a protective factor for suicide).

KH: This is a great thought. We have quite a few programs that didn't reduce suicidal behavior, but do impact related RFs, so we're trying to stray from them and focus on those that impacted suicide and attempts or have a greater amount of evidence/more evaluations behind them.

**Comment [A]:** From TS: Is there any evidence on outcomes more proximal to suicide? Did they look for any and not find them? It is important to describe relevant null effects when they were found.

KH: They did not look at more proximal outcomes, but SOS is currently undergoing a 6-year evaluation funded by NIMH to examine impact, hopefully with suicidal behaviors being one of the outcomes they're measuring.



for suicide, stress levels and engagement in more physical exercise, a protective factor for suicide, than residents in control vacant lot areas. Other benefits included reductions in firearm assaults and vandalism (Branas et al., 2011).

**Comment [A]:** From JM: Not seeing strong evidence here. Are you suggesting that this affects documented risk factors for suicide by reducing stress and increasing physical exercise? I would like to see a stronger evidence statement here.

From LLD: you might want to incorporate a phrase in the statement along the lines of "which are risk factors for suicide"

KH: Added the qualifier you suggested, Linda.

**Comment [A]:** From TS: They had a follow up paper in 2013 that showed intervention sites felt significantly safer. The effects on crimes was encouraging but not significant. It seems important to mention this too.

From LLD: not sure I agree with Tom's last point about mentioning the nonsignificant effect on crime.

**Comment [A]:** From LLD: the word "either" here implies another comparative clause; should the word "or" be inserted before the word "modeling"? May want to just delete the word "either"

KH: Added.

## Teach Coping and Problem-Solving Skills

### Rationale

Building life skills prepares individuals to successfully tackle every day challenges and adapt to stress and adversity. Life skills encompasses many concepts, but most often include coping and problem-solving skills, conflict resolution, and critical thinking. Life skills are important in shielding individuals from suicidal behaviors (World Health Organization, 2014). Suicide prevention programs that focus on life and social skills training are drawn from social cognitive theories (Bandura, 1986), surmising that suicidal behavior is attributed to ~~either~~ direct learning, modeling, ~~and or~~ environmental and individual (e.g. hopelessness) characteristics. The literature linking life skills and suicide is robust. The inability to employ adequate strategies to cope with immediate stressors or identify and find solutions for problems has been characterized among suicide attempters (Pollock & Williams, 2004). Treatments that include bolstering skills (Goldsmith, Pellmar, Kleinman, & Bunney, 2002) and include problem-solving techniques (Ghahramanlou-Holloway, Bhar, Brown, Olsen, & Beck, 2012; Townsend et al., 2001) appear to reduce suicidal ideation and attempts more effectively. Prevention programs focused on teaching these skills target youth, parents and families and have been used with both universal and at-risk populations. While many do not target suicidal behaviors directly, these programs strive to train youth and parents in important life skills to offset the underlying vulnerabilities that contribute to engaging in high-risk behaviors early in life.

### Approaches

Current evidence provides support for the following two approaches:

- **Social emotional learning programs** focus on developing and strengthening communication and problem-solving skills, emotion regulation, conflict resolution, help seeking and coping skills. These approaches address a range of risk and protective factors for suicidal behavior. They provide children and youth with skills to resolve problems in relationships, school, and with peers, and help youth to address other negative influences (e.g., substance use) associated with suicide. These approaches are typically delivered to all students in a particular grade or school, although some programs also focus on groups of students considered to be at high risk for suicide. Opportunities to practice and reinforce skills are an important part of programs that work (Herman, Borden, Reinke, & Webster-Stratton, 2011).



- **Parenting skill and family relationship programs** are designed to strengthen parenting skills, enhance positive parent-child interactions, and improve children's behavioral and emotional skills and abilities. Several parenting and family relationship programs have been shown in rigorous evaluations to improve resilience and reduce risk factors for various behaviors, including ones closely related to suicide, such as depression, internalizing behaviors, and substance abuse (M. S. Knox, Burkhart, & Hunter, 2010).

### Potential Outcomes

- Reductions in suicide attempts and suicide ideation
- Improvements in Enhanced knowledge of risk and protective factors associated with suicide
- Reductions in suicide risk behaviors (i.e., depression, anxiety, conduct problems, substance abuse)
- Improvements in and normalize help-seeking behavior
- Improvements Enhance in social competence and emotional regulation skills
- Improvements Enhance in problem-solving and conflict management skills

### Evidence

There are several programs with evidence that support teaching social, emotional and parenting skills to reduce suicidal behaviors and associated risk factors.

- **Social emotional learning programs.** The *Youth Aware of Mental Health Program (YAM)* is a program developed for teenagers that uses interactive dialogue and role-playing to teach adolescents about the risk and protective factors associated with suicide (including knowledge about depression and anxiety) and enhances their problem-solving skills for dealing with adverse life events, stress, school and other problems. The program includes 3 hours of role-play sessions and interactive workshops combined with a booklet that students can keep, educational posters displayed in classroom, and interactive lectures about mental health at the beginning and end of the program (Wasserman et al., 2014). In a cluster-randomized controlled trial of YAM conducted across 10 European Union countries and 168 schools, students aged 14-16 participating in the YAM program were significantly less likely to have an incident suicide attempt (OR 0.45, 95% CI 0.24–0.85;  $p=0.014$ ) attempt suicide and have severe suicidal ideation (0.50, 0.27–0.92;  $p=0.025$ ) at the 12-month follow-up compared to the control group which did not participate in an intervention. Overall, the relative risk of youth suicide attempts among the YAM group was reduced by over 50%, indicating demonstrating that out of 1000 students, five attempted suicide in the YAM group compared to 11 in the control group. Additionally, related to severe suicide ideation, in the

**Comment [A]:** I think this should be this reference – 2015:

Wasserman, D., Hoven, C. W., Wasserman, C., Wall, M., Eisenberg, B., Hadlaczky, G., ... & Bobes, J. (2015). School-based suicide prevention programmes: the SEYLE cluster-randomised, controlled trial *The Lancet*, 385(9977), 1536-1544

**Comment [A]:** From JH: Report ages (compare to SOS below)

**Comment [A]:** From JH: Suggest translating OR and 95% CI for wider audience.

From LLD: agree; this is too technical for a wider audience. See Tom's suggestion below.

Revised accordingly

**Comment [A]:** From JH: state if the control group received any kind of intervention

Added



YAM group absolute risk fell by 0.50% and relative risk fell by 49.6% (Wasserman et al., 2014).

Comment [A]: From JH: significant?

Comment [A]: From TS: The Lancet paper has a 2015 publication date.

The authors provide the absolute and RR for suicide attempts too and they give a clear way of thinking about this – i.e., for RR “Of 1000 pupils, 11 attempted suicide in the control group vs five attempts in YAM”

It might be worth using the attempt example so you can provide this explanation.

Revised.

Comment [A]: From JH: significant? Effect size/magnitude of reduction?

Comment [A]: From JH: define control condition

Comment [A]: From JH: significant?

Comment [A]: From JH: Lower-risk? Do you mean students with no prior reported history of suicide attempts?

Comment [A]: From LLD: Jeff had questions about what is meant by upstream. You are referring to primary prevention but some of the other

Comment [A]: From JH: compared to?

Added.

Comment [A]: From JH: Suggest stating clearly there are two separate cohorts of students receiving the intervention. How do these cohorts differ (time, location)?

Comment [A]: From TS: It is important to help the reader to understand that this study looked at the suicidal ideation when the first graders were age 19-21. This is

Comment [A]: From JH: Is this the authors' comment or your interpretation of the data? Please clarify.

*Signs of Suicide (SOS)* is another school-based prevention program for students aged 13-17. The program includes guided classroom discussions about suicide and depression. As part of the program, students are screened for depression and suicide risk and referred for professional help as indicated. The program is designed to increase knowledge about suicide and risk factors associated with suicidal behavior as well as improve and normalize help-seeking behavior (Schilling, Aseltine, & James, 2016). In a randomized controlled trial, *SOS* was shown to reduce self-reported suicide attempts at 3-months post intervention among participating students compared to control students. The *SOS* program also increased students' knowledge of how to get help for themselves or friends for depression and/or suicidal thoughts, and favorable attitudes toward help-seeking. *SOS* participants with a lifetime history of suicide attempt were also less likely to report planning a suicide in the 3 months following the program compared to lower-risk participants (Schilling et al., 2016).

Finally, the *Good Behavior Game (GBG)* is a classroom-based program for elementary school children aged 6-10; ~~it represents an example of upstream suicide prevention programming~~. The program uses a team-based behavior management strategy that promotes good behavior by setting clear expectations for good behavior and consequences for maladaptive behavior. The goal of the *GBG* is to create an integrated classroom social system that is supportive of all children being able to learn with little aggressive or disruptive behavior (Wilcox et al., 2008). Two cohorts of youths participated in the program in 1985-85 and 1986-86 school years when they were in the first and second grades. A number of proximal and distal outcomes were assessed among the two cohorts over time. With respect to distal suicide-related outcomes, an outcome evaluation of the GBG indicated that first-graders assigned individuals in the first cohort who were assigned to participate in the GBG when they were in the first grade reported half the adjusted odds of suicidal ideation and suicide attempts when assessed approximately 15 years later, between the ages of 19 to 21, compared to peers who had been in a standard classroom setting. The beneficial effect of the program was consistent for suicidal ideation regardless of whether baseline covariates were included. The *GBG* effect on attempts was less robust in some adjusted models including caregiver mental health. In the second cohort of *GBG* students, neither suicidal ideation nor suicide attempts were significantly different between *GBG* and the control interventions (Wilcox et al., 2008). ~~this~~ The authors surmise this finding likely arose due to the lack of implementation fidelity and pointed to the need for *GBG* to be delivered with precision, consistency, and teacher support. *GBG* was also found to be associated with reduced risk of later substance abuse, a risk factor for suicide (Kellam et al., 2008).



- **Parenting skill and family relationship programs.** Parenting and family skills training approaches have shown promising impacts in preventing key risk factors associated with suicide. For example, the *Incredible Years (IY)* is a comprehensive group training program for parents, teachers and children designed to reduce conduct and substance abuse problems, two important suicide risk factors, in youth by improving protective factors such as responsive and positive parent-teacher-child interactions and relationships, emotion self-regulation and social competence (all protective factors for suicide) (Herman et al., 2011). The program includes 9- 20 sessions offered in community-based settings (e.g., religious, recreation centers, mental health treatment centers, and hospitals). Several studies have demonstrated the effect of the *IY* program on reducing internalizing symptoms, such as anxiety and depression, and child conduct problems (C. H. Webster-Stratton, Reid, & Beauchaine, 2011; Webster-Stratton, Jamila Reid, & Stoolmiller, 2008). The program is also associated with improved problem-solving and conflict management; these skills were maintained at 1-year follow-up (Reid, Webster-Stratton, & Hammond, 2003; C. Webster-Stratton & Hammond, 1997; C. Webster-Stratton, Reid, & Hammond, 2001). The program demonstrated greater benefits as the dosage of the intervention increased (Herman et al., 2011).

Additionally, *Strengthening Families 10-14* is a program that involves sessions between parents, youth, and family with the goal of improving parents' skills for disciplining, managing emotions and conflict, and communicating with their children; promoting youths' interpersonal and problem-solving skills; and creating family activities to build cohesion and positive parent-child interactions. The premise of the program is that developing these skills for both parents and children will reduce internalizing behavior and adolescent substance abuse, two important risk factors for suicide (Spoth, Gyll, & Day, 2002). *Strengthening Families* has been shown to significantly decrease externalizing behaviors, such as aggression, alcohol use, and drug use among youth participants (and, as well as reductions in depression, alcohol use, and drug use among participating families (Spoth et al., 2002).

**Comment [A]:** From JH: significant? Also please define externalizing behaviors.

KH Added

**Comment [A]:** From TS: This transition seems off.

KH: edited.



## Identify and Support People At-Risk

### Rationale

In order to decrease suicide, attention to people at increased ~~or high-risk~~, for example people with prior suicide attempts, is necessary, as these individuals tend to experience suicidal behavior at higher than average rates. These vulnerable or disadvantaged populations include, but are not limited to, individuals with lower socio-economic status or who are living with a mental health problem; people who have attempted suicide previously; individuals who are institutionalized, have been victims of violence, or are homeless; and members of certain racial and ethnic minority groups. Supporting these vulnerable groups requires proactive case finding along with access to, and retention in, mental health services. Finding effective ways of identifying at-risk or vulnerable groups, customizing services to make them accessible and engaged in care remain key challenges. For example, simply improving services does not guarantee that those services will be used by those most in need of them, nor will it necessarily increase the number of people who follow treatments that are recommended. People who are disadvantaged face social and economic issues that may adversely affect their ability to respond to the treatments or advice that are offered.

**Comment [A]:** From TS: This seems awkward as written. It might be better to say "...attention to people with specific vulnerabilities..."

**Comment [A]:** I'm not sure about 'specific vulnerabilities' terminology. I think people are much more familiar with something like this.

### Approaches

The following three approaches focus on identifying and supporting people at increased risk.

- **Gatekeeper training** is designed to train teachers, coaches, providers and others in the community to identify people who may be at risk of suicide and to respond effectively, including facilitating treatment seeking and support services. Gatekeeper training is typically implemented in schools to identify at-risk youth and within health care settings to identify adults (and youth).
- **Screening combined with care management and overall continuity of care** has been used in primary care and behavioral health care settings to assure that people who may be at high-risk of suicide are identified and receive ongoing treatment as needed, particularly after inpatient discharge and other transitions within the healthcare system so they don't 'slip through the cracks'. These approaches typically employ screening for depression and/or suicide combined with collaborative treatment planning between patients and their providers and patient follow-up.
- **Crisis intervention.** These approaches provide support and referral services, typically by connecting a person in crisis (or a friend or family member of someone at-risk) to trained volunteers or professional staff via telephone hotline, online chat, or text messaging. Crisis intervention approaches are intended to impact key risk factors for suicide, including feelings of

depression, hopelessness, and subsequent mental health care utilization. Like means reduction, crisis interventions can put space or time between an individual who may be considering suicide and harmful behavior.

### Potential Outcomes

- Reductions in suicide attempts
- Reductions in suicide deaths
- ~~Increased-Increases in~~ identification of individuals at-risk for suicidal behavior
- ~~Increased-Increases in~~ at-risk individuals in treatment
- ~~Increased-Increases in~~ community members trained to identify at-risk individuals
- ~~Increased-Increases in~~ referrals for health care

### Evidence

~~Identifying people at risk of suicide can positively impact both suicide risk factors as well as suicide mortality, however sustained implementation of programs and practices appears critical. Among people who identify themselves through calls to suicide hotlines, preliminary evidence finds reductions in suicide risk factors. There is evidence that gatekeeper–successful in reducing suicides–but the efforts must be The number of studies evaluating crisis intervention services is limited, but–decreased suicidal thoughts and behavior.~~

- **Gatekeeper training.** One example of gatekeeper training is the *Mental Health First Aid (MHFA)* program. This program is designed for the lay public and consists of three weekly sessions of three hours each. Participants learn the symptoms of people in mental health crises and/or in the early stages of mental health problems (i.e., those experiencing suicidal thoughts and behavior, acute stress reaction, panic attacks and acute psychotic behavior, and depression, anxiety, and psychotic disorders), possible risk factors, and where and how to get ~~evidence-based effective~~ help (Kitchener & Jorm, 2004). In a randomized controlled trial of 301 participants of MHFA, the ~~intervention group, compared to the wait-listed control group,~~ reported at 5 months follow-up, significantly ~~greater feelings of confidence~~ in helping someone (74.5% vs. 57.4%,  $p<.001$ ), greater likelihood of encouraging people to seek professional help (29.4% vs. 16.8%,  $p<.007$ ), improved agreement with health professionals about treatments ( $p<.036$ ), and decreased stigmatizing attitudes towards mental illness ( $p<.02$ ). Additionally, the intervention resulted in improved ~~overall~~ mental health of the participants themselves ( $p<.035$ ). ~~However, the percent who provided some or a lot of help did not differ between groups (~~ (Kitchener & Jorm, 2004). Additional research rigorously evaluating MHFA for its impact on intervention recipients' suicidal behavior is needed (Kitchener & Jorm, 2006).

**Comment [A]:** From LLD: suggest shortening this introductory statement about the evidence and making it consistent with the other sections. If you need to provide caveats, then you might want to take a look at the YV TP for example wording.

**Comment [A]:** From TS: Add cites here. Also this wording is awkward because it could be read as suggesting that those who chose to use the hotline are different from others at risk who did not. Maybe you could add the follow up period to the end – they have decrease suicidal thoughts and behavior at xx

**Comment [A]:** From LLD: wording is a bit awkward here

**Comment [A]:** From JH: compared to?

**Comment [A]:** From JH: significant? Is it possible to report magnitude of intervention effects?

**Comment [A]:** From JH: Overall mental health or specific facets (e.g., depression, etc.)? Please clarify



Gatekeeper training has also been a primary part of all *Garret Lee Smith (GLS) Suicide Prevention Program* which is in place in 49 states and 48 tribes. A multi-site evaluation assessed the impact of community gatekeeper training on suicide attempts and deaths by comparing the change in suicide rates and nonfatal suicidal behavior among young people aged 10-24 in counties implementing GLS trainings, with the trajectory observed in similar counties that did not implement these trainings. Counties that implemented GLS trainings had significantly lower youth suicide rates one year following the training implementation (Walrath, Garraza, Reid, Goldston, & McKeon, 2015). This finding equates to a decrease of 1 suicide death per 100,000 among youth ages 10 to 24, or the prevention of approximately 237 deaths in the age group, between 2007 and 2010. Counties implementing GLS program activities, including gatekeeper training, also had significantly lower suicide attempt rates among youth ages 16 to 23 in the year following implementation of the GLS program than did similar counties that did not implement GLS activities (4.9 fewer attempts per 1000 youths; (Godoy Garraza, Walrath, Goldston, Reid, & McKeon, 2015)). More than 79,000 suicide attempts may have been prevented during the period examined, following implementation of the GLS program.

- **Screening combined with care management and overall continuity of care.** The Henry Ford healthcare system is a large health maintenance organization (HMO) in the state of Michigan. Henry Ford's Perfect Depression Care program was the pre-cursor to what is now called Zero Suicide, and its overall goal was to eliminate suicide among its members. More broadly, the aim was to redesign delivery of depression care to achieve "breakthrough improvement" in quality and safety by focusing on six aims: effectiveness, safety, patient centeredness, timeliness, efficiency, and equity among patients. The program screened and assessed each patient for suicide risk and implemented coordinated continuous follow-up care system wide (C. E. Coffey, 2006). An examination of the impact of the program found that there was a dramatic and statistically significant decrease in the rate of suicide between the baseline years, 1999 and 2000, prior to the intervention to the intervention years, 2002-2009. During this time period, the suicide rate fell by 82% (C. E. Coffey, 2006; C. E. Coffey, Coffey, & Ahmedani, 2013). Further, among HMO members who received mental health specialty services, the suicide rate decreased from 110.3/100,000 in 1999 to 47.6/100,000 in 2010 (p<.04) with a mean of 36.2/100,000 over the time period. Additionally, for those HMO members who accessed only general medical services as opposed to specialty mental health services, the suicide rate increased from 2.7/100,000 to 5.6/100,000 (p<.01). Similarly, in the state of Michigan, rates of suicide in the general population increased over the period from 9.8/100,000 to 12.5/100,000 (p<.001) (M. Coffey, Coffey, & Ahmedani, 2015).

**Comment [A]:** From JM: I think you need to provide a little more context on Henry Ford so the readers understands in what kind of population the reductions were experienced. I assume from the end that Henry Ford is some sort of HMO, but just a little more information would help clarify this description to readers.

**Comment [A]:** From JH: how much?

- Crisis intervention.** Suicide prevention hotlines are one way to provide crisis intervention. In an evaluation of the effectiveness of the *National Suicide Prevention Lifeline (NSPL)* to prevent suicide, 1,085 suicidal individuals who called the hotline completed a standard risk assessment for suicide, and 380 of those completed a follow-up assessment between 1 and 52 days (mean=13.5 days) after the initial assessment. Researchers found that over half of the initial sample were seriously considering suicide when they called, and they had a plan for their suicide. Researchers also found that among follow-up participants, there was a significant decrease in psychological pain ( $F=52.8, p<.001$ ), hopelessness ( $F=47.8, p<.001$ ) and intent to die ( $F=7.57, p<.01$ ) between initiation of the call (time 1) to follow-up (time 3). Between time 2 (end of the call) to time 3, the effect remained for psychological pain ( $F=14.1, p<.001$ ) and hopelessness ( $F=17.03, p<.001$ ) but was not significant for intent to die. (Gould, Kalafat, Harrismunfakh, & Kleinman, 2007).

In another study, this time employing a randomized controlled trial, Gould, Cross, Pisani, Munfakh, and Kleinman (2013) assessed the impact of the *Applied Suicide Intervention Skills Training (ASIST)*, a widely implemented training program that helps hotline counselors, emergency workers, and other gatekeepers to identify and connect with suicidal individuals, understand their reasoning for living and dying, and assist with safely connecting those in need to available resources. The training was evaluated across the NSPL network of hotlines over the period 2008-2009. Using data from 1,410 suicidal individuals who called 17 Lifeline centers, researchers found that compared to callers who spoke to counselors that received the usual care training, individuals who spoke with counselors without training in ASIST were significantly more likely to feel depressed ( $OR=1.31 (1.01, 1.71)$ ), suicidal ( $OR=1.74 (1.39, 2.18)$ ), more overwhelmed ( $OR=1.46 (1.18, 1.82)$ , and less hopeful ( $1.35 (1.04, 1.77)$ ) by the end of their call to the hotline compared to those with training in ASIST. Counselors trained in ASIST were also more skilled at keeping callers on the phone longer and establishing a connection with them. However, training in ASIST did not result in more comprehensive suicide risk assessments than usual care training (Gould et al., 2013).

**Comment [A]:** From JH: Report magnitude of decrease?

**Comment [A]:** This is really the best I can do. Not sure if you want this level of detail however.

**Comment [A]:** To be consistent with above I added some measures of association.



## Intervene to Lessen Harms and Prevent Future Risk

### Rationale

Individuals who have experienced mental health challenges, suicidal ideation, who have made suicide attempts or engaged in non-suicidal self-injury are at increased risk of suicide (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). Risk of suicide can also increase among those who have lost a friend, family member, co-worker, or other acquaintance to suicide (Pitman, Osborn, King, & Erlangsen, 2014). Exposure to sensationalized or uninformed reporting regarding on suicide may heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to suicide contagion (Etzersdorfer & Sonneck, 1998; Niederkrotenthaler & Sonneck, 2007).

### Approaches

~~A broad array of a~~The four approaches included here to lesson harms and reduce future risk of suicide among those at increased risk focus on providing appropriate mental healthcare, continuity of care, caring for the bereaved, and providing safe messaging around suicide. include the provision of mental health care and improved continuity of care, improving linkage to care through active post-discharge planning and follow-up that decreases barriers to ongoing therapeutic support, increasing connectedness to supportive others, addressing bereavement, and framing communications to emphasize resilience, decrease negative affect, and to prevent contagion.

- **Treatment for people at-risk of suicide** typically includes various forms of psychotherapy delivered by licensed providers to help individuals with mental health problems and other risk factors for suicide with problem-solving, impulsivity and emotion regulation. Treatment usually takes place in a one on one or group format between patients and clinicians in mental healthcare settings and can vary in duration from several weeks to ongoing therapy for years in some cases.
- **Treatment to prevent re-attempts.** These approaches typically include follow-up contact and use diverse modalities (e.g., home visits, mail, telephone, e-mail) to engage recent suicide attempt survivors in continued treatment to prevent re-attempts. Treatment may focus on improved coping skills, mindfulness, and other emotional regulation skills, and may include case management home visits to increase adherence to treatment and continuity of care; and one-on-one interpersonal therapy and/or group therapy. Approaches that engage and connect attempters to peers and providers are especially important because many attempters do not present to aftercare; 12%-25% reattempt within a year, and 3%-9% of attempt survivors die by suicide within 1 to 5 years of their initial attempt (Inagaki et al., 2015)
- **Postvention** approaches are implemented *after* a suicide has taken place and may include debriefing sessions, counseling, and/or bereavement support groups for surviving friends and

**Comment [A]:** From LLD: simplify statement and make it consistent with the other introductory statements about approaches. You may also want to take a look at the introductory statements to this section in the other TPs.

**KH: edited.**

**Comment [A]:** From LLD: Suggest fleshing this description out a bit. You may want to mention how these are typically delivered (e.g., one on one or group formats; typical number of sessions, location, etc.).

Included some of this info. I don't think there's a "typical" number of sessions, as it seems to vary across treatment settings.

family members/loved ones. These programs have not typically been evaluated for their impact on suicide or suicidal behavior but may reduce survivors' guilt, feelings of depression, and complicated grief (Szumilas & Kutcher, 2011).

- **Safe messaging following a suicide.** The manner in which information on a recent suicide is communicated to the public (e.g. school assemblies, mass media, social media) can heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to suicide contagion. Therefore, responsible and safe reporting may help prevent suicide and suicide contagion.

**Comment [A]:** From JH: add something about contagion?

KH: added

### Potential Outcomes

- Reductions in mental health-related sequelae
- Increases in connectedness
- Improvements in coping skills
- Improvements in messaging following suicide
- Reductions in re-attempts
- Reductions in contagion effects related to suicide

### Evidence

The evidence addressing strategies to lesson harm and prevent future risk of suicide includes the evaluation of effects of specific approaches on risk and protective factors as well as suicide-related mortality. However, because the evaluation of suicide-related mortality requires large sample sizes and extended follow-up, much of the evidence in this area primarily focuses on risk and protective factors.

- **Treatment for people at-risk of suicide.** There are a number of treatments with evidence of impact on risk and protective factors for suicide. One example is the *Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)* program. *IMPACT* aims to prevent suicide among older primary care patients by reducing suicide ideation and depression in primary care settings. It facilitates the development of a therapeutic alliance, a personalized treatment plan that includes patient preferences, as well as proactive follow-up (biweekly during an acute phase and monthly during continuation phase) by a depression care manager (Hunkeler et al., 2006). The program has been shown to significantly improve quality of life, and to reduce functional impairment, depression and suicidal ideation over 24-months of follow-up (Hunkeler et al., 2006; Unutzer et al., 2006) relative to patients who received care as usual.



Another example is *Collaborative Assessment and Management of Suicidality (CAMS)*, which is a therapeutic approach for suicide-specific assessment and treatment of patient's suicide risk. This flexible approach can be used across treatment settings and clinician theoretical orientations and involves the clinician and patient working together in an interactive assessment process to develop patient-specific treatment plans. CAMS sessions are collaborative and involve constant patient input about what is and is not working with the ultimate goal of enhancing the therapeutic alliance and increasing treatment motivation in the suicidal patient. CAMS been tested and supported in 6 correlational studies (Jobes, 2012), in a variety of inpatient and outpatient settings and in one RCT with several additional RCTs under way. CAMS has been associated with significant improvements in suicidal ideation, overall symptom distress, and feelings of hopelessness at 12 month follow-up among a community-based sample of suicidal outpatients. (Comtois et al., 2011).

Other examples include *Dialectical Behavioral Therapy (DBT)* and *Attachment-Based Family Therapy (ABFT)*. DBT is a multicomponent therapy for individuals at high risk for suicide and who may struggle with impulsivity and emotional regulation. The components of DBT include individual therapy, group skills training, between-session telephone coaching and a therapist consultation team. In a randomized controlled trial of women with recent suicidal or self-injurious behavior, those receiving DBT were half as likely to make a suicide attempt at two-year follow-up than women receiving community treatment (23% vs 46%), required less hospitalization for suicide ideation, and had lower medical risk across all suicide attempts and self-injurious acts combined (Linehan et al., 2006).

ABFT is a program for adolescents aged 12-18 and is designed to treat clinically diagnosed major depressive disorder, eliminate suicidal ideation, and reduce dispositional anxiety (Diamond et al., 2010). A randomized controlled trial of ABFT found that suicidal adolescents assigned to ABFT experienced significantly greater improvement in suicidal ideation over 24 weeks of follow-up than did adolescents assigned to enhanced usual care. Additionally, a significantly higher percentage of ABFT participants reported no suicidal ideation in the week prior to assessment at 12 weeks than did adolescents receiving enhanced usual care (69.2% vs. 34.6%) and at 24 weeks (82.1% vs. 46.2%) (Diamond et al., 2010).

- **Treatment to prevent re-attempts.** Several strategies that aim to prevent re-attempts have demonstrated impact on reducing suicidal behavior. For example, *Emergency Department Brief Intervention with Follow-up Visits* is a program that involves a one-hour discharge information session that addresses suicidal behavior, distress, risk and protective factors, alternatives to suicidal behavior, and referral options, combined with nine follow-up contacts over 18 months (at 1, 2, 4, 7, 11 weeks and 4, 6, 12, 18 months). Follow-up contacts are either conducted by phone or through home visits according to a specific time line for up to 18-months. A randomized

Comment [A]: From TS: I think a word is missing – "patient input"?

Added.

controlled trial that enrolled suicide attempters from eight hospital emergency departments in five culturally different countries (Brazil, India, Sri Lanka, Iran, and China) sites found that a brief intervention combined with 9 follow-up visits over 18-months was associated with significantly fewer deaths from suicide relative to a treatment-as-usual group (0.2% versus 2.2%, respectively) (Fleischmann et al., 2008).

Another example of treatment to prevent re-attempts involves *active follow-up contact approaches* such as postcards, letters, and telephone calls intended to increase a patient's sense of connectedness with health care providers and decrease isolation. These approaches include expression of care and support and typically invite patients to reconnect with their provider. Contacts are made periodically (e.g., monthly or every few months in the first 12 months post-discharge with some programs continuing contact for two or more years). In a meta-analysis conducted by Inagaki et al. (2015), interventions to prevent repeat suicidal behavior in patients admitted to an emergency department for suicide attempt were found to reduce reattempts by approximately 17% for up to 12 months post-discharge; however, the long-term effects of these approaches over periods of time longer than one year on reattempts has not yet been demonstrated. Also, because the number of trials and associated sample sizes included in this meta-analysis were small, it was not possible to determine the effect of active contact and follow-up approaches on death by suicide. In a randomized controlled trial of the post-crisis suicide prevention long-term follow-up contact approach, Motto and Bostrom (2001) found that patients who refused ongoing care but who were randomized to be contacted by letter four times per year had a lower rate of suicide over two years of follow-up than did patients in the control group who received no further contact. Other studies have also shown post-crisis letters and coping cards to be protective against suicide ideation and attempts (Hassanian-Moghaddam, Sarjami, Kolahi, & Carter, 2011; Wang et al., 2016).

Finally, *Cognitive Behavior Therapy for Suicide Prevention (CBT-SP)* is an example of a therapeutic approach to prevent re-attempts. It uses a risk-reduction, relapse prevention approach that includes an analysis of proximal risk factors and stressors (e.g., relationship problems, school or work-related difficulties) leading up to and following the suicidal event; safety plan development; skill building; and psychoeducation. CBT-SP also has family skill modules focused on family support and communication patterns as well as improving the family's problem solving skills. A randomized controlled trial of CBT-SP found that 10-session outpatient cognitive therapy designed to prevent repeat suicide attempts resulted in a 50% reduction in the likelihood of a suicide reattempt among adults who had been admitted to an emergency department for a suicide attempt relative to treatment as usual (Brown et al., 2005).

**Comment [A]:** From JH: Unclear. According to the article, this program was evaluated in five countries. Please state the countries. Thnx.

Added.

**Comment [A]:** From JH: Define (follow-ups greater than 1 year)

Revised.

**Comment [A]:** From JH: Define

KH: Defined later in the sentence - contact 4x/yr, 2 years of follow up.



- Postvention** programs are implemented with the goal of providing support to survivors of others' suicide to reduce their own risk of suicide. One example of a postvention program, *StandBy Response Service (StandBy)*, provides clients with face-to-face outreach and telephone support through a professional crisis response team. Site coordinators develop customized case management plans, referring clients to other existing community services matched to their needs (Visser, Comans, & Scuffham, 2014). In a study by Visser et al. (2014), *StandBy* clients were significantly less likely to be at high risk for suicidality than a suicide bereaved comparison group who had not had contact with the *StandBy* program (48% and 64% respectively). Additionally, research suggests that active postvention approaches in which outreach to suicide survivors occurs at the scene of a suicide is associated with intake into treatment sooner, greater attendance at support group meetings, and attendance at more meetings compared to passive postvention (versus passive approaches where survivors self-refer for services) (J. Cerel & Campbell, 2008).
- Safe messaging following a suicide.** Safe messaging after a suicide can help assure that reporting of the event is done in such a way to reduce risk to consumers of news media and other messaging who may be particularly vulnerable. One way to ensure safe messaging following a suicide is to encourage that reporters adhere to *Recommendations for Reporting on Suicide* (<http://www.reportingonsuicide.org>). Reports that are both inclusive of suicide prevention messages, stories of hope and resilience, risk and protective factors, and links to helping resources (e.g., hotline) and that avoid sensationalizing events or reducing suicide to one cause can help reduce the likelihood of suicide contagion. The most compelling evidence supporting the effect of *recommendations for reporting on suicide* on reduction in suicides comes from Austria. After a sharp increase in suicides on the Viennese subway, media guidelines were introduced and an interrupted time series design was used to evaluate the national impact of the guidelines on subsequent suicides. Changes in the quality and quantity of media reporting resulted in a *nationwide* significant reduction of 81 suicides *annually* (Niederkröthenthaler & Sonneck, 2007). *Finally, research suggests that not only does reporting on suicide in a negative way (e.g., reporting on suicide myths and repetition) have harmful effects on suicide, but reporting on positive coping skills in the face of adversity can also demonstrate protective effects against suicide* (Niederkröthenthaler et al., 2010). *Reports of individual suicidal ideation not accompanied by reports of suicide or suicide attempts, along with reports describing a "mastery" of a crisis situation where adversities were overcome, associated with significant decreases in suicide rates in the time period immediately following such reports* (Niederkröthenthaler et al., 2010).

**Comment [A]:** From TS: Don't you mean "Recommendations for Reporting on Suicide"?

Please cite:

<http://ajsp.org/wp-content/uploads/2016/01/recommendations.pdf>

The media did not want "guidelines" and they reacted negatively to the idea of external guidelines.

KH: Edited accordingly. I didn't realize they didn't like the idea of "guidelines" - interesting.

**Comment [A]:** I think this is a better link.

**Comment [A]:** From TS: Are you sure that the 81 reduction was just on the subway system? I thought that was nationally. Please confirm.

KH: it was nationally – apologies for the oversight in the way this was written.

**Comment [A]:** From TS: Thomas also had a 2010 report that suggested benefits of good reporting.

<http://bjp.rcpsych.org/content/bjprpsych/197/3/234.full.pdf>

KH: Added.



## Sector Involvement

Public health can play an important and unique role in addressing suicide. Public health agencies, which typically place prevention at the forefront of efforts and work to create broad population-level impact, can bring critical leadership and resources to bear on this problem. For example, these agencies can serve as a convener, bringing together partners and stakeholders to plan, prioritize, and coordinate suicide prevention efforts. Public health agencies are also well positioned to collect and disseminate data, implement preventive measures, evaluate programs, and track progress. Although public health can play a leadership role in preventing suicide, the strategies and approaches outlined in this technical package cannot be accomplished by the public health sector alone. As noted in the National Strategy to Prevent Suicide, the integration and coordination of prevention activities across sectors and settings is critical for expanding the reach and impact of suicide prevention efforts.

Other sectors vital to implementing this package include, but are not limited to, education, government (local, state, and federal), social services, health services, business, labor, justice, housing, media, and organizations that comprise the civil society sector such as faith-based organizations, youth-serving organizations, foundations, and other non-governmental organizations. Collectively, these sectors can make a difference in preventing suicide by impacting the various contexts and underlying risks that contribute to suicide.

The strategies and approaches described in this technical package are summarized in Appendix A along with the relevant sectors that are well positioned to lead implementation efforts. For example, business and labor, health care insurers and providers, and government entities are in the best position to implement programs and policies that *Strengthen Economic Supports and Access to Mental Health Care*. These types of supports go beyond individual behavior change and require commitment and support from those sectors that can directly address some of the underlying risks and the environmental contexts that increase the risk for suicide. Public health entities can play an important role by gathering and synthesizing information to inform policy, raise awareness, and evaluate the effectiveness of various policies. Moreover, partnerships with non-governmental and community organizations can be instrumental in increasing awareness of and garnering support for policies affecting individuals and families.

The public health sector has been at the forefront of many community-based prevention efforts, working collaboratively with schools and community-based organizations, to change social norms and positively impact health behavior. Public health is well suited to take on a similar leadership role in *Promoting*



*Connectedness* through peer norm and community engagement activities and supporting the development, evaluation, and adoption of effective programs that *Teach Coping and Problem-Solving Skills* to prevent suicide from happening in the first place. These programs are often delivered in school and community settings, making education and non-governmental organizations vital partners in prevention.

Businesses, workplaces, and local and state government entities, on the other hand, are in the best position to establish policies and support practices that *Create Protective Environments* where people live, work, and play. Public health entities can play an important role by gathering and synthesizing information, working with other agencies within the executive branch of their state or local government in support of policy and other approaches, and evaluating the effectiveness of measures taken. In a similar fashion, public health entities can partner with schools, workplaces, and community organizations to implement and evaluate prevention programs, policies and practices geared toward creating safe, healthy, and supportive environments.

Finally, this technical package includes a number of interventions delivered in hospital, primary care, behavioral health care, and community settings designed to *Identify and Support People At-Risk* and to *Lessen Harms and Prevent Future Risk*. The intensity and activities of these interventions require the expertise of professionals who are licensed and trained to deliver critical intervention support. The health care, social services, and justice sectors can work collaboratively to support individuals at high-risk for suicide and their families. These activities also require coordination of supports across various service providers and community organizations.

Regardless of strategy, action by many sectors will be necessary for the successful implementation of this package. In this regard, all sectors can play an important and influential role in preventing suicide from happening in the first place and lessening the immediate and long-term harms of suicidal behavior by helping those in times of crisis get the services and support they need.

## Monitoring and Evaluation

Monitoring and evaluation are necessary components of the public health approach to prevention. It is important to have timely and reliable data to monitor the extent of the problem and to evaluate the impact of prevention efforts. Data are necessary for program implementation as planning, implementation, and assessment all rely on accurate measurement of the problem.

Surveillance data helps researchers and practitioners track changes in the burden of suicide. Surveillance systems exist at the federal, state, and local levels. It is important to assess the availability of surveillance data and data systems across these levels to identify and address gaps in the systems. CDC's National Vital Statistics System and the National Violent Death Reporting System (NVDRS) are examples of surveillance systems that provide data on deaths from suicide. NVDRS, for example, is a state-based surveillance system that combines data from death certificates, law enforcement reports, and coroner or medical examiner reports to provide detailed information on the circumstances of violent deaths, including suicide, which can assist communities in guiding prevention approaches (Blair, Fowler, Jack, & Crosby, 2016). The National Electronic Injury Surveillance System-All Injury Program (NEISS-AIP) provides nationally representative data about all types and causes of nonfatal injuries treated in U.S. hospital emergency departments, and can be used to assess national rates of, and trends in, self-harm injuries by cause (e.g., falls, poisoning, etc.), age, race/ethnicity, sex, disposition (where the injured person goes when released from the Emergency Department).

In addition to information on deaths and nonfatal injuries, there are also surveillance systems that provide national, state, and some local estimates of suicidal behavior. The Youth Risk Behavior Surveillance System (YRBSS) collects information from a nationally representative sample of 9-12 grade students and is a key resource in monitoring health-risk behaviors among youth, including whether youth have seriously considered attempting suicide, attempted suicide, made a plan, or required treatment by a doctor or nurse for a suicide attempt that resulted in an injury, poisoning, or overdose (Brener et al., 2013). The YRBSS data are obtained from a national school-based survey conducted by CDC as well as from state, territorial, tribal, and large urban school district surveys conducted by education and health agencies. The National Survey on Drug Use and Health (NSDUH) is an annual survey of the civilian, non-institutionalized population aged 12 years and older. NSDUH provides both national and state-level estimates of substance use, including alcohol, tobacco, illicit drugs, and non-medical use of prescription drugs; and mental health, including past year mental illness, co-occurring illnesses, service utilization, along with suicide ideation, suicide plans, and suicide attempts. NSDUH is a key resource to track trends in suicide-related risk factors in the population and to help identify groups at increased risk.

It is also important at all levels (local, state, and federal) to address gaps in responses, track progress of prevention efforts and evaluate the impact of those efforts, including the impact of this technical package. Evaluation data, produced through program implementation and monitoring, is essential to provide information on what does and does not work to reduce rates of suicide and its associated risk

**Comment [A]:** From TS: This description seems incomplete compared to the description of YRBS



and protective factors. Theories of change and logic models that identify short, intermediate, and long-term outcomes are an important part of program evaluation.

The evidence-base for suicide prevention has advanced greatly over the last few decades. However, additional research is needed to understand the impact of programs, policies, and practices on suicide (and suicide attempts, at a minimum), as opposed to merely examining their effectiveness on risk factors associated with suicide. More research is also needed to examine the effectiveness of upstream (before risk occurs) and community-level strategies to prevent suicide at the population level. Lastly, it will be important for researchers to test the effectiveness of combinations of the strategies and approaches included in this package. Most existing evaluations focus on approaches implemented in isolation, but there is potential to understand the synergistic effects within a comprehensive prevention approach. ~~Additional research is needed to understand the extent to which combinations of strategies and approaches result in greater reductions in suicide than individual programs, practices, or policies.~~

## Conclusion

Suicide is a serious public health problem whose rates have been on the rise for more than a decade and whose costs stretch well into the billions of dollars each year. While suicide is a rare outcome statistically, its human impact has a ripple effect that is far-reaching. Each of us likely interacts with suicide survivors, those with lived experience, and those with thoughts of suicide, on a daily basis--at home, at work, and in our communities. Suicide and suicide attempts are therefore public health issues of societal concern. Fortunately, like many public health problems, suicide is preventable, and fortunately more is being done to prevent suicide than ever before, as evidenced by the work of the National Action Alliance for Suicide Prevention, the release of the first world report on suicide, and more timely surveillance data, to name just a few examples. Unfortunately and unlike most other public health problems, suicide prevention must still overcome struggles against the stigma, shame, and secrecy related to help-seeking, mental illness, being a survivor, or someone with lived experience; misplaced fear of-related to asking someone about their risk of suicide (versus the fear and consequence of *not* asking), and fear of taking up strategies known to be effective but perhaps unpopular; misinformation about suicide preventability, misplaced emphasis by the media and others on sensational aspects of suicide, and disproportionate funding given its public health burden. ~~Suicide also struggles against the right degree of awareness where too much information, for example by well-meaning reporters and others, may actually do harm.~~

In an effort to continue pushing the field and society further towards prevention, this technical package includes strategies and approaches that ideally would be used in a comprehensive fashion, in combination--in a multi-level, multi-sectoral way. This technical package includes strategies and approaches targeting (upstream prevention) (e.g., social emotional learning for children and youth), as well as strategies focused more downstream (e.g., cognitive behavioral treatment to prevent re-

**Comment [A]:** From TS: Should this be programs, policies, and practices to be consistent?

**Comment [A]:** From JH: including attempts?

**Comment [A]:** From JH: redundant with prior sentence.

**Comment [A]:** From TS: I found this somewhat awkward. The idea of suicide struggling seemed off and the point is not entirely clear. I think you can be more specific and reference an earlier point in the media recommendations section.

**Comment [A]:** From JH: Upstream/downstream is jargon.

**Comment [A]:** I prefer to keep this language in if it's ok. The e.g. is meant to help define the terms and it's been mentioned previously and defined. It's also a continued topic of discussion in the field that we need to focus more upstream. Iterating and re-iterating it is good I think. And lastly, there's a lot of jargon and terms in here that we'd also have to get rid of if we're honest about the use of jargon and reading level!

attempts). It includes ~~(universal, selective, and indicated strategies, or)~~ strategies that range from a focus on the whole population regardless of risk to strategies designed to support people at highest risk. Importantly, this technical package extends the bounds of the typical prevention strategies to consider approaches ~~at the (outer levels of the social ecology)~~ that go beyond individual behavior change to better address risk factors impacting communities and populations more broadly e.g., policies to stabilize housing and community engagement initiatives.

While the evidence base continues to emerge, the collection of programs, policies, and practices laid out here are available for implementation now. And in keeping with good public health practice, the intent is that monitoring and evaluation will play a key role in that implementation. Moreover, as new evidence becomes available, this technical package can be refined to reflect the current state of the science.

In closing, and in keeping with a message of resilience as spoken by those with lived experience, 'hope, help, and healing is possible.'

**Comment [A]:** From TS: I think you can drop this and just use the more descriptive text. You don't need both. You could describe this as a range.

**Comment [A]:** From JM: Yes this is jargon, so the e.g., helps, but you might want to figure out a way to say this without referring to the outer levels of the social ecology.

**Comment [A]:** This sets you up for people to say oh yeah what about... AI/AN, transgendered people, prisoners etc.

**Comment [A]:** I'm not exactly clear on how to take this comment and subsequently how to address it. Open to ideas.



## References

- Arsenault-Lapierre, G., Kim, C., & Turecki, G. (2004). Psychiatric diagnoses in 3275 suicides: a meta-analysis. *BMC Psychiatry*, 4, 37. doi:10.1186/1471-244X-4-37
- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*: Prentice-Hall, Inc.
- Basile, K. C., Espelage, D. L., Rivers, I., McMahon, P. M., & Simon, T. R. (2009). The theoretical and empirical links between bullying behavior and male sexual violence perpetration. *Aggression and violent behavior*, 14(5), 336-347.
- Basile, K. C., Hamburger, M. E., Swahn, M. H., & Choi, C. (2013). Sexual violence perpetration by adolescents in dating versus same-sex peer relationships: differences in associated risk and protective factors. *Western Journal of Emergency Medicine*, 14(4), 329.
- Beautrais, A. L. (2001). Effectiveness of barriers at suicide jumping sites: A case study. *Aust NZ J Psychiat*, 35. doi:10.1080/0004867010060501
- Beautrais, A. L., Gibb, S. J., Fergusson, D. M., Horwood, L. J., & Larkin, G. L. (2009). Removing bridge barriers stimulates suicides: An unfortunate natural experiment. *Aust NZ J Psychiat*, 43. doi:10.1080/00048670902873714
- Beyer, K. M., Layde, P. M., Hamberger, L. K., & Laud, P. W. (2015). Does neighborhood environment differentiate intimate partner femicides from other femicides? *Violence Against Women*, 21(1), 49-64. doi:10.1177/1077801214564075
- Blair, J. M., Fowler, K. A., Jack, S. P., & Crosby, A. E. (2016). The National Violent Death Reporting System: overview and future directions. *Inj Prev*, 22 Suppl 1, i6-i11. doi:10.1136/injuryprev-2015-041819
- Borowsky, I. W., Hogan, M., & Ireland, M. (1997). Adolescent sexual aggression: risk and protective factors. *Pediatrics*, 100(6), E7.
- Branas, C. C., Cheney, R. A., MacDonald, J. M., Tam, V. W., Jackson, T. D., & Ten Have, T. R. (2011). A difference-in-differences analysis of health, safety, and greening vacant urban space. *Am J Epidemiol*, 174(11), 1296-1306. doi:10.1093/aje/kwr273
- Brown, G. K., Ten Have, T., Henriques, G. R., Xie, S. X., Hollander, J. E., & Beck, A. T. (2005). Cognitive therapy for the prevention of suicide attempts: a randomized controlled trial. *JAMA*, 294(5), 563-570. doi:10.1001/jama.294.5.563
- Butchart, A., Phinney, A., Check, P., & Villaveces, A. (2004). *Preventing Violence: A Guide to Implementing the Recommendations of the World Report on Violence and Health*. Geneva, Switzerland: World Health Organization.
- Capaldi, D. M., Knoble, N. B., Shortt, J. W., & Kim, H. K. (2012). A Systematic Review of Risk Factors for Intimate Partner Violence. *Partner Abuse*, 3(2), 231-280. doi:10.1891/1946-6560.3.2.231
- Carter, M., McGee, R., Taylor, B., & Williams, S. (2007). Health outcomes in adolescence: associations with family, friends and school engagement. *J Adolesc*, 30(1), 51-62. doi:10.1016/j.adolescence.2005.04.002
- Cavanagh, J. T., Carson, A. J., Sharpe, M., & Lawrie, S. M. (2003). Psychological autopsy studies of suicide: a systematic review. *Psychol Med*, 33(3), 395-405.
- Centers for Disease Control and Prevention. (2009). Strategic direction for the prevention of suicidal behavior: Promoting individual, family, and community connectedness to prevent suicidal behavior. Retrieved from Available at: [http://www.cdc.gov/ViolencePrevention/pdf/Suicide\\_Strategic\\_Direction\\_Full\\_version-a.pdf](http://www.cdc.gov/ViolencePrevention/pdf/Suicide_Strategic_Direction_Full_version-a.pdf)
- Centers for Disease Control and Prevention. (2016a). Child Maltreatment: Risk and Protective Factors. Retrieved from Available at: <http://www.cdc.gov/violenceprevention/childmaltreatment/riskprotectivefactors.html>
- Centers for Disease Control and Prevention. (2016b). Elder Maltreatment: Risk and Protective Factors. Retrieved from Available at: <http://www.cdc.gov/ViolencePrevention/eldermaltreatment/riskprotectivefactors.html>

- Centers for Disease Control and Prevention. (2016c). Sexual Violence: Risk and Protective Factors. Retrieved from Available at: <http://www.cdc.gov/ViolencePrevention/sexualviolence/riskprotectivefactors.html>
- Centers for Disease Control and Prevention. (2016d). Web-Based Injury Statistics Query and Reporting System (WISQARS). Retrieved June 3, 2016 Available at: <http://www.cdc.gov/injury/wisqars/index.html>
- Centers for Disease Control and Prevention. (2016e). Youth Violence: Risk and Protective Factors. Retrieved from Available at: <http://www.cdc.gov/violenceprevention/youthviolence/riskprotectivefactors.html>
- Cerel, J., & Campbell, F. R. (2008). Suicide survivors seeking mental health services: a preliminary examination of the role of an active postvention model. *Suicide Life Threat Behav*, 38(1), 30-34.  
doi:10.1521/suli.2008.38.1.30
- Cerel, J., Maple, M., DE VENNE, J. V., Moore, M., Flaherty, C., & Brown, M. (2016). Exposure to Suicide in the Community: Prevalence and Correlates in One US State. *Public Health Reports*, 131(1).
- Cerel, J., McIntosh, J. L., Neimeyer, R. A., Maple, M., & Marshall, D. (2014). The Continuum of "Survivorship": Definitional Issues in the Aftermath of Suicide. *Suicide and life-threatening behavior*, 44(6), 591-600.  
doi:10.1111/sltb.12093
- Chapman, A. L., & Dixon-Gordon, K. L. (2007). Emotional antecedents and consequences of deliberate self-harm and suicide attempts. *Suicide Life Threat Behav*, 37(5), 543-552. doi:10.1521/suli.2007.37.5.543
- Cherpitel, C. J., Borges, G. L. G., & Wilcox, H. C. (2004). Acute alcohol use and suicidal behavior: A review of the literature. *Alcoholism: Clinical and Experimental Research*, 28(5 SUPPL.), 18S-28S.
- Classen, T. J., & Dunn, R. A. (2012). The effect of job loss and unemployment duration on suicide risk in the United States: a new look using mass-layoffs and unemployment duration. *Health Econ*, 21(3), 338-350.  
doi:10.1002/hecl.1719
- Coffey, C. E. (2006). Pursuing perfect depression care. *Psychiatr Serv*, 57(10), 1524-1526.  
doi:10.1176/ps.2006.57.10.1524
- Coffey, C. E., Coffey, M. J., & Ahmedani, B. K. (2013). An update on perfect depression care. *Psychiatr Serv*, 64(4), 396. doi:10.1176/appi.PS.640422
- Coffey, M., Coffey, C., & Ahmedani, B. K. (2015). Suicide in a health maintenance organization population. *JAMA Psychiatry*, 72(3), 294-296. doi:10.1001/jamapsychiatry.2014.2440
- Comtois, K. A., Jobes, D. A., S. O'Connor, S., Atkins, D. C., Janis, K., E. Chessen, C., . . . Yuodelis-Flores, C. (2011). Collaborative assessment and management of suicidality (CAMS): feasibility trial for next-day appointment services. *Depress Anxiety*, 28(11), 963-972. doi:10.1002/da.20895
- Coulton, C. J., Crampton, D. S., Irwin, M., Spilsbury, J. C., & Korbin, J. E. (2007). How neighborhoods influence child maltreatment: a review of the literature and alternative pathways. *Child Abuse Negl*, 31(11-12), 1117-1142. doi:10.1016/j.chiabu.2007.03.023
- Cox, G. R., Owens, C., Robinson, J., Nicholas, A., Lockley, A., Williamson, M., . . . Pirkis, J. (2013). Interventions to reduce suicides at suicide hotspots: a systematic review. *BMC Public Health*, 13(1), 1-12.  
doi:10.1186/1471-2458-13-214
- Crosby, A. E., Espitia-Hardeman, V., Ortega, L., & Lozano, B. (2013). Alcohol and suicide. *Alcohol: Science, Policy and Public Health*, 190.
- Crosby, A. E., Han, B., Ortega, L., Parks, S. E., & Gfroerer, J. (2011). Suicidal Thoughts and Behaviors Among Adults Aged ≥18 Years — United States, 2008–2009. *MMWR*, 60(No. SS-13), 1-22.
- Crosby, A. E., Ortega, L., & Melanson, C. (2011). *Self-directed Violence Surveillance: Uniform Definitions and Recommended Data Elements, Version 1.0*. Retrieved from Atlanta, GA:
- Crosby, A. E., & Sacks, J. J. (2002). Exposure to Suicide: Incidence and Association with Suicidal Ideation and Behavior: United States, 1994. *Suicide and life-threatening behavior*, 32(3), 321-328.  
doi:10.1521/suli.32.3.321.22170
- Cunningham, P. J. (2009). Beyond parity: primary care physicians' perspectives on access to mental health care. *Health Aff (Millwood)*, 28(3), w490-501. doi:10.1377/hlthaff.28.3.w490



- Curtin, S. C., Warner, M., & Hedegaard, H. (2016). *Increase in suicide in the United States, 1999-2014*. ( ). Hyattsville, MD: National Center for Health Statistics Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/25116188>.
- Cylus, J., Glymour, M. M., & Avendano, M. (2014). Do generous unemployment benefit programs reduce suicide rates? A state fixed-effect analysis covering 1968-2008. *Am J Epidemiol*, 180(1), 45-52. doi:10.1093/aje/kwu106
- Dahlberg, L. L., & Krug, E. G. (2002). Violence-a global public health problem. In E. Krug, L. L. Dahlberg, J. A. Mercy, A. B. Zwi, & R. Lozano (Eds.), *World Report on Violence and Health* (pp. 1-56). Geneva, Switzerland: World Health Organization.
- DeGue, S., Massetti, G. M., Holt, M. K., Tharp, A. T., Valle, L. A., Matjasko, J. L., & Lippy, C. (2013). Identifying links between sexual violence and youth violence perpetration: New opportunities for sexual violence prevention. *Psychology of violence*, 3(2), 140.
- Deisenhammer, E. A., Ing, C. M., Strauss, R., Kemmler, G., Hinterhuber, H., & Weiss, E. M. (2009). The duration of the suicidal process: how much time is left for intervention between consideration and accomplishment of a suicide attempt? *J Clin Psychiatry*, 70(1), 19-24.
- Desai, R. A., Dausey, D. J., & Rosenheck, R. A. (2005). Mental health service delivery and suicide risk: the role of individual patient and facility factors. *Am J Psychiatry*, 162(2), 311-318. doi:10.1176/appi.ajp.162.2.311
- Diamond, G. S., Wintersteen, M. B., Brown, G. K., Diamond, G. M., Gallop, R., Shelef, K., & Levy, S. (2010). Attachment-based family therapy for adolescents with suicidal ideation: a randomized controlled trial. *J Am Acad Child Adolesc Psychiatry*, 49(2), 122-131.
- Dunne, E. J., McIntosh, J. L., & Dunne-Maxim, K. (Eds.). (1987). *Suicide and its aftermath: Understanding and counseling the survivors*. New York: Norton.
- Durkheim, E. (1897/1951). *Suicide: A study in sociology* (JA Spaulding & G. Simpson, trans.). Glencoe, IL: Free Press. (Original work published 1897).
- Elgar, F. J., Craig, W., Boyce, W., Morgan, A., & Vella-Zarb, R. (2009). Income inequality and school bullying: multilevel study of adolescents in 37 countries. *J Adolesc Health*, 45(4), 351-359. doi:10.1016/j.jadohealth.2009.04.004
- Escobedo, L. G., & Ortiz, M. (2002). The relationship between liquor outlet density and injury and violence in New Mexico. *Accid Anal Prev*, 34(5), 689-694.
- Etzersdorfer, E., & Sonneck, G. (1998). Preventing suicide by influencing mass-media reporting: The Viennese experience, 1980-1996. *Arch Suicide Res*, 4.
- Ferdon, C., Crosby, A. E., Caine, E. D., Hindman J., Reed, G. A., & Iskander, J. (In press). CDC Public Health Grand Rounds: Preventing Suicide through a Comprehensive Public Health Approach. *MMWR*.
- Flavin, P., & Radcliff, B. (2009). Public policies and suicide rates in the American states. *Social Indicators Research*, 90(2), 195-209.
- Fleischmann, A., Bertolote, J. M., Wasserman, D., De Leo, D., Bolhari, J., Botega, N. J., . . . Thanh, H. T. (2008). Effectiveness of brief intervention and contact for suicide attempters: a randomized controlled trial in five countries. *Bulletin of the World Health Organization*, 86(9), 703-709. doi:S0042-96862008000900014 [pii]
- Florence, C., Simon, T., Haegerich, T., Luo, F., & Zhou, C. (2015). Estimated lifetime medical and work-loss costs of fatal injuries-United States, 2013. *MMWR: Morbidity and mortality weekly report*, 64(38), 1074-1077.
- Fowler, K. A., Gladden, R. M., Vagi, K. J., Barnes, J., & Frazier, L. (2015). Increase in suicides associated with home eviction and foreclosure during the US housing crisis: findings from 16 National Violent Death Reporting System States, 2005-2010. *Am J Public Health*, 105(2), 311-316. doi:10.2105/AJPH.2014.301945
- Freisthler, B., Merritt, D. H., & LaScala, E. A. (2006). Understanding the ecology of child maltreatment: a review of the literature and directions for future research. *Child Maltreat*, 11(3), 263-280. doi:10.1177/1077559506289524

- Ghahramanlou-Holloway, M., Bhar, S., Brown, G., Olsen, C., & Beck, A. T. (2012). Changes in problem-solving appraisal after cognitive therapy for the prevention of suicide. *Psychological Medicine*, 42(06), 1185-1193.
- Giesbrecht, N., Huguette, N., Ogden, L., Kaplan, M. S., McFarland, B. H., Caetano, R., . . . Nolte, K. B. (2015). Acute alcohol use among suicide decedents in 14 US states: impacts of off-premise and on-premise alcohol outlet density. *Addiction*, 110(2), 300-307. doi:10.1111/add.12762
- Godoy Garraza, L., Walrath, C., Goldston, D. B., Reid, H., & McKeon, R. (2015). Effect of the Garrett Lee Smith Memorial Suicide Prevention Program on Suicide Attempts Among Youths. *JAMA Psychiatry*, 72(11), 1143-1149. doi:10.1001/jamapsychiatry.2015.1933
- Goldsmith, S. K., Pellmar, T. C., Kleinman, A. M., & Bunney, W. E. (2002). *Reducing suicide: A national imperative*: National Academies Press.
- Gould, M. S., Cross, W., Pisani, A. R., Munfakh, J. L., & Kleinman, M. (2013). Impact of Applied Suicide Intervention Skills Training on the National Suicide Prevention Lifeline. *Suicide Life Threat Behav*, 43(6), 676-691. doi:10.1111/sltb.12049
- Gould, M. S., Kalafat, J., Harrismunfakh, J. L., & Kleinman, M. (2007). An evaluation of crisis hotline outcomes. Part 2: Suicidal callers. *Suicide Life Threat Behav*, 37(3), 338-352. doi:10.1521/suli.2007.37.3.338
- Grossman, D. C., Mueller, B. A., Riedy, C., Dowd, M. D., Villaveces, A., Prodzinski, J., . . . Harruff, R. (2005). Gun storage practices and risk of youth suicide and unintentional firearm injuries. *JAMA*, 293(6), 707-714. doi:10.1001/jama.293.6.707
- Haddon, W. (1980). Advances in the epidemiology of injuries as a basis for public policy. *Public Health Reports*, 95(5), 411-421.
- Han, B., Crosby, A. E., Ortega, L. A., Parks, S. E., Compton, W. M., & Gfroerer, J. (2016). Suicidal ideation, suicide attempt, and occupations among employed adults aged 18–64 years in the United States. *Comprehensive psychiatry*, 66, 176-186.
- Harris, E. C., & Barraclough, B. (1997). Suicide as an outcome for mental disorders. A meta-analysis. *Br J Psychiatry*, 170, 205-228.
- Harris, E. C., & Barraclough, B. (1998). Excess mortality of mental disorder. *Br J Psychiatry*, 173, 11-53.
- Harris, K. M., Carpenter, C., & Bao, Y. (2006). The effects of state parity laws on the use of mental health care. *Med Care*, 44(6), 499-505. doi:10.1097/01.mlr.0000215813.16211.00
- Hassanian-Moghaddam, H., Sarjani, S., Kolahi, A. A., & Carter, G. L. (2011). Postcards in Persia: randomised controlled trial to reduce suicidal behaviours 12 months after hospital-treated self-poisoning. *British Journal of Psychiatry*, 198(4), 309-316.
- Hawton, K. (2007). Restricting access to methods of suicide: Rationale and evaluation of this approach to suicide prevention. *Crisis*, 28. doi:10.1027/0227-5910.28.s1.4
- Heise, L., & Garcia-Moreno, C. (2002). Violence by Intimate Partners. In E. Krug, L. L. Dahlberg, J. A. Mercy, A. B. Zwi, & R. Lozano (Eds.), *World Report on Violence and Health* (pp. 87-121). Geneva, Switzerland: World Health Organization.
- Herman, K. C., Borden, L. A., Reinke, W. M., & Webster-Stratton, C. (2011). The Impact of the Incredible Years Parent, Child, and Teacher Training Programs on Children's Co-Occurring Internalizing Symptoms. *Sch Psychol Q*, 26(3), 189-201. doi:10.1037/a0025228
- Hong, J. S., Kral, M. J., Espelage, D. L., & Allen-Meares, P. (2012). The social ecology of adolescent-initiated parent abuse: a review of the literature. *Child Psychiatry Hum Dev*, 43(3), 431-454. doi:10.1007/s10578-011-0273-y
- Houle, J. N., & Light, M. T. (2014). The home foreclosure crisis and rising suicide rates, 2005 to 2010. *Am J Public Health*, 104(6), 1073-1079. doi:10.2105/AJPH.2013.301774
- Hunkeler, E. M., Katon, W., Tang, L., Williams, J. W., Jr., Kroenke, K., Lin, E. H., . . . Unutzer, J. (2006). Long term outcomes from the IMPACT randomised trial for depressed elderly patients in primary care. *BMJ*, 332(7536), 259-263. doi:10.1136/bmj.38683.710255.BE



- Inagaki, M., Kawashima, Y., Kawanishi, C., Yonemoto, N., Sugimoto, T., Furuno, T., . . . Yamada, M. (2015). Interventions to prevent repeat suicidal behavior in patients admitted to an emergency department for a suicide attempt: a meta-analysis. *J Affect Disord*, 175, 66-78. doi:10.1016/j.jad.2014.12.048
- Isometsa, E. T. (2001). Psychological autopsy studies--a review. *Eur Psychiatry*, 16(7), 379-385.
- Jobes, D. A. (2012). The Collaborative Assessment and Management of Suicidality (CAMS): an evolving evidence-based clinical approach to suicidal risk. *Suicide Life Threat Behav*, 42(6), 640-653. doi:10.1111/j.1943-278X.2012.00119.x
- Johnson, F. W., Gruenewald, P. J., & Remer, L. G. (2009). Suicide and alcohol: do outlets play a role? *Alcohol Clin Exp Res*, 33(12), 2124-2133. doi:10.1111/j.1530-0277.2009.01052.x
- Kaplan, M. S., McFarland, B. H., Huguet, N., Conner, K., Caetano, R., Giesbrecht, N., & Nolte, K. B. (2013). Acute alcohol intoxication and suicide: a gender-stratified analysis of the National Violent Death Reporting System. *Inj Prev*, 19(1), 38-43. doi:10.1136/injuryprev-2012-040317
- Kellam, S. G., Brown, C. H., Poduska, J. M., Ialongo, N. S., Wang, W., Toyinbo, P., . . . Wilcox, H. C. (2008). Effects of a universal classroom behavior management program in first and second grades on young adult behavioral, psychiatric, and social outcomes. *Drug Alcohol Depend*, 95 Suppl 1, S5-S28. doi:10.1016/j.drugalcdep.2008.01.004
- Kessler, R. C., Demler, O., Frank, R. G., Olfson, M., Pincus, H. A., Walters, E. E., . . . Zaslavsky, A. M. (2005). Prevalence and treatment of mental disorders, 1990 to 2003. *N Engl J Med*, 352(24), 2515-2523. doi:10.1056/NEJMSa043266
- Kitchener, B. A., & Jorm, A. F. (2004). Mental health first aid training in a workplace setting: a randomized controlled trial [ISRCTN13249129]. *BMC Psychiatry*, 4, 23. doi:10.1186/1471-244X-4-23
- Kitchener, B. A., & Jorm, A. F. (2006). Mental health first aid training: review of evaluation studies. *Aust N Z J Psychiatry*, 40(1), 6-8. doi:10.1111/j.1440-1614.2006.01735.x
- Kleiman, E. M., Riskind, J. H., Schaefer, K. E., & Weingarden, H. (2012). The moderating role of social support on the relationship between impulsivity and suicide risk. *Crisis*, 33(5), 273-279. doi:10.1027/0227-5910/a000136
- Klevens, J., Simon, T. R., & Chen, J. (2012). Are the perpetrators of violence one and the same? Exploring the co-occurrence of perpetration of physical aggression in the United States. *J Interpers Violence*, 27(10), 1987-2002. doi:10.1177/0886260511431441
- Knox, K. L., Litts, D. A., Talcott, G. W., Feig, J. C., & Caine, E. D. (2003). Risk of suicide and related adverse outcomes after exposure to a suicide prevention programme in the US Air Force: cohort study. *BMJ*, 327(7428), 1376.
- Knox, K. L., Pflanz, S., Talcott, G. W., Campise, R. L., Lavigne, J. E., Bajorska, A., . . . Caine, E. D. (2010). The US Air Force suicide prevention program: implications for public health policy. *Am J Public Health*, 100(12), 2457-2463. doi:10.2105/ajph.2009.159871
- Knox, M. S., Burkhart, K., & Hunter, K. E. (2010). ACT against violence parents raising safe kids program: Effects on maltreatment-related parenting behaviors and beliefs. *Journal of Family Issues*.
- Lang, M. (2013). The impact of mental health insurance laws on state suicide rates. *Health Econ*, 22(1), 73-88. doi:10.1002/hecl.1816
- Linehan, M. M., Comtois, K. A., Murray, A. M., Brown, M. Z., Gallop, R. J., Heard, H. L., . . . Lindenboim, N. (2006). Two-year randomized controlled trial and follow-up of dialectical behavior therapy vs therapy by experts for suicidal behaviors and borderline personality disorder. *Arch Gen Psychiatry*, 63(7), 757-766. doi:10.1001/archpsyc.63.7.757
- Losel, F., & Farrington, D. P. (2012). Direct protective and buffering protective factors in the development of youth violence. *Am J Prev Med*, 43(2 Suppl 1), S8-S23. doi:10.1016/j.amepre.2012.04.029
- Luo, F., Florence, C. S., Quispe-Agnoli, M., Ouyang, L., & Crosby, A. E. (2011). Impact of business cycles on US suicide rates, 1928-2007. *Am J Public Health*, 101(6), 1139-1146. doi:10.2105/ajph.2010.300010

- Maimon, D., Browning, C. R., & Brooks-Gunn, J. (2010). Collective efficacy, family attachment, and urban adolescent suicide attempts. *J Health Soc Behav*, 51(3), 307-324. doi:10.1177/0022146510377878
- Mark, T. L., Shern, D. L., Bagalman, J. E., & Cao, Z. (2007). Ranking America's mental health: An analysis of depression across the states. Alexandria, VA: *Mental Health America*.
- McIntosh, W. L., Spies, E., Stone, D. M., Lokey, C. N., Trudeau, A. R., & Bartholow, B. (2016). Suicide Rates by Occupational Group - 17 States, 2012. *MMWR Morb Mortal Wkly Rep*, 65(25), 641-645. doi:10.15585/mmwr.mm6525a1
- Miller, M., Warren, M., Hemenway, D., & Azrael, D. (2015). Firearms and suicide in US cities. *Inj Prev*, 21(e1), e116-119. doi:10.1136/injuryprev-2013-040969
- Mishara, B. L. (Ed.) (1995). *The Impact of Suicide*. New York: Springer.
- Mishara, B. L., & Martin, N. (2012). Effects of a comprehensive police suicide prevention program. *Crisis: Journal of Crisis Intervention & Suicide*, 33(3), 162-168.
- Mitchell, A. M., Kim, Y., Prigerson, H. G., & Mortimer-Stephens, M. (2004). Complicated grief in survivors of suicide. *Crisis*, 25(1), 12-18. doi:10.1027/0227-5910.25.1.12
- Motto, J. A., & Bostrom, A. G. (2001). A randomized controlled trial of postcrisis suicide prevention. *Psychiatr Serv*, 52(6), 828-833.
- Muennig, P., Cohen, A. K., Palmer, A., & Zhu, W. (2013). The relationship between five different measures of structural social capital, medical examination outcomes, and mortality. *Soc Sci Med*, 85, 18-26. doi:10.1016/j.socscimed.2013.02.007
- National Action Alliance for Suicide Prevention. (2014). Research Prioritization Task Force.(2014). *A prioritized research agenda for suicide prevention: An action plan to save lives*.
- National Action Alliance for Suicide Prevention Workplace Task Force. (2015). *Comprehensive Blueprint for Workplace Suicide Prevention*. Washington, D.C. : Author.
- National Action Alliance for Suicide Prevention: Suicide Attempt Survivors Task Force. (2014). *The Way Forward: Pathways to hope, recovery, and wellness with insights from lived experience*. Washington, D.C. : Author.
- National Action Alliance for Suicide Prevention: Survivors of Suicide Loss Task Force. (2015). *Responding to Grief, Trauma, and Distress After a Suicide: U.S. National Guidelines*. Washington, D.C. : Author.
- Niederkrotenthaler, T., & Sonneck, G. (2007). Assessing the impact of media guidelines for reporting on suicides in Austria: Interrupted time series analysis. *Aust N Z J Psychiatry*, 41. doi:10.1080/00048670701266680
- Niederkrotenthaler, T., Voracek, M., Herberth, A., Till, B., Strauss, M., Etzersdorfer, E., . . . Sonneck, G. (2010). Media and suicide. Papageno v Werther effect. *BMJ*, 341, c5841. doi:10.1136/bmj.c5841
- Olfson, M., Gerhard, T., Huang, C., Crystal, S., & Stroup, T. S. (2015). Premature Mortality Among Adults With Schizophrenia in the United States. *JAMA Psychiatry*, 72(12), 1172-1181. doi:10.1001/jamapsychiatry.2015.1737
- Owens, D. (2002). Fatal and non-fatal repetition of self-harm: Systematic review. *British Journal of Psychiatry*, 181(3), 193-199.
- Perron, S., Burrows, S., Fournier, M., Perron, P. A., & Ouellet, F. (2013). Installation of a bridge barrier as a suicide prevention strategy in Montreal, Quebec, Canada. *Am J Public Health*, 103(7), 1235-1239. doi:10.2105/ajph.2012.301089
- Pinchevsky, G. M., & Wright, E. M. (2012). The impact of neighborhoods on intimate partner violence and victimization. *Trauma Violence Abuse*, 13(2), 112-132. doi:10.1177/1524838012445641
- Pirkis, J., Too, L. S., Spittal, M. J., Krysinaka, K., Robinson, J., & Cheung, Y. T. D. (2015). Interventions to reduce suicides at suicide hotspots: a systematic review and meta-analysis. *The Lancet Psychiatry*, 2(11), 994-1001. doi:http://dx.doi.org/10.1016/S2215-0366(15)00266-7
- Pitman, A., Osborn, D., King, M., & Erlangsen, A. (2014). Effects of suicide bereavement on mental health and suicide risk. *Lancet Psychiatry*, 1, 86-94.
- Pollock, L. R., & Williams, J. M. (2004). Problem-solving in suicide attempters. *Psychol Med*, 34(1), 163-167.



- Reeves, A., Stuckler, D., McKee, M., Gunnell, D., Chang, S. S., & Basu, S. (2012). Increase in state suicide rates in the USA during economic recession. *Lancet*, 380(9856), 1813-1814. doi:10.1016/S0140-6736(12)61910-2
- Reid, M. J., Webster-Stratton, C., & Hammond, M. (2003). Follow-up of children who received the Incredible Years intervention for oppositional-defiant disorder: Maintenance and prediction of 2-year outcome. *Behavior Therapy*, 34(4), 471-491.
- Resnick, M. D., Ireland, M., & Borowsky, I. (2004). Youth violence perpetration: what protects? What predicts? Findings from the National Longitudinal Study of Adolescent Health. *J Adolesc Health*, 35(5), 424 e421-410. doi:10.1016/j.jadohealth.2004.01.011
- Rowhani-Rahbar, A., Simonetti, J. A., & Rivara, F. P. (2016). Effectiveness of Interventions to Promote Safe Firearm Storage. *Epidemiol Rev*, 38(1), 111-124. doi:10.1093/epirev/mxv006
- Runyan, C. W., Becker, A., Brandspigel, S., Barber, C., Trudeau, A., & Novins, D. (2016). Lethal Means Counseling for Parents of Youth Seeking Emergency Care for Suicidality. *West J Emerg Med*, 17(1), 8-14. doi:10.5811/westjem.2015.11.28590
- Runyan, D., Wattam, C., Ikeda, R., Hassan, F., & Ramiro, L. (2002). Child abuse and neglect by parents and other caregivers. In E. Krug, L. L. Dahlberg, J. A. Mercy, A. B. Zwi, & R. Lozano (Eds.), *World Report on Violence and Health* (pp. 59-86). Geneva, Switzerland: World Health Organization.
- Sampson, R. J., Morenoff, J. D., & Gannon-Rowley, T. (2002). Assessing "Neighborhood Effects": Social Processes and New Directions in Research. *Annual Review of Sociology*, 28, 443-478.
- Schilling, E. A., Aseltine, R. H., Jr., & James, A. (2016). The SOS Suicide Prevention Program: Further Evidence of Efficacy and Effectiveness. *Prev Sci*, 17(2), 157-166. doi:10.1007/s11121-015-0594-3
- Shepard, D. S., Gurewicz, D., Lwin, A. K., Reed, G. A., Jr., & Silverman, M. M. (2016). Suicide and Suicidal Attempts in the United States: Costs and Policy Implications. *Suicide Life Threat Behav*, 46(3), 352-362. doi:10.1111/sltb.12225
- Silverman, M. M., & Maris, R. W. (1995). The prevention of suicidal behaviors: An overview. *Suicide and life-threatening behavior*, 25(1), 10-21.
- Simon, O. R., Swann, A. C., Powell, K. E., Potter, L. B., Kresnow, M. J., & O'Carroll, P. W. (2001). Characteristics of impulsive suicide attempts and attempters. *Suicide Life Threat Behav*, 32(1 Suppl), 49-59.
- Spoth, R. L., Gyll, M., & Day, S. X. (2002). Universal family-focused interventions in alcohol-use disorder prevention: cost-effectiveness and cost-benefit analyses of two interventions. *J Stud Alcohol*, 63(2), 219-228.
- Stack, S., & Wasserman, I. (2007). Economic strain and suicide risk: a qualitative analysis. *Suicide and life-threatening behavior*, 37(1), 103-112.
- Sudak, H., Maxim, K., & Carpenter, M. (2008). Suicide and stigma: a review of the literature and personal reflections. *Acad Psychiatry*, 32(2), 136-142. doi:10.1176/appi.ap.32.2.136
- Szumilas, M., & Kutcher, S. (2011). Post-suicide intervention programs: a systematic review. *Can J Public Health*, 102(1), 18-29.
- Townsend, E., Hawton, K., Altman, D. G., Arensman, E., Gunnell, D., Hazell, P., . . . Van Heeringen, K. (2001). The efficacy of problem-solving treatments after deliberate self-harm: meta-analysis of randomized controlled trials with respect to depression, hopelessness and improvement in problems. *Psychological Medicine*, 31(6), 979-988.
- Tyrer, P., Reed, G. M., & Crawford, M. J. (2015). Classification, assessment, prevalence, and effect of personality disorder. *Lancet*, 385(9969), 717-726. doi:10.1016/S0140-6736(14)61995-4
- U.S. Office of the Surgeon General, & National Action Alliance for Suicide Prevention. (2012). *2012 National Strategy for Suicide Prevention: Goals and Objectives for Action*. Washington, D.C.: HHS.
- U.S. Public Health Service. (1999). *The Surgeon General's Call to Action to Prevent Suicide*. Washington, D.C.
- Unutzer, J., Tang, L., Oishi, S., Katon, W., Williams, J. W., Jr., Hunkeler, E., . . . Langston, C. (2006). Reducing suicidal ideation in depressed older primary care patients. *J Am Geriatr Soc*, 54(10), 1550-1556.

- Visser, V. S., Comans, T. A., & Scuffham, P. A. (2014). Evaluation Of The Effectiveness Of A Community-Based Crisis Intervention Program For People Bereaved By Suicide. *Journal of Community Psychology*, 42(1), 19-28. doi:10.1002/jcop.21586
- Walrath, C., Garraza, L. G., Reid, H., Goldston, D. B., & McKeon, R. (2015). Impact of the Garrett Lee Smith youth suicide prevention program on suicide mortality. *Am J Public Health*, 105(5), 986-993. doi:10.2105/AJPH.2014.302496
- Wang, Y. C., Hsieh, L. Y., Wang, M. Y., Chou, C. H., Huang, M. W., & Ko, H. C. (2016). Coping Card Usage can Further Reduce Suicide Reattempt in Suicide Attempter Case Management Within 3-Month Intervention. *Suicide Life Threat Behav*, 46(1), 106-120. doi:10.1111/sltb.12177
- Wasserman, D., Hoven, C. W., Wasserman, C., Wall, M., Eisenberg, R., Hadlaczky, G., . . . Carli, V. (2014). School-based suicide prevention programmes: The SEYLE cluster-randomised, controlled trial. *The Lancet*, 385(9977), 1536-1544. doi:10.1016/S0140-6736(14)61213-7
- Webster-Stratton, C., & Hammond, M. (1997). Treating children with early-onset conduct problems: a comparison of child and parent training interventions. *J Consult Clin Psychol*, 65(1), 93-109.
- Webster-Stratton, C., Reid, M. J., & Hammond, M. (2001). Preventing conduct problems, promoting social competence: a parent and teacher training partnership in head start. *J Clin Child Psychol*, 30(3), 283-302. doi:10.1207/S15374424JCCP3003\_2
- Webster-Stratton, C. H., Reid, M. J., & Beauchaine, T. (2011). Combining parent and child training for young children with ADHD. *Journal of Clinical Child & Adolescent Psychology*, 40(2), 191-203.
- Webster-Stratton, C., Jamila Reid, M., & Stoolmiller, M. (2008). Preventing conduct problems and improving school readiness: evaluation of the incredible years teacher and child training programs in high-risk schools. *Journal of child psychology and psychiatry*, 49(5), 471-488.
- Widome, R., Sieving, R. E., Harpin, S. A., & Hearst, M. O. (2008). Measuring neighborhood connection and the association with violence in young adolescents. *J Adolesc Health*, 43(5), 482-489. doi:10.1016/j.jadohealth.2008.04.013
- Wilcox, H. C., Kellam, S. G., Brown, C. H., Poduska, J. M., Ialongo, N. S., Wang, W., & Anthony, J. C. (2008). The impact of two universal randomized first- and second-grade classroom interventions on young adult suicide ideation and attempts. *Drug Alcohol Depend*, 95 Suppl 1, S60-73.
- Wilson, W. J. (2011). *When work disappears: The world of the new urban poor*: Vintage.
- World Health Organization. (2014). *Suicide Prevention: A Global Imperative*. Geneva, Switzerland: WHO Press.
- Wyman, P. A., Brown, C. H., LoMurray, M., Schmeelk-Cone, K., Petrova, M., Yu, Q., . . . Wang, W. (2010). An outcome evaluation of the Sources of Strength suicide prevention program delivered by adolescent peer leaders in high schools. *Am J Public Health*, 100(9), 1653-1661. doi:
- Yip, P., Caine, E., Yousuf, S., Chang, S.-S., Wu, K., & Chen, Y.-Y. (2012). Means restriction for suicide prevention. *Lancet*, 379. doi:10.1016/s0140-6736(12)60521-2



## Appendix A: Summary of Strategies and Approaches to Prevent Suicide

Strategy	Approach/Program, Practice or Policy	Best Available Evidence			Lead Sectors <sup>1</sup>
		Suicide	Suicide Attempts or Ideation	Other Risk/Protective Factors for Suicide	
Strengthen economic supports	<b>Strengthen household financial security</b>				Government (local, state, Federal)
	<i>Unemployment benefit programs</i>	✓			
	<i>Other income supports</i>	✓			Business/labor
	<b>Housing stabilization policies</b>				Government (local, state, Federal)
	<i>The National Neighborhood Stabilization Program</i>			✓	
Strengthen access to mental health care	<b>Coverage of mental health conditions in health insurance policies</b>				Health care
	<i>Mental Health Parity Laws</i>	✓		✓	Government (state, Federal)
Establish protective environments	<b>Reducing access to lethal means among persons at-risk</b>				Government (local, state)
	<i>Intervening at suicide hot spots</i>	✓			
	<i>Safe storage practices</i>		✓	✓	Public Health
	<b>Organizational policies and culture</b>				Business/Labor
	<i>Together for Life</i>	✓			
	<i>US Air Force Suicide Prevention Program</i>	✓		✓	Government (local, state, Federal)

		Best Available Evidence			
	<b>Community-based policies to reduce excessive alcohol use</b>				Government (local, state)
	<i>Alcohol outlet density</i>	✓		✓	Business/labor
<b>Promote connectedness</b>	<b>Peer norm approaches</b>				Public Health
	<i>Sources of Strength</i>			✓	Education
	<b>Community-engagement activities</b>				Public Health
	<i>Greening vacant urban spaces</i>			✓	Government (local)
<b>Teach coping and problem-solving skills</b>	<b>Social emotional learning</b>				Public Health
	<i>Youth Aware of Mental Health Program</i>		✓		Education
	<i>Signs of Suicide</i>		✓	✓	
	<i>Good Behavior Game</i>		✓	✓	
	<b>Parenting skill and family relationship approaches</b>				Public Health
	<i>The Incredible Years</i>			✓	Education
	<i>Strengthening Families 10-14</i>			✓	
<b>Identify and</b>	<b>Gatekeeper training</b>				Public Health
	<i>Mental Health First Aid</i>			✓	Healthcare
	<b>Screening combined with care management</b>				Healthcare



		Best Available Evidence			
support people at-risk	<i>Henry Ford Perfect Depression Care (Pre-cursor to Zero Suicide)</i>	✓		✓	Social Services
	<b>Crisis Intervention</b>				Public Health
	<i>National Suicide Prevention Lifeline</i>		✓	✓	Social Services
	<i>Applied Suicide Intervention Skills Training</i>		✓	✓	
Intervene to lessen harms and prevent future risk	<b>Treatment for people at risk of suicide</b>				Healthcare
	<i>Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)</i>		✓	✓	Social Services Justice
	<i>Collaborative Assessment and Management of Suicidality (CAMS)</i>		✓	✓	
	<i>Dialectical Behavioral Therapy</i>		✓	✓	
	<i>Attachment-Based Family Therapy</i>		✓		
	<b>Treatment to prevent re-attempts</b>				Healthcare
	<i>ED Brief Intervention with Follow-up Visits</i>	✓			Social Services
	<i>Active follow-up contact approaches</i>	✓	✓		
	<i>CBT for Suicide Prevention</i>				
	<b>Postvention</b>				Healthcare

		Best Available Evidence			
	<i>StandBy Response Service</i>		✓		
	<b>Safe messaging following a suicide</b>				Public Health
	<i>Media Guidelines</i>	✓			Media

<sup>1</sup>This column refers to the lead sectors well positioned to bring leadership and resources to implementation efforts. For each strategy, there are many other sectors such as non-governmental organizations that are instrumental to prevention planning and implementing the specific programmatic activities.



**Preventing Suicide:  
A Technical Package of Policy, Programs, and Practices**

**Prepared by:**

**Deb Stone, ScD, MSW, MPH  
Kristin Holland, PhD, MPH  
Brad Bartholow, PhD  
Alex Crosby, MD, MPH  
Shane Davis, PhD  
Natalie Wilkins, PhD**

**Division of Violence Prevention  
National Center for Injury Prevention and Control (NCIPC)  
Centers for Disease Control and Prevention**

**2016**

*Policies, Programs, and Practices to Support Individuals, Families, & Communities:*  
*A Technical Package to Prevent Suicide* is a publication of the National Center for Injury Prevention  
and Control of the Centers for Disease Control and Prevention.

Centers for Disease Control and Prevention  
Thomas R. Frieden, MD, MPH, Director

National Center for Injury Prevention and Control  
Debra E. Houry, MD, MPH, Director

Division of Violence Prevention  
James A. Mercy, PhD, Director

*Suggested Citation:* Stone, D.M., Holland, K.M., Bartholow, B., Crosby, A.E., Davis, S., and Wilkins, N.  
Policies, Programs, and Practices to Support Individuals, Families, and Communities: *A Technical  
Package to Prevent Suicide*. Atlanta, GA: National Center for Injury Prevention and Control, Centers for  
Disease Control and Prevention, 2016.



## Contents

Acknowledgements.....	4
External Reviewers.....	5
Overview of Technical Package.....	6
Strengthen Economic Supports.....	13
Strengthen Access to Mental Health Care.....	16
Create Protective Environments.....	18
Promote Connectedness.....	22
Teach Coping and Problem-Solving Skills.....	24
Identify and Support People At-Risk.....	28
Intervene to Lessen Harms and Prevent Future Risk.....	32
Sector Involvement.....	37
Monitoring and Evaluation.....	39
Conclusion.....	40
References.....	42
Appendix A.....	50

## Acknowledgments

[to be inserted later]



## External Reviewers

[to be inserted later]

## Overview

This technical package represents a select group of strategies based on the best available evidence to help communities and states sharpen their focus on prevention activities with the greatest potential to prevent suicide. These strategies include strengthening economic supports; strengthening access to mental health care; creating protective environments; promoting connectedness; teaching coping and problem-solving skills; identifying and supporting people at-risk; and intervening to lessen harms and prevent future risk. The strategies represented in this package include those with a focus on preventing suicide from happening in the first place as well as approaches to lessen the immediate and long-term harms of suicidal behavior for individuals, families, communities, and society. The strategies in the technical package support the goals and objectives of the National Strategy for Suicide Prevention and the National Action Alliance for Suicide Prevention's priority to strengthen community-based prevention. Commitment, cooperation, and leadership from numerous sectors, including public health, education, justice, health care, social services, business, labor, and government can bring about the successful implementation of this package.

### What is a Technical Package?

A technical package is a compilation of a core set of strategies to achieve and sustain substantial reductions in a specific risk factor or outcome (Frieden, 2014). Technical packages help communities and states prioritize prevention activities based on the best available evidence. This technical package has three components. The first component is the **strategy** or the preventive direction or actions to achieve the goal of preventing suicide. The second component is the **approach**. The approach includes the specific ways to advance the strategy. This can be accomplished through *programs, policies, and practices*. The approaches included come primarily from studies based in the United States. The **evidence** for each of the approaches in preventing suicide or its associated risk factors is included as the third component. This package is intended as a resource to guide and inform prevention decision-making in communities and states.

### Preventing Suicide is a Priority

Suicide, as defined by the Centers for Disease Control and Prevention (CDC), is part of a broader class of behavior called *self-directed violence*. Self-directed violence refers to behavior directed at oneself that deliberately results in injury or the *potential* for injury (A.E. Crosby, Ortega, & Melanson, 2011). Self-directed violence may be *suicidal* or *non-suicidal* in nature. For the purposes of this document, we refer only to behavior where suicide is intended:

- **Suicide** is a death caused by self-directed injurious behavior with any intent to die as a result of the behavior.



- **Suicide attempt** is defined as a *non-fatal* self-directed and potentially injurious behavior with any intent to die as a result of the behavior. A suicide attempt may or may not result in injury.

**Suicide is highly prevalent.** Suicide presents a major challenge to public health in the United States and worldwide. It contributes to premature death, morbidity, lost productivity, and health care costs (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014). In 2014 (the most recent year of available death data), suicide was responsible for 42,773 deaths in the U.S., which is approximately one suicide every 12 minutes (Centers for Disease Control and Prevention, 2016d). In 2014, suicide ranked as the 10th leading cause of death and has been among the top 12 leading causes of death since 1975 in the U.S (Centers for Disease Control and Prevention, 2016d). Overall suicide rates have increased 24% from 1999 to 2014 (Curtin, Warner, & Hedegaard, 2016). Suicide is a problem throughout the life span; it is the second leading cause of death among those aged 10–34 years; it is the fourth leading cause among persons in their 40s and seventh among persons in their 50s. Suicide rates vary by race/ethnicity with the highest rates, across the lifespan, occurring among non-Hispanic American Indian/Alaska Native (AI/AN) (rate: 17.8/100,000). Among AI/AN, young people are disproportionately at increased risk of suicide with young males aged 25-29 experiencing the highest rates (rate: 56.9/100,000) (Centers for Disease Control and Prevention, 2016d). Moreover, suicide rates among non-Hispanic AI/AN have increased by 48.7% since 1999.

Suicides reflect only a portion of the problem (A.E. Crosby, Han, Ortega, Parks, & Gfroerer, 2011). Substantially more people are hospitalized as a result of nonfatal suicidal behavior (i.e. suicide attempts) than are fatally injured, and an even greater number are either treated in ambulatory settings (e.g., emergency departments) or not treated at all (A.E. Crosby, Han, et al., 2011). For example, during 2014, among adults aged 18 years and older, for every one suicide there were 9 adults treated in hospital emergency departments for self-harm injuries, 27 who reported making a suicide attempt, and over 227 who reported seriously considering suicide (i.e. ideation) (Ferdon et al., In press).

**Suicide is associated with several risk and protective factors.** Suicide, like other human behaviors, has no single determining cause. Instead, suicide occurs in response to multiple biological, psychological, interpersonal, environmental and societal influences that interact with one another, often over time. The social-ecological model-- encompassing multiple levels of focus from the individual, relationship, community, and societal-- is a useful framework for viewing and understanding suicide risk factors identified in the literature (Dahlberg & Krug, 2002). Risk and protective factors for suicide exist at each level. For example, risk factors include:

- **Individual level:** History of depression and other mental illnesses, hopelessness, substance abuse, certain health conditions, previous suicide attempt, violence victimization and perpetration, and genetic and biological determinants
- **Relationship level:** High conflict or violent relationships, sense of isolation and lack of social support, family/loved one's history of suicide, financial and work stress



- **Community level:** Inadequate community connectedness, barriers to health care (e.g., lack of access to providers and medications)
- **Societal level:** Availability of lethal means of suicide, unsafe media portrayals of suicide, stigma associated with help-seeking and mental illness (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014).

It is important to recognize that the vast majority of individuals who are depressed or who have other risk factors noted, do *not* die by suicide. Furthermore, the relevance of each risk factor can vary by age, race, gender, sexual orientation, residential geography, and socio-cultural and economic status (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014).

Protective factors, or those influences that guard *against* the risk for suicide, can also be found across the different levels of the social-ecological model. Protective factors identified in the literature include: effective coping and problem solving skills, moral objections to suicide, strong and supportive relationships with partners, friends, and family; connectedness to school, community and other social institutions; availability of quality and ongoing physical and mental health care, and reduced access to lethal means (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014). These protective factors can either counter a specific risk factor or guard against a number of risks associated with suicide.

**Suicide is connected to other forms of violence.** Suicide and other forms of violence often share some of the same root causes (Butchart, Phinney, Check, & Villaveces, 2004; Klevens, Simon, & Chen, 2012). For example, in neighborhoods where there is low social cohesion, or where residents don't support and trust each other, people are at higher risk for suicide (Desai, Dausey, & Rosenheck, 2005) as well as perpetration of child maltreatment (Coulton, Crampton, Irwin, Spilsbury, & Korbin, 2007; Freisthler, Merritt, & LaScala, 2006), teen dating violence (Capaldi, Knoble, Shortt, & Kim, 2012), intimate partner violence (Pinchevsky & Wright, 2012), and youth violence (Sampson, Morenoff, & Gannon-Rowley, 2002). Additionally, a lack of economic opportunities and unemployment are associated with suicide (Luo, Florence, Quispe-Agnoli, Ouyang, & Crosby, 2011; Reeves et al., 2012), as well as perpetration of child maltreatment (D. Runyan, Wattam, Ikeda, Hassan, & Ramiro, 2002), intimate partner violence (Heise & Garcia-Moreno, 2002; Pinchevsky & Wright, 2012), sexual violence (Centers for Disease Control and Prevention, 2016c) and youth violence (Wilson, 2011). Other shared risk factors for suicide and violence occur at the individual level and include substance abuse, mental health problems, witnessing violence, and a lack of problem-solving skills (Centers for Disease Control and Prevention, 2016a, 2016c, 2016e; U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012).

Just as risk factors may be shared across suicide and violence, so too may protective factors overlap. For example, ~~connectedness increases individual's and communities' resilience to suicide and other forms~~



~~of violence, including~~ connectedness to one's community (Basile, Hamburger, Swahn, & Choi, 2013; Borowsky, Hogan, & Ireland, 1997; Centers for Disease Control and Prevention, 2016b; Coulton et al., 2007; Kleiman, Riskind, Schaefer, & Weingarden, 2012; Pinchevsky & Wright, 2012; Widome, Sieving, Harpin, & Hearst, 2008), school (Basile, Espelage, Rivers, McMahon, & Simon, 2009; Capaldi et al., 2012; Carter, McGee, Taylor, & Williams, 2007; DeGue et al., 2013; Hong, Kral, Espelage, & Allen-Meares, 2012; Losel & Farrington, 2012), family (Capaldi et al., 2012; Centers for Disease Control and Prevention, 2016a; Elgar, Craig, Boyce, Morgan, & Vella-Zarb, 2009; Maimon, Browning, & Brooks-Gunn, 2010; Resnick, Ireland, & Borowsky, 2004), caring adults (Capaldi et al., 2012; Losel & Farrington, 2012; Maimon et al., 2010), and pro-social peers (Capaldi et al., 2012; Losel & Farrington, 2012) enhances resilience to suicide and other forms of violence.

**The health and economic consequences of suicide are substantial.** Suicide and suicide attempts have far-reaching consequences for individuals, families, and communities (Dunne, McIntosh, & Dunne-Maxim, 1987; Mishara, 1995; National Action Alliance for Suicide Prevention: Suicide Attempt Survivors Task Force, 2014; National Action Alliance for Suicide Prevention: Survivors of Suicide Loss Task Force, 2015). In an early study, Crosby and Sacks (2002) estimated that 7% of the U.S. adult population, or 13.2 million adults, knew someone in the prior 12 months who had died by suicide. They also estimated that for each suicide, 425 adults were exposed, or knew about the death. In a more recent study, in one state, Cerel et al. (2016) found that 48% of the weighted survey population knew at least one person who died by suicide in their lifetimes. Research indicates that the impact of knowing someone who died by suicide and/or having lived experience (i.e. having attempted suicide oneself) is much more extensive than injury and death. Suicide attempt survivors may suffer long-term health and mental health consequences ranging from anger, guilt, and physical impairment, depending on the means and severity of the attempt (Chapman & Dixon-Gordon, 2007). Similarly, survivors of a loved one's suicide may experience ongoing pain and suffering including complicated grief (Mitchell, Kim, Prigerson, & Mortimer-Stephens, 2004), stigma, depression, anxiety, post-traumatic stress disorder, and increased risk of suicidal ideation and suicide (Julie Cerel, McIntosh, Neimeyer, Maple, & Marshall, 2014; Sudak, Maxim, & Carpenter, 2008). In addition to the emotional and physical toll, survivors of suicide may also struggle financially and occupationally (Florence, Simon, Haegerich, Luo, & Zhou, 2015).

The economic toll of suicide is immense as well. According to more conservative estimates, in 2013, suicide cost \$50.8 billion in estimated lifetime medical and work-loss costs (Florence et al., 2015). By another estimate, the total lifetime costs associated with nonfatal injuries and deaths caused by self-directed violence in 2013 were approximately \$93.5 billion after adjusting for under-reporting of suicide (Shepard, Gurewich, Lwin, Reed, & Silverman, 2016). The overwhelming burden of these costs results from lost productivity over the life course, with the average cost per suicide being over \$1.3 million (Shepard et al., 2016).

**Comment [A]:** From TS: I found this wording somewhat awkward.

**Comment [A]:** From TS: It seems like it would be appropriate to acknowledge the CDC estimate too. Consider using that as a minimum and then say that others have estimated that the costs could be considerably higher after adjusting for under-reporting of suicide.



**Suicide can be prevented.** Despite the myths surrounding suicide, like most public health problems, suicide is preventable (U.S. Public Health Service, 1999). And while progress will continue to be made into the future, evidence for numerous programs, practices, and policies currently exists, and many programs are ready to be implemented now. Just as suicide is not caused by a single factor, research suggests that suicide will not be prevented by any single intervention taking place in any single setting (Silverman & Maris, 1995; U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). Rather, suicide prevention is best achieved by a focus across the individual, relationship, family, community, and societal-levels and across all sectors, private and public (e.g., business, public health, physical and behavioral healthcare, justice, education, labor) (National Action Alliance for Suicide Prevention, 2014; World Health Organization, 2014).

### Assessing the Evidence

This technical package includes programs, practices, and policies with evidence of impact on suicide or risk or protective factors for suicide. To be considered for inclusion in the technical package, the program, practice, or policy selected had to meet at least one of these criteria: a) meta-analyses or systematic reviews showing impact on suicide; b) evidence from at least one rigorous (e.g., randomized controlled trial [RCT] or quasi-experimental design) evaluation study that found significant preventive effects on suicide; c) meta-analyses or systematic reviews showing impact on risk or protective factors for suicide, or d) evidence from at least one rigorous (e.g., RCT or quasi-experimental design) evaluation study that found significant impacts on risk or protective factors for suicide. Finally, consideration was also given to the likelihood of achieving beneficial effects on multiple forms of violence; no evidence of harmful effects on specific outcomes or with particular subgroups; and feasibility of implementation in a U.S. context if the program, policy, or practice has been evaluated in another country.

Within this technical package, some approaches do not yet have research evidence demonstrating impact on rates of suicide but instead are supported by evidence indicating impacts on risk or protective factors for suicide (e.g., help-seeking, stigma reduction, depression, connectedness). In terms of the strength of the evidence, programs that have demonstrated effects on suicidal behavior (e.g., reductions in deaths, attempts) provide a higher-level of evidence, but the evidence base is not that strong in all areas. For instance, there has been less evaluation of community engagement and family programs on suicidal behavior. Thus, approaches in this package that have effects on risk or protective factors reflect the **(developing mental)** nature of the evidence base and the use of the best available evidence at a given time.

It is also important to note that there is often significant heterogeneity among the programs, policies, or practices that fall within one approach or strategy area in terms of the nature and quality of the available evidence. Not all programs, policies, or practices that utilize the same approach (e.g., gatekeeper training) are equally effective, and even those that are effective may not work across all populations. Tailoring programs and more evaluation may be necessary to address different population groups. The

**Comment [A]:** From TS: “developmental nature” doesn’t seem correct. Do you mean the “current status”



examples provided are not intended to be a comprehensive list of evidence-based programs, policies, or practices for each approach, but rather illustrate models that have been shown to impact suicide or have beneficial effects on risk or protective factors for suicide. In practice, the effectiveness of the programs, policies and practices identified in this package will be strongly dependent on the quality of their implementation and the communities in which they are implemented. Implementation guidance to assist practitioners, organizations and communities will be developed separately.

### Context and Cross-Cutting Themes

The strategies and approaches that have been included in this technical package represent different levels of the social ecology, with efforts intended to impact the community and societal levels, as well individual and relationship levels. The strategies and approaches are intended to work in combination and reinforce each other to prevent suicide (see box below). The strategies are arranged in order such that those strategies hypothesized to have the greatest potential for broad public health impact on suicide are included first, followed by those that might impact more select populations (e.g., persons who have already made a suicide attempt).

Preventing Suicide	
Strategy	Approach
Strengthen economic supports	<ul style="list-style-type: none"> <li>Strengthen household financial security</li> <li>Housing stabilization policies</li> </ul>
Strengthen access to mental health care	<ul style="list-style-type: none"> <li>Coverage of mental health conditions in health insurance policies</li> </ul>
Create protective environments	<ul style="list-style-type: none"> <li>Reducing access to lethal means among persons at-risk of suicide</li> <li>Organizational policies and culture</li> <li>Community-based policies to reduce excessive alcohol use</li> </ul>
Promote connectedness	<ul style="list-style-type: none"> <li>Peer norm approaches</li> <li>Community engagement activities</li> </ul>
Teach coping and problem-solving skills	<ul style="list-style-type: none"> <li>Social-emotional learning</li> <li>Parenting skill and family relationship approaches</li> </ul>
Identify and support people at risk	<ul style="list-style-type: none"> <li>Gatekeeper training</li> <li>Screening combined with care management</li> <li>Crisis intervention</li> </ul>
Intervene to lessen harms and prevent future risk	<ul style="list-style-type: none"> <li>Treatment for people at-risk of suicide</li> <li>Treatment to prevent re-attempts</li> <li>Postvention</li> </ul>

The example programs, policies, and practices have been implemented within particular contexts. The social and cultural context of communities is critically important to take into account when selecting strategies and approaches. Practitioners in the field may be in the best position to assess the needs and strengths of their communities and work with community members to make decisions about the combination of approaches included here that are best suited to their context.

Suicide ideation, attempts, morbidity and mortality vary by gender, race/ethnicity, age, occupation, and other important population characteristics. Barriers to disclosure, help seeking, timely access to quality care, and ongoing support may also vary by population and community characteristics. Ideally, the availability of multiple approaches tailored to the economic, cultural, and environmental context of individuals and communities are desirable as they may increase the likelihood of removing barriers to supportive and effective care and provide opportunities to develop individual and community resilience. These culturally appropriate approaches can then be included in comprehensive strategies to maximize the public health impact on reducing suicide-related morbidity and mortality among individuals and within communities.

This package includes strategies where public health agencies are well positioned to bring leadership and resources to implementation efforts. It also includes strategies where public health can serve as an important collaborator (e.g., strategies addressing community and societal level risks), but where leadership and commitment from other sectors such as business, labor or health care is critical to implement a particular policy or program (e.g., workplace policies; screening combined with care management). The role of various sectors in the implementation of a strategy or approach in preventing suicide is described further in the section on *Sector Involvement*.

In the sections that follow, the strategies and approaches with the best available evidence for preventing suicide are described.



## Strengthen Economic Supports

### Rationale

Studies from the U.S. examining historical trends indicate that suicide rates increase during economic recessions marked by high unemployment rates, job losses, and economic instability and decrease during economic expansions and periods marked by low unemployment rates, particularly for working-age individuals 25 to 64 years old (Luo et al., 2011; Fowler et al., 2015). Economic and financial strain, such as job loss, long periods of unemployment, reduced income, difficulty covering medical, food, and housing expenses, and even the anticipation of such financial stress, can directly or indirectly increase an individual's risk for suicide; buffering these risks can therefore, potentially protect against suicide (Stack & Wasserman, 2007). For example, strengthening economic support systems can help people stay in their homes or obtain affordable housing while also paying for necessities such as food and medical care, job training, child care, among other expenses required for daily living. In providing this support, stress and anxiety and the potential for a crisis situation may be reduced, thereby preventing suicide.

### Approaches

Economic supports for individuals and families can be strengthened by targeting household financial security and ensuring stability in housing during periods of economic stress.

- **Strengthening household financial security** can potentially buffer the risk of suicide by providing individuals with the financial means to lessen the stress and hardship associated with a job loss or other unanticipated financial problems. The provision of unemployment benefits and other forms of temporary assistance, livable wages, medical benefits, and retirement and disability insurance to help cover the cost of necessities or to offset costs in the event of disability, are examples of ways to strengthen household financial security.
- **Housing stabilization policies** aim to keep people in their homes and provide housing options for those in need during times of financial insecurity. This may occur through programs that provide affordable housing such as through government subsidies or through other options available to potential homebuyers such as loan modification programs, move-out planning, or financial counseling services that help minimize the risk or impact of foreclosures and eviction.

### Potential Outcomes

- Reduced suicide rates
- Lower foreclosure rates
- Lower eviction rates
- Reduced emotional distress

**Comment [A]:** From TS: I was thinking that it might be good to work in a point about how these risks can be directly or indirectly associated with suicide risk because these stressors can exacerbate relationship as well physical and mental health problems.

**Comment [A]:** From JH: Consistent tense – reduced vs. reduce

**Comment [A]:** From LLD: the other packages use "Reductions in..."; you may want to consider using similar language for your potential outcomes.

## Evidence

There is evidence suggesting that strengthening household financial security and stabilizing housing can reduce suicide risk.

- **Strengthen household financial security.** An examination of variations in U.S. *unemployment benefit programs* across states demonstrated that the impact of unemployment on suicide was offset in those states that provided greater than average unemployment benefits (Cylus, Glymour, & Avendano, 2014). Another U.S. study examining the link between unemployment and suicide risk using monthly suicide data, length of unemployment, and job losses found that the duration of unemployment, as opposed to just the loss of job, predicted suicide risk (Classen & Dunn, 2012). Together, these results suggest that not only should state unemployment benefit programs be generous in their financial allocations, but also in their duration.

Other measures to strengthen household financial security (e.g., transfer payments related to retirement and disability insurance, unemployment insurance compensation, medical benefits, and other forms of family assistance) have also shown an impact on suicide. A study by Flavin and Radcliff (2009) examined the impact of states' per capita spending on transfer payments, medical benefits, and family assistance (Temporary Assistance to Needy Families – TANF) and total state spending on suicide rates between 1990-2000, controlling for a number of suicide risk factors (e.g., residential mobility, divorce rate, unemployment rate) at the state level. As per capita spending on total transfer payments, medical benefits, and family assistance increased there was an associated decrease in state suicide rates. Moreover, it wasn't spending in general that was associated with the reduction but spending on these types of assistance. In terms of lives saved, Flavin & Radcliff calculated the cost of reducing a state's suicide rate by a full point for the years studied. At the national level, they estimated that 3,000 fewer suicides would occur per year nationwide if every state increased their per capita spending on these types of assistance by \$45 per year (Flavin & Radcliff, 2009).

- **Housing stabilization policies.** The *National Neighborhood Stabilization Program* was designed to help neighborhoods suffering from high rates of foreclosure and abandonment by slowing the deterioration of the neighborhoods and providing affordable housing options for low, moderate, and middle-income homebuyers. This program also offers financial assistance to eligible individuals for the purchase of a new home. Although this program has not been rigorously evaluated for its impact on suicide outcomes, it addresses foreclosure and eviction, which are risk factors for suicide. A longitudinal analysis of annual data on suicides and foreclosures demonstrated that as the proportion of foreclosed properties increased in U.S. states, so did the state suicide rate, particularly among working-aged adults (Houle & Light, 2014). Another study

**Comment [A]:** From TS: Consider including a point about this being a correlational study and more evaluation work is needed but it suggests the potential benefits of policies that reach those who are particularly vulnerable at the times when they are in greatest need.



of data from 16 U.S. states participating in the National Violent Death Reporting System found that suicides precipitated by home foreclosures and evictions increased more than 100% from 2005 (before the housing crisis began) to 2010 (after it had peaked; Fowler, Gladden, Vagi, Barnes, and Frazier (2015)). Most of these suicides occurred prior to the actual loss of the decedent's home. These findings suggest that integrating suicide prevention resources, messaging, and referrals into financial, foreclosure, and move-out planning and counseling services may help to prevent suicide.

## Strengthen Access to Mental Health Care

### Rationale

While most people with mental health problems do not attempt or die by suicide (Olfson, Gerhard, Huang, Crystal, & Stroup, 2015; Owens, 2002), and risk conferred by mental illnesses differ (Arsenault-Lapierre, Kim, & Turecki, 2004; E. C. Harris & Barraclough, 1997; Tyrer, Reed, & Crawford, 2015), previous research indicates that mental illness is an important risk factor for suicide (E. C. Harris & Barraclough, 1998; World Health Organization, 2014). Studies suggest that up to 90% of people who die by suicide may have had a mental illness at the time of their deaths (Arsenault-Lapierre et al., 2004; Cavanagh, Carson, Sharpe, & Lawrie, 2003; Isometsa, 2001). State-level suicide rates have also been found to be correlated with general mental health measures such as depression (Lang, 2013; Mark, Shern, Bagalman, & Cao, 2007). Findings from the National Comorbidity Survey indicate that relatively few people in the U.S. with mental health disorders receive treatment for those conditions (Kessler et al., 2005). Lack of access to mental health care is one of the contributing factors related to the underuse of mental health services (Cunningham, 2009). Identifying ways to improve access to timely, affordable, and quality mental health care for people in need is a critical component to suicide prevention (World Health Organization, 2014). Apart from the treatment benefits, it can also serve to normalize help-seeking behavior and increase the use of such services.

### Approaches

One approach to strengthening access to mental health care is through the provision of mental health coverage in health insurance policies.

- **Coverage of mental health conditions in health insurance policies.** Federal and state laws include provisions for equal coverage of mental health services in health insurance plans that is on par with coverage for other health concerns (i.e., mental health parity). Benefits and services covered include such things as the number of visits, co-pays, deductibles, inpatient/outpatient services, prescription drugs, and hospitalizations. If a state has a stronger mental health parity law than the federal parity law, then insurance plans regulated by the state must follow the state parity law. Federal parity replaces the state law only in cases where the state law prevents the application of the federal parity law (e.g., includes coverage for some mental health conditions but not others). Equal coverage does not necessarily imply good coverage as health insurance plans vary in the extent to which benefits and services are offered to address various health conditions. Rather it helps to ensure that mental health services are covered on par with other health concerns.

### Potential Outcomes

- Increased utilization of mental health services

**Comment [A]:** From JM: I assume this means that different types of mental health problems pose different risks for suicide, but wasn't sure? May want to make the point more explicit

**Comment [A]:** From TS: Isn't this including substance abuse disorder? It would be good to state this explicitly.

**Comment [A]:** From TS: I found this sentence confusing. Can you reword to simplify this.

From LLD: could say: "if a state has a weaker parity law than the federal parity law (e.g., includes coverage for some mental health conditions but not others), then the federal parity law will replace the state law."



- Decreased symptoms of mental illnesses
- Decreased rates of suicide attempts
- Decreased rates of suicide

### Evidence

There is evidence suggesting that coverage of mental health conditions in health insurance policies can reduce risk factors associated with suicide and may directly impact suicide rates.

- **Coverage of mental health conditions in health insurance policies.** The National Survey of Drug Use and Health is a nationally representative survey of the U.S. population that provides data on substance use, mental health conditions, and services utilization. Using data from this survey, K. M. Harris, Carpenter, and Bao (2006) found that 12 months after states enacted *mental health parity laws*, self-reported use of mental healthcare services significantly increased. Moreover, subsequent research by Lang (2013) examined state mental health laws and suicide rates between 1990 and 2004 and found that mental health parity laws, specifically, were associated with an approximate 5% reduction in suicide rates. This reduction, in the 29 states with parity laws, equated to the prevention of 592 suicides per year. Lang et. al (2013) estimated the cost of saving a life through such mandates as mental health parity by comparing the loss in wages attributable to the policy, via increased premiums, to the number of lives saved. Based on these calculations, the cost of saving one life was between and a cost savings of \$1.3-3.1 million. However, this calculation did not take into account the saving associated with improved mental health among non-suicidal individuals, increases in productivity, or quality of life associated with increased mental health care. As such, this figure is considered the upper bounds on costs incurred and should be interpreted with caution per suicide prevented (Lang, 2013).

**Comment [A]:** From TS: I don't think this is accurate. I was curious about this study and checked out the paper. I think they are saying that this is the cost incurred per suicide prevented. They go on to explain that this is the upper bound and does not reflect the benefits to non-suicidal individuals. Please confirm this. If you are going to include this then it will be important to explain it further.

## Create Protective Environments

### Rationale

Prevention efforts that focus not only on individual behavior change (e.g., help-seeking, treatment interventions) but on changes to the environment can increase the likelihood of positive behavioral and health outcomes (Haddon, 1980). Creating environments that address risk and protective factors where individuals live, work, and play, can help prevent suicide (Dahlberg & Krug, 2002; U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). For example, rates of suicide and suicide attempts are elevated in certain occupational groups (Han et al., 2016; McIntosh et al., 2016), therefore, changes to the organizational culture in these occupations, by way of implementation of supportive policies or even physical modifications to the workplace environment, can change social norms, encourage help-seeking, and demonstrate that good health and mental health are valued and that stigma and other risk factors for suicide are not (K. L. Knox et al., 2010; National Action Alliance for Suicide Prevention Workplace Task Force, 2015). Similarly, modifying the characteristics of the environment to prevent harmful behavior such as access to lethal means can reduce suicide rates, particularly in times of crisis (Beautrais, Gibb, Fergusson, Horwood, & Larkin, 2009; A.E. Crosby, Espitia-Hardeman, Ortega, & Lozano, 2013; Kaplan et al., 2013; Miller, Warren, Hemenway, & Azrael, 2015; C. W. Runyan et al., 2016).

### Approaches

The current evidence suggests three **promising** approaches for creating environments that protect against suicide.

- **Reducing access to lethal means among persons at-risk of suicide.** Means of suicide such as firearms, hanging/suffocation, or jumping from heights provide little opportunity for rescue and, as such, have high case fatality rates (e.g., about 85% of people who use a firearm in a suicide attempt will die from the injury). Research also indicates that 1) the interval between thinking about and attempting suicide can be as short as 5 or 10 minutes (Deisenhammer et al., 2009; Simon et al., 2001) and 2) that people tend *not* to substitute a different method when a highly lethal method is unavailable or difficult to access (Hawton, 2007; Yip et al., 2012). Therefore, increasing the time interval between the thought and the suicide attempt, for example, by making it more difficult to access lethal means, can be lifesaving. The following are examples of approaches reducing access to lethal means for persons at-risk of suicide:
  - *Intervening at Suicide Hotspots.* Suicide hotspots, or places where suicides may take place relatively easily, include tall structures (e.g., bridges and cliffs), railway tracks, and isolated locations such as parks. Efforts to prevent suicide at these locations include

**Comment [A]:** From JM: The word promising has certain connotations when using it around evidence. You say later that the evidence around this strategy is some of the strongest for suicide. These two statements seem somewhat inconsistent. I would use a different word here then promising if you truly believe there is strong evidence.

From JH: suggest deleting the word "promising"

From LLD: since we don't want to infer that these are the only approaches for creating protective environments, I might be inclined to change the word "promising" to "potential" or "possible" or something along those lines.



erecting barriers to prevent jumping and installing signs and telephones to encourage individuals who are considering suicide, to seek help (Cox et al., 2013).

- *Safe Storage Practices.* Safe storage of medications, firearms, and other household products can reduce the risk for suicide by separating individuals who may be vulnerable and/or impulsive from easy access to lethal means. Such practices may include education and counseling around storing firearms--locked in a secure place (e.g., in a gun safe or lock box), unloaded and separate from the ammunition--and keeping medicines in a locked cabinet or other secure location away from people who may be at risk or who have made prior attempts (Rowhani-Rahbar, Simonetti, & Rivara, 2016; C. W. Runyan et al., 2016).

- **Organizational policies and culture** that promote protective environments may be implemented in places of employment. Such policies and cultural values may promote prosocial behavior (e.g., asking for help), skill building, changing social norms, referral and access to helping services (e.g. mental health, substance abuse treatment, financial counseling), and encourage leadership support from the top down. Such policies and cultural shifts can positively impact organizational climate and morale and help prevent suicide and its related risk factors (e.g. depression, social isolation) (National Action Alliance for Suicide Prevention Workplace Task Force, 2015).
- **Community-based policies to reduce excessive alcohol use.** Research studies in the United States have found that greater alcohol availability is positively associated with alcohol-involved suicides (Escobedo & Ortiz, 2002; Giesbrecht et al., 2015). Policies to reduce excessive alcohol use broadly include zoning to limit alcohol outlet locations and density, taxes on alcohol, and bans on the sale of alcohol for individuals under the legal drinking age. These policies are important because acute alcohol use has been found to be associated with more than one-third of suicides and approximately 40% of suicide attempts (Cherpitel, Borges, & Wilcox, 2004).

#### Potential Outcomes

- Increase in safe storage of means
- Reduction in suicide attempts
- Reduction in suicide deaths
- Increase in help-seeking
- Reduction in alcohol-related suicide deaths

#### Evidence

The evidence for the effectiveness reducing access to lethal means for person at-risk of suicide and other ways to establish protective environments is some of the strongest in the field (Zalsman et al., 2016).

**Comment [A]:** From JM: Consistent with promising used earlier? Is it the strongest?

- **Reducing access to lethal means among persons at-risk of suicide.** A meta-analysis examining the impact of *suicide hotspot interventions* implemented in combination or in isolation, both in the U.S. and abroad, found associated reduced rates of suicide (Cox et al., 2013; Pirkis et al., 2015). For example, after erecting a barrier on the Jacques-Cartier bridge in Canada, the suicide rate from jumping from the bridge decreased from about 10 suicide deaths per year to about 3 deaths per year (Perron, Burrows, Fournier, Perron, & Ouellet, 2013). Moreover, the reduction in suicides by jumping was sustained even when all bridges and nearby jumping sites were considered, suggesting little to no displacement of suicides to other jumping sites (Perron et al., 2013). Further evidence for the effectiveness of bridge barriers was demonstrated by a study examining the impact of the *removal* of safety barriers from the Grafton Bridge in Auckland, New Zealand. After removal of the barrier, both the number and rate of suicide increased fivefold (Beautrais, 2001; Beautrais et al., 2009).

Another form of means reduction involves implementation of *safe storage practices*. In a case-control study of firearm-related events identified from 37 counties in Washington, Oregon, and Missouri, and from 5 trauma centers, Grossman et al. (2005) found that storing firearms unloaded, separate from ammunition, in a locked place or secured with a safety device was protective of suicide attempts among adolescents. Further, a recent systematic review of clinic and community-based education and counseling interventions suggested that the provision of safety devices significantly increased safe firearm storage practices compared to counseling alone or compared to the provision of economic incentives to acquire safety devices on one's own (Rowhani-Rahbar et al., 2016).

Another program, *The Emergency Department Counseling on Access to Lethal Means (ED CALM)*, trained psychiatric emergency clinicians in a large children's hospital to provide lethal means counseling and safe storage boxes to parents of patients under age 18 receiving care for suicidal behavior. In a pre-post quality improvement project, Runyan et al (2016) found that at post-test 76% (of the 55% of parents followed up, n=114) reported that all medications in the home were locked up as compared to fewer than 10% at the time of the initial emergency department visit. Among parents who indicated the presence of guns in the home at pre-test (i.e. 67%), all (100%) reported guns were currently locked up at post-test (C. W. Runyan et al., 2016).

- **Organizational policies and culture.** *Together for Life* is a workplace program of the Montreal Police Force implemented to address suicide among officers. Policy and program components were designed to foster an organizational culture that promoted mutual support and solidarity among all members of the Force. The program included training of supervisors, managers and all units to improve competencies in identifying suicidal risk and to improve use and awareness of existing resources. The program also included an education campaign to improve awareness and help-seeking (Mishara & Martin, 2012). Police suicides were tracked over 12 years and



compared to rates in the control city of Quebec. The suicide rate in the intervention group decreased significantly by 78.9% to a rate of 6.4 suicides per 100,000 population per year compared to an 11% increase in the control city (29.0 per 100,000) (Mishara & Martin, 2012).

Another example of this approach is the *United States Air Force Suicide Prevention Program (AFSPP)*. AFSPP included 11 policy and education initiatives and was designed to change the culture of the Air Force surrounding suicide. The program uses leaders as role models and agents of change, establishes expectations for behavior related to awareness of suicide risk, develops population skills and knowledge (i.e., education and training), and investigates every suicide (i.e., outcomes measurement). The program represents a fundamental shift from viewing suicide and mental illness solely as medical problem and instead sees them as larger service-wide problems impacting the whole community (K. L. Knox, Litts, Talcott, Feig, & Caine, 2003). Using a time-series design to examine the impact of the AFSPP program on various violence-related outcomes, researchers found that the program was associated with a 33% relative risk reduction in suicide (K. L. Knox et al., 2003). The program was also associated with relative risk reductions in related outcomes including moderate and severe family violence (30% and 54%, respectively), homicide (51%), and accidental death (18%) (K. L. Knox et al., 2003). A longitudinal assessment of the program over the period 1981 to 2008 (16 years before the 1997 launch of the program and 11 years post-launch) found significantly lower rates of suicide after the program was launched than before (K. L. Knox et al., 2010). These effects were sustained over time, except in 2004, which the authors found was associated with less rigorous implementation in that year than in the other years (K. L. Knox et al., 2010).

- **Community-based policies to reduce excessive alcohol use.** While multiple policies to limit excessive use of alcohol exist, several studies on alcohol outlet *density*, specifically, suggest that measures to reduce alcohol outlet density can potentially reduce alcohol-involved suicides. Additionally, a longitudinal analysis of alcohol outlet density, suicide mortality, and hospitalizations for suicide attempts over 6 years in 581 California zip codes indicated that the density of bars, specifically, is related to suicide and suicide attempts, particularly in rural areas (Johnson, Gruenewald, & Remer, 2009).

## Promote Connectedness

### Rationale

Sociologist, Emile Durkheim theorized in 1897 that weak social bonds, i.e. lack of connectedness, are among the chief causes for suicidality (Durkheim, 1897/1951). *Connectedness* is the degree to which an individual or group of individuals are socially close, interrelated, or share resources with others (Centers for Disease Control and Prevention, 2009). Social connections can be formed within and between multiple levels of the social ecology (Dahlberg & Krug, 2002), for instance between individuals (e.g. peers, neighbors, co-workers), families, schools, neighborhoods, workplace, faith communities, cultural groups, and society as a whole. Related to connectedness, *social capital* refers to a sense of trust in one's community and neighborhood, social integration, and also the availability and participation in social organizations (Beyer, Layde, Hamberger, & Laud, 2015; Muennig, Cohen, Palmer, & Zhu, 2013). Many ecological cross-sectional and longitudinal studies have examined the impact of aspects of social capital on depression symptoms, depressive disorder, mental health more generally, and suicide. While the evidence is still being built the pattern is towards a positive ~~n inverse~~ association between social capital measured by social trust, community/ neighborhood engagement, and improved mental health. Connectedness and social capital together can serve to protect against suicidal behaviors by decreasing isolation, encouraging adaptive coping behaviors, increasing belongingness, personal value and worth all of which helps individuals to build resilience in the face of adversity. Connectedness can also provide individuals with better access to formal supports and resources, mobilize communities to meet the needs of its members and provide collective primary prevention activities to the community as a whole (Centers for Disease Control and Prevention, 2009).

### Approaches

Promoting connectedness among individuals and within communities through modeling peer norms and enhancing community engagement can protect against suicide.

- **Peer norm approaches** seek to normalize prosocial behaviors/protective factors for suicide such as help-seeking, reaching out and talking to trusted adults, and promote peer connectedness. These approaches typically target youth and are delivered in school settings but can also be implemented in community settings.

**Comment [A]:** From JM: Seems like a nuance you can delete from this paragraph. You don't really pick up on this later and it probably requires more explanation

**Comment [A]:** From JH: Awkward wording. Consider, while the evidence is limited, existing studies suggest...

**Comment [A]:** From JM: This implies that prosocial behavior is currently abnormal. Maybe promote is a better word?

From JH: suggest deleting "seek to normalize" and say "Peer norm approaches encourage prosocial behavior..."

**Comment [A]:** I prefer to keep it as normalize and took out prosocial behavior. We want to normalize help-seeking versus making it seem like a personal weakness.



- **Community engagement activities.** Community engagement is an aspect of social capital. Community engagement approaches may involve residents participating in a range of activities, including religious activities, community clean-up and greening activities, and physical exercise. These activities provide opportunities for residents to become more involved in the community and to connect with other community members, organizations, and resources, resulting in enhanced overall physical health, reduced stress, and decreased depressive symptoms, thereby reducing risk of suicide.

### Potential Outcomes

- Reduction in maladaptive coping attitudes and behaviors
- Increase in healthy coping attitudes and behaviors
- Increase in referrals for youth in distressed
- Increase help-seeking behaviors
- Positive perception of adult support

### Evidence

Current evidence suggests that peer norm approaches and community engagement can reduce risk factors associated with suicidal behaviors.

- **Peer norm approaches.** Evaluations show that programs such as *Sources of Strength* can improve school norms and beliefs about suicide that are created and disseminated by student peers. In a randomized controlled trial of *Sources of Strength* conducted with 18 high-schools (6 metropolitan, 12 rural), Wyman et al. (2010) found that the program improved peer leaders' adaptive norms regarding suicide, their connectedness to adults, and school engagement. Peer leaders were also more likely than controls to refer a suicidal friend to an adult. Among students, the intervention increased perceptions of adult support for suicidal youths and the acceptability of seeking help. Perception of adult support increased most in students with a history of suicidal ideation. Finally, trained peer leaders also reported a greater decrease in maladaptive coping attitudes compared with untrained leaders (Wyman et al., 2010).
- **Community engagement activities.** A vacant lot greening initiative was undertaken in Philadelphia between 1999 and 2008. Local residents and community members worked together to green 4,436 lots (or 7.8 million square feet) in 4 areas of the city. Researchers found significant associated reductions in community residents' self-reported stress levels and engagement in more physical exercise than residents in control vacant lot areas. Other benefits included reductions in firearm assaults and vandalism (Branas et al., 2011).

**Comment [A]:** From JH: Cite findings from Let's Connect intervention program? While the intervention didn't significantly reduce suicidal behavior, there were significant improvements in connectedness (a protective factor for suicide).

**Comment [A]:** From TS: Is there any evidence on outcomes more proximal to suicide? Did they look for any and not find them? It is important to describe relevant null effects when they were found.

**Comment [A]:** From JM: Not seeing strong evidence here. Are you suggesting that this affects documented risk factors for suicide by reducing stress and increasing physical exercise? I would like to see a stronger evidence statement here.

From LLD: you might want to incorporate a phrase in the statement along the lines of "which are risk factors for suicide"

**Comment [A]:** From TS: They had a follow up paper in 2013 that showed intervention sites felt significantly safer. The effects on crimes was encouraging but not significant. It seems important to mention this too.

From LLD: not sure I agree with Tom's last point about mentioning the nonsignificant effect on crime.

## Teach Coping and Problem-Solving Skills

### Rationale

Building life skills prepares individuals to successfully tackle every day challenges and adapt to stress and adversity. Life skills encompasses many concepts, but most often include coping and problem-solving skills, conflict resolution, and critical thinking. Life skills are important in shielding individuals from suicidal behaviors (World Health Organization, 2014). Suicide prevention programs that focus on life and social skills training are drawn from social cognitive theories (Bandura, 1986), surmising that suicidal behavior is attributed to either direct learning, modeling, and environmental and individual (e.g. hopelessness) characteristics. The literature linking life skills and suicide is robust. The inability to employ adequate strategies to cope with immediate stressors or identify and find solutions for problems has been characterized among suicide attempters (Pollock & Williams, 2004). Treatments that include bolstering skills (Goldsmith, Pellmar, Kleinman, & Bunney, 2002) and include problem-solving techniques (Ghahramanlou-Holloway, Bhar, Brown, Olsen, & Beck, 2012; Townsend et al., 2001) appear to reduce suicidal ideation and attempts more effectively. Prevention programs focused on teaching these skills target youth, parents and families and have been used with both universal and at-risk populations. While many do not target suicidal behaviors directly, these programs strive to train youth and parents in important life skills to offset the underlying vulnerabilities that contribute to engaging in high-risk behaviors early in life.

**Comment [A]:** Specific edits needed here.

**Comment [A]:** From LLD: the word "either" here implies another comparative clause; should the word "or" be inserted before the word "modeling"? May want to just delete the word "either"

### Approaches

Current evidence provides support for the following two approaches:

- **Social emotional learning programs** focus on developing and strengthening communication and problem-solving skills, emotion regulation, conflict resolution, help seeking and coping skills. These approaches address a range of risk and protective factors for suicidal behavior. They provide children and youth with skills to resolve problems in relationships, school, and with peers, and help youth to address other negative influences (e.g., substance use) associated with suicide. These approaches are typically delivered to all students in a particular grade or school, although some programs also focus on groups of students considered to be at high risk for suicide. Opportunities to practice and reinforce skills are an important part of programs that work (Herman, Borden, Reinke, & Webster-Stratton, 2011).
- **Parenting skill and family relationship programs** are designed to strengthen parenting skills, enhance positive parent-child interactions, and improve children's behavioral and emotional skills and abilities. Several parenting and family relationship programs have been shown in rigorous evaluations to improve resilience and reduce risk factors for various behaviors, including



ones closely related to suicide, such as depression, internalizing behaviors, and substance abuse (M. S. Knox, Burkhart, & Hunter, 2010).

### Potential Outcomes

- Reduction in suicide attempts and suicide ideation
- Enhanced knowledge of risk and protective factors associated with suicide
- Reduction in suicide risk behaviors (i.e., depression, anxiety, conduct problems, substance abuse)
- Improve and normalize help-seeking behavior
- Enhance social competence and emotional regulation skills
- Enhance problem-solving and conflict management skills

### Evidence

There are several programs with evidence that support teaching social, emotional and parenting skills to reduce suicidal behaviors and associated risk factors.

- **Social emotional learning programs.** The *Youth Aware of Mental Health Program (YAM)* is a program developed for teenagers that uses interactive dialogue and role-playing to teach adolescents about the risk and protective factors associated with suicide (including knowledge about depression and anxiety) and enhances their problem-solving skills for dealing with adverse life events, stress, school and other problems. The program includes 3 hours of role-play sessions and interactive workshops combined with a booklet that students can keep, educational posters displayed in classroom, and interactive lectures about mental health at the beginning and end of the program (Wasserman et al., 2014). In a cluster-randomized controlled trial of YAM conducted across 10 European Union countries and 168 schools, students participating in the YAM program were significantly less likely to have an incident suicide attempt (OR 0.45, 95%CI 0.24–0.85;  $p=0.014$ ) and severe suicidal ideation (0.50, 0.27–0.92;  $p=0.025$ ) at the 12-month follow-up compared to the control group. Additionally, related to severe suicide ideation, in the YAM group absolute risk fell by 0.50% and relative risk fell by 49.6% (Wasserman et al., 2014).

*Signs of Suicide (SOS)* is another school-based prevention program for students aged 13–17. The program includes guided classroom discussions about suicide and depression. As part of the program, students are screened for depression and suicide risk and referred for professional help as indicated. The program is designed to increase knowledge about suicide and risk factors associated with suicidal behavior as well as improve and normalize help-seeking behavior (Schilling, Aseltine, & James, 2016). In a randomized controlled trial, SOS was shown to reduce self-reported suicide attempts at 3-months post intervention among

**Comment [A]:** From JH: Report ages (compare to SOS below)

**Comment [A]:** From JH: Suggest translating OR and 95% CI for wider audience.

From LLD: agree; this is too technical for a wider audience. See Tom's suggestion below.

**Comment [A]:** From JH: state if the control group received any kind of intervention

**Comment [A]:** From JH: significant?

**Comment [A]:** From TS: The Lancet paper has a 2015 publication date.

The authors provide the absolute and RR for suicide attempts too and they give a clear way of thinking about this – i.e., for RR “Of 1000 pupils, 11 attempted suicide in the control group vs five attempts in YAM”

It might be worth using the attempt example so you can provide this explanation.

**Comment [A]:** From JH: significant? Effect size/magnitude of reduction?



participating students compared to control students. The SOS program also increased students' knowledge of how to get help for themselves or friends for depression and/or suicidal thoughts, and favorable attitudes toward help-seeking. SOS participants with a lifetime history of suicide attempt were also less likely to report planning a suicide in the 3 months following the program compared to lower-risk participants (Schilling et al., 2016).

Finally, the *Good Behavior Game (GBG)* is a classroom-based program for elementary school children aged 6-10; it represents an example of upstream suicide prevention programming. The program uses a team-based behavior management strategy that promotes good behavior by setting clear expectations for good behavior and consequences for maladaptive behavior. The goal of the GBG is to create an integrated classroom social system that is supportive of all children being able to learn with little aggressive or disruptive behavior (Wilcox et al., 2008). In an outcome evaluation of the GBG, first graders assigned to GBG reported half the adjusted odds of suicidal ideation and suicide attempts. The beneficial effect of the program was consistent for suicidal ideation regardless of whether baseline covariates were included. The GBG effect on attempts was less robust in some adjusted models including caregiver mental health. In the second cohort of GBG students, neither suicidal ideation nor suicide attempts were significantly different between GBG and the control interventions (Wilcox et al., 2008). This finding likely arose due to the lack of implementation fidelity and pointed to the need for GBG to be delivered with precision, consistency, and teacher support. GBG was also found to be associated with reduced risk of later substance abuse, a risk factor for suicide (Kellam et al., 2008).

- **Parenting skill and family relationship programs.** Parenting and family skills training approaches have shown promising impacts in preventing key risk factors associated with suicide. For example, the *Incredible Years (IY)* is a comprehensive group training program for parents, teachers and children designed to reduce conduct and substance abuse problems, two important suicide risk factors, in youth by improving protective factors such as responsive and positive parent-teacher-child interactions and relationships, emotion self-regulation and social competence (all protective factors for suicide) (Herman et al., 2011). The program includes 9- 20 sessions offered in community-based settings (e.g., religious, recreation centers, mental health treatment centers, and hospitals). Several studies have demonstrated the effect of the IY program on reducing internalizing symptoms, such as anxiety and depression, and child conduct problems (C. H. Webster-Stratton, Reid, & Beauchaine, 2011; Webster-Stratton, Jamila Reid, & Stoolmiller, 2008). The program is also associated with improved problem-solving and conflict management; these skills were maintained at 1-year follow-up (Reid, Webster-Stratton, & Hammond, 2003; C. Webster-Stratton & Hammond,

**Comment [A]:** From JH: define control condition

**Comment [A]:** From JH: significant?

**Comment [A]:** From JH: Lower-risk? Do you mean students with no prior reported history of suicide attempts?

**Comment [A]:** From LLD: Jeff had questions about what is meant by upstream. You are referring to primary prevention but some of the other examples – YAM – are also primary prevention. Suggest just deleting this statement.

**Comment [A]:** From JH: compared to?

**Comment [A]:** From JH: Suggest stating clearly there are two separate cohorts of students receiving the intervention. How do these cohorts differ (time, location)?

**Comment [A]:** From TS: It is important to help the reader to understand that this study looked at the suicidal ideation when the first graders were age 19-21. This is not clear currently.

**Comment [A]:** From JH: Is this the authors' comment or your interpretation of the data? Please clarify.



1997; C. Webster-Stratton, Reid, & Hammond, 2001). The program demonstrated greater benefits as the dosage of the intervention increased (Herman et al., 2011).

Additionally, *Strengthening Families 10-14* is a program that involves sessions between parents, youth, and family with the goal of improving parents' skills for disciplining, managing emotions and conflict, and communicating with their children; promoting youths' interpersonal and problem-solving skills; and creating family activities to build cohesion and positive parent-child interactions. The premise of the program is that developing these skills for both parents and children will reduce internalizing behavior and adolescent substance abuse, two important risk factors for suicide (Spoth, Gyll, & Day, 2002). *Strengthening Families* has been shown to decrease externalizing behaviors, alcohol use, and drug use among youth participants and reductions in depression, alcohol use, and drug use among participating families (Spoth et al., 2002).

**Comment [A]:** From JH: significant? Also please define externalizing behaviors.

**Comment [A]:** From TS: This transition seems off.

## Identify and Support People At-Risk

### Rationale

In order to decrease suicide, attention to people at increased ~~or high~~-risk is necessary as these individuals tend to experience suicidal behavior at higher than average rates. These vulnerable or disadvantaged populations include, but are not limited to, individuals with lower socio-economic status or who are living with a mental health problem; people who have attempted suicide previously; individuals who are institutionalized, have been victims of violence, or are homeless; and members of certain racial and ethnic minority groups. Supporting these vulnerable groups requires proactive case finding along with access to, and retention in, mental health services. Finding effective ways of identifying at-risk or vulnerable groups, customizing services to make them accessible and engaged in care remain key challenges. For example, simply improving services does not guarantee that those services will be used by those most in need of them, nor will it necessarily increase the number of people who follow treatments that are recommended. People who are disadvantaged face social and economic issues that may adversely affect their ability to respond to the treatments or advice that are offered.

**Comment [A]:** From TS: This seems awkward as written. It might be better to say "...attention to people with specific vulnerabilities..."

**Comment [A]:** I prefer to use the standard language here.

### Approaches

The following three approaches focus on identifying and supporting people at increased risk.

- **Gatekeeper training** is designed to train teachers, coaches, providers and others in the community to identify people who may be at risk of suicide and to respond effectively, including facilitating treatment seeking and support services. Gatekeeper training is typically implemented in schools to identify at-risk youth and within health care settings to identify adults (and youth).
- **Screening combined with care management and overall continuity of care** has been used in primary care and behavioral health care settings to assure that people who may be at high-risk of suicide are identified and receive ongoing treatment as needed, particularly after inpatient discharge and other transitions within the healthcare system so they don't 'slip through the cracks'. These approaches typically employ screening for depression and/or suicide combined with collaborative treatment planning between patients and their providers and patient follow-up.
- **Crisis intervention.** These approaches provide support and referral services, typically by connecting a person in crisis (or a friend or family member of someone at-risk) to trained volunteers or professional staff via telephone hotline, online chat, or text messaging. Crisis intervention approaches are intended to impact key risk factors for suicide, including feelings of depression, hopelessness, and subsequent mental health care utilization. Like means reduction,



crisis interventions can put space or time between an individual who may be considering suicide and harmful behavior.

### Potential Outcomes

- Reduction in suicide attempts
- Reduction in suicide deaths
- Increased identification of individuals at-risk for suicidal behavior
- Increased at-risk individuals in treatment
- Increased community members trained to identify at-risk individuals
- Increased referrals for health care

### Evidence

~~There is evidence that community gatekeeper programs are successful in reducing suicides and suicide attempts but the efforts must be maintained (Substance Abuse and Mental Health Services Administration, 2014). However, there is limited evidence for effectiveness of screening programs, but at the same time, standard principles for public health screening make them promising (Pena & Caine, 2006). The number of studies evaluating crisis intervention services is limited, but a few studies do indicate that those who use the hotline services have decreased suicidal thoughts and behavior.~~

- **Gatekeeper training.** One example of gatekeeper training is the *Mental Health First Aid (MHFA)* program. This program is designed for the lay public and consists of three weekly sessions of three hours each. Participants learn the symptoms of people in mental health crises and/or in the early stages of mental health problems (i.e., those experiencing suicidal thoughts and behavior, acute stress reaction, panic attacks and acute psychotic behavior, and depression, anxiety, and psychotic disorders), possible risk factors, and where and how to get effective evidence-based effective help (Kitchener & Jorm, 2004). In a randomized controlled trial of 3010 participants of *MHFA*, the intervention group, compared to the wait-listed controls, reported significantly greater confidence in providing help to others, greater likelihood of advising people to seek professional help, improved concordance with health professionals about treatments, and decreased stigmatizing attitudes toward mental illness. Additionally, the intervention resulted in improved mental health of the participants themselves (Kitchener & Jorm, 2004). Additional research rigorously evaluating *MHFA* for its impact on intervention recipients' suicidal behavior is needed (Kitchener & Jorm, 2006).

Gatekeeper training has also been a core part of all *Garret Lee Smith (GLS) Suicide Prevention Program* which is in place in 49 states and 48 tribes. A multi-site evaluation assessed the

**Comment [A]:** From LLD: suggest shortening this introductory statement about the evidence and making it consistent with the other sections. If you need to provide caveats, then you might want to take a look at the YV TP for example wording.

**Comment [A]:** From TS: Add cites here. Also this wording is awkward because it could be read as suggesting that those who chose to use the hotline are different from others at risk who did not. Maybe you could add the follow up period to the end – they have decrease suicidal thoughts and behavior at xx

**Comment [A]:** From LLD: wording is a bit awkward here

**Comment [A]:** From JH: compared to?

**Comment [A]:** From JH: significant? Is it possible to report magnitude of intervention effects?

**Comment [A]:** From JH: Overall mental health or specific facets (e.g., depression, etc.)? Please clarify



connection between community gatekeeper training and a reduction of suicide attempts and deaths by comparing the change in suicide mortality rates and nonfatal suicidal behavior among the population aged 10-24 in counties implementing *GLS* trainings, with the trajectory observed in similar counties that did not implement these trainings. Counties implementing *GLS* trainings had significantly lower youth suicide rates the year following the training implementation (Walrath, Garraza, Reid, Goldston, & McKeon, 2015). This finding represents a decrease of 1 suicide death per 100,000 among youths 10 to 24 years of age or the avoidance of approximately 237 deaths in this age group between 2007 and 2010. Counties implementing *GLS* program activities also had significantly lower suicide attempt rates among youths 16 to 23 years of age in the year following implementation of the *GLS* program than did similar counties that did not implement *GLS* program activities (4.9 fewer attempts per 1000 youths; (Godoy Garraza, Walrath, Goldston, Reid, & McKeon, 2015)). More than 79,000 suicide attempts may have been averted during the period studied following implementation of the *GLS* program.

- **Screening combined with care management and overall continuity of care.** The *Henry Ford Perfect Depression Care* program was the pre-cursor to *Zero Suicide*, and its overall goal was to eliminate suicide. More broadly, though, the aim was to completely redesign depression care delivery to achieve breakthrough improvement in quality and safety by focusing on six aims: effectiveness, safety, patient centeredness, timeliness, efficiency, and equity among patients. The program developed concrete measures to assess progress on each of these aims and began with screening and assessment of each patient for suicide risk with coordinated continuous follow-up care system wide (C. E. Coffey, 2006). An examination of the impact of the *Henry Ford Perfect Depression Care (Pre-cursor to Zero Suicide)* program found that there was a dramatic and statistically significant decrease in the rate of suicide between the baseline years prior to the intervention (1999 and 2000) to the intervention years (2002-2009). During this time period, the suicide rate fell 82% (C. E. Coffey, 2006; C. E. Coffey, Coffey, & Ahmedani, 2013). Further, suicide rates also declined among HMO members who participated in targeted suicide prevention efforts and received mental health specialty services. However, for those HMO members who accessed only general medical services as opposed to specialty mental health services, the suicide rate increased (M. Coffey, Coffey, & Ahmedani, 2015).
- **Crisis intervention.** Suicide prevention hotlines are one way to provide crisis intervention. In an evaluation of the effectiveness of the *National Suicide Prevention Lifeline (NSPL)* to prevent suicide, 1,085 suicidal individuals who called the hotline completed a standard risk assessment for suicide, and 380 of those completed a follow-up assessment between 1 and 52 days after the initial assessment. Researchers found that over half of the initial sample were seriously considering suicide when they called, and they had a plan for their suicide. Researchers also found that participants experienced significant decreases in suicidality over the course of the

**Comment [A]:** From JM: I think you need to provide a little more context on Henry Ford so the readers understands in what kind of population the reductions were experienced. I assume from the end that Henry Ford is some sort of HMO, but just a little more information would help clarify this description to readers.

**Comment [A]:** From JH: how much?

**Comment [A]:** From JH: Report magnitude of decrease?



telephone session, and that levels of hopelessness and psychological pain continued to decrease after their initial call (Gould, Kalafat, Harrismunfakh, & Kleinman, 2007).

Comment [A]: From JH: how long?

In another study, this time employing a randomized controlled trial, Gould, Cross, Pisani, Munfakh, and Kleinman (2013) assessed the impact of the *Applied Suicide Intervention Skills Training (ASIST)*, a widely implemented training program that helps hotline counselors, emergency workers, and other gatekeepers to identify and connect with suicidal individuals, understand their reasoning for living and dying, and assist with safely connecting those in need to available resources. The training was evaluated across the NSPL network of hotlines over the period 2008-2009. Using data from 1,410 suicidal individuals who called 17 Lifeline centers, researchers found that compared to callers who spoke to counselors that received the usual care training, individuals who spoke with counselors trained in *ASIST* were significantly more likely to feel less depressed, less suicidal, less overwhelmed, and more hopeful by the end of their call to the hotline. Counselors trained in *ASIST* were also more skilled at keeping callers on the phone longer and establishing a connection with them. However, training in *ASIST* did not result in more comprehensive suicide risk assessments than usual care training (Gould et al., 2013).

## Intervene to Lessen Harms and Prevent Future Risk

### Rationale

Individuals who have experienced mental health challenges, suicidal ideation, who have made suicide attempts or engaged in non-suicidal self-injury are at increased risk of suicide (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). Risk of suicide can also increase among those who have lost a friend, family member, co-worker, or other acquaintance to suicide (Pitman, Osborn, King, & Erlangsen, 2014). Exposure to sensationalized or uninformed reporting regarding on suicide may heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to suicide contagion (Etzersdorfer & Sonneck, 1998; Niederkrotenthaler & Sonneck, 2007).

### Approaches

A broad array of approaches to lesson harms and reduce future risk of suicide among those at increased risk include the provision of mental health care and improved continuity of care, improving linkage to care through active post-discharge planning and follow-up that decreases barriers to ongoing therapeutic support, increasing connectedness to supportive others, addressing bereavement, and framing communications to emphasize resilience, decrease negative affect, and to prevent contagion.

- **Treatment for people at-risk of suicide** typically includes various forms of psychotherapy delivered by licensed providers to help individuals with mental health problems and other risk factors for suicide with problem-solving, impulsivity and emotion regulation.
- **Treatment to prevent re-attempts.** These approaches typically include follow-up contact and use diverse modalities (e.g., home visits, mail, telephone, e-mail) to engage recent suicide attempt survivors in continued treatment to prevent re-attempts. Treatment may focus on improved coping skills, mindfulness, and other emotional regulation skills, and may include case management home visits to increase adherence to treatment and continuity of care; and one-on-one interpersonal therapy and/or group therapy. Approaches that engage and connect attempters to peers and providers are especially important because many attempters do not present to aftercare; 12%-25% reattempt within a year, and 3%-9% of attempt survivors die by suicide within 1 to 5 years of their initial attempt (Inagaki et al., 2015)
- **Postvention** approaches are implemented *after* a suicide has taken place and may include debriefing sessions, counseling, and/or bereavement support groups for surviving friends and family members/loved ones. These programs have not typically been evaluated for their impact on suicide or suicidal behavior but may reduce survivors' guilt, feelings of depression, and complicated grief (Szumilas & Kutcher, 2011).

**Comment [A]:** From LLD: simplify statement and make it consistent with the other introductory statements about approaches. You may also want to take a look at the introductory statements to this section in the other TPs.

**Comment [A]:** From LLD: Suggest fleshing this description out a bit. You may want to mention how these are typically delivered (e.g., one on one or group formats; typical number of sessions, location, etc.).



- **Safe messaging following a suicide.** The manner in which information on a recent suicide is communicated to the public (e.g. school assemblies, mass media, social media) can heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to suicide contagion. Therefore, responsible and safe reporting may help prevent suicide and suicide contagion.

**Comment [A]:** From JH: add something about contagion?

### Potential Outcomes

- Reduction in mental health-related sequelae
- Increase connectedness
- Improved coping skills
- Improved messaging following suicide
- Reduction in re-attempts

### Evidence

The evidence addressing strategies to lesson harm and prevent future risk of suicide includes the evaluation of effects of specific approaches on risk and protective factors as well as suicide-related mortality. However, because the evaluation of suicide-related mortality requires large sample sizes and extended follow-up, much of the evidence in this area primarily focuses on risk and protective factors.

- **Treatment for people at-risk of suicide.** There are a number of treatments with evidence of impact on risk and protective factors for suicide. One example is the *Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)* program. *IMPACT* aims to prevent suicide among older primary care patients by reducing suicide ideation and depression in primary care settings. It facilitates the development of a therapeutic alliance, a personalized treatment plan that includes patient preferences, as well as proactive follow-up (biweekly during an acute phase and monthly during continuation phase) by a depression care manager (Hunkeler et al., 2006). The program has been shown to significantly improve quality of life, and to reduce functional impairment, depression and suicidal ideation over 24-months of follow-up (Hunkeler et al., 2006; Unutzer et al., 2006) relative to patients who received care as usual.

Another example is *Collaborative Assessment and Management of Suicidality (CAMS)*, which is a therapeutic approach for suicide-specific assessment and treatment of patient's suicide risk. This flexible approach can be used across treatment settings and clinician theoretical orientations and involves the clinician and patient working together in an interactive assessment process to develop patient-specific treatment plans. *CAMS* sessions are collaborative and involve constant

patient about what is and is not working with the ultimate goal of enhancing the therapeutic alliance and increasing treatment motivation in the suicidal patient. CAMS been tested and supported in 6 correlational studies (Jobes, 2012), in a variety of inpatient and outpatient settings and in one RCT with several additional RCTs under way. CAMS has been associated with significant improvements in suicidal ideation, overall symptom distress, and feelings of hopelessness at 12 month follow-up among a community-based sample of suicidal outpatients. (Comtois et al., 2011).

Other examples include *Dialectical Behavioral Therapy (DBT)* and *Attachment-Based Family Therapy (ABFT)*. DBT is a multicomponent therapy for individuals at high risk for suicide and who may struggle with impulsivity and emotional regulation. The components of DBT include individual therapy, group skills training, between-session telephone coaching and a therapist consultation team. In a randomized controlled trial of women with recent suicidal or self-injurious behavior, those receiving DBT were half as likely to make a suicide attempt at two-year follow-up than women receiving community treatment (23% vs 46%), required less hospitalization for suicide ideation, and had lower medical risk across all suicide attempts and self-injurious acts combined (Linehan et al., 2006).

ABFT is a program for adolescents aged 12-18 and is designed to treat clinically diagnosed major depressive disorder, eliminate suicidal ideation, and reduce dispositional anxiety (Diamond et al., 2010). A randomized controlled trial of ABFT found that suicidal adolescents assigned to ABFT experienced significantly greater improvement in suicidal ideation over 24 weeks of follow-up than did adolescents assigned to enhanced usual care. Additionally, a significantly higher percentage of ABFT participants reported no suicidal ideation in the week prior to assessment at 12 weeks than did adolescents receiving enhanced usual care (69.2% vs. 34.6%) and at 24 weeks (82.1% vs. 46.2%) (Diamond et al., 2010).

- **Treatment to prevent re-attempts.** Several strategies that aim to prevent re-attempts have demonstrated impact on reducing suicidal behavior. For example, *Emergency Department Brief Intervention with Follow-up Visits* is a program that involves a one-hour discharge information session that addresses suicidal behavior, distress, risk and protective factors, alternatives to suicidal behavior, and referral options, combined with nine follow-up contacts over 18 months (at 1, 2, 4, 7, 11 weeks and 4, 6, 12, 18 months). Follow-up contacts are either conducted by phone or through home visits according to a specific time line for up to 18-months. A randomized controlled trial that enrolled suicide attempters from eight hospital emergency departments in five culturally different sites found that a brief intervention combined with 9 follow-up visits over 18-months was associated with significantly fewer deaths from suicide relative to a treatment-as-usual group (0.2% versus 2.2%, respectively) (Fleischmann et al., 2008).

**Comment [A]:** From TS: I think a word is missing – "patient input"?

**Comment [A]:** From JH: Unclear. According to the article, this program was evaluated in five countries. Please state the countries. Thnx.



Another example of treatment to prevent re-attempts involves *active follow-up contact approaches* such as postcards, letters, and telephone calls intended to increase a patient's sense of connectedness with health care providers and decrease isolation. These approaches include expression of care and support and typically invite patients to reconnect with their provider. Contacts are made periodically (e.g., monthly or every few months in the first 12 months post-discharge with some programs continuing contact for two or more years). In a meta-analysis conducted by Inagaki et al. (2015), interventions to prevent repeat suicidal behavior in patients admitted to an emergency department for suicide attempt were found to reduce reattempts by approximately 17% for up to 12 months post-discharge; however, the **long-term effects** of these approaches on reattempts has not yet been demonstrated. Also, because the number of trials and associated sample sizes included in this meta-analysis were small, it was not possible to determine the effect of active contact and follow-up approaches on death by suicide. In a randomized controlled trial of the post-crisis suicide prevention **long-term** follow-up contact approach, Motto and Bostrom (2001) found that patients who refused ongoing care but who were randomized to be contacted by letter four times per year had a lower rate of suicide over two years of follow-up than did patients in the control group who received no further contact. Other studies have also shown post-crisis letters and coping cards to be protective against suicide ideation and attempts (Hassanian-Moghaddam, Sarjani, Kolahi, & Carter, 2011; Wang et al., 2016).

Finally, *Cognitive Behavior Therapy for Suicide Prevention (CBT-SP)* is an example of a therapeutic approach to prevent re-attempts. It uses a risk-reduction, relapse prevention approach that includes an analysis of proximal risk factors and stressors (e.g., relationship problems, school or work-related difficulties) leading up to and following the suicidal event; safety plan development; skill building; and psychoeducation. *CBT-SP* also has family skill modules focused on family support and communication patterns as well as improving the family's problem solving skills. A randomized controlled trial of *CBT-SP* found that 10-session outpatient cognitive therapy designed to prevent repeat suicide attempts resulted in a 50% reduction in the likelihood of a suicide reattempt among adults who had been admitted to an emergency department for a suicide attempt relative to treatment as usual (Brown et al., 2005).

- **Postvention** programs are implemented with the goal of providing support to survivors of others' suicide to reduce their own risk of suicide. One example of a postvention program, *StandBy Response Service (StandBy)*, provides clients with face-to-face outreach and telephone support through a professional crisis response team. Site coordinators develop customized case management plans, referring clients to other existing community services matched to their needs (Visser, Comans, & Scuffham, 2014). In a study by Visser et al. (2014), *StandBy* clients were significantly less likely to be at high risk for suicidality than a suicide bereaved comparison group

Comment [A]: From JH: Define (follow-ups greater than 1 year)

Comment [A]: From JH: Define

who had not had contact with the *StandBy* program (48% and 64% respectively). Additionally, research suggests that active postvention approaches in which outreach to suicide survivors occurs at the scene of a suicide is associated with intake into treatment sooner, greater attendance at support group meetings, and attendance at more meetings compared to passive postvention (versus passive approaches where survivors self-refer for services) (J. Cerel & Campbell, 2008).

- **Safe messaging following a suicide.** Safe messaging after a suicide can help assure that reporting of the event is done in such a way to reduce risk to consumers of news media and other messaging who may be particularly vulnerable. One way to ensure safe messaging following a suicide is to encourage that reporters adhere to *media guidelines for reporting on suicides*. Reports that are both inclusive of suicide prevention messages, stories of hope and resilience, risk and protective factors, and links to helping resources (e.g., hotline) and that avoid sensationalizing events or reducing suicide to one cause can help reduce the likelihood of suicide contagion. The most compelling evidence supporting the effect of *media guidelines* on reduction in suicides comes from Austria. After a sharp increase in suicides on the Viennese subway, media guidelines were introduced and an interrupted time series design was used to evaluate the national impact of the guidelines on subsequent suicides. Changes in the quality and quantity of media reporting resulted in a significant reduction of 81 suicides annually in the Viennese subway system (Niederkrötenhaler & Sonneck, 2007).

**Comment [A]:** From TS: Don't you mean "Recommendations for Reporting on Suicide"?  
Please cite:  
<http://afsp.org/wp-content/uploads/2016/01/recommendations.pdf>

The media did not want "guidelines" and they reacted negatively to the idea of external guidelines.

**Comment [A]:** From TS: Are you sure that the 81 reduction was just on the subway system? I thought that was nationally. Please confirm.

**Comment [A]:** From JH: other evaluations available?

**Comment [A]:** From TS: Thomas also had a 2010 report that suggested benefits of good reporting.  
<http://bjp.rcpsych.org/content/bjprcpsych/197/3/234.full.pdf>



## Sector Involvement

Public health can play an important and unique role in addressing suicide. Public health agencies, which typically place prevention at the forefront of efforts and work to create broad population-level impact, can bring critical leadership and resources to bear on this problem. For example, these agencies can serve as a convener, bringing together partners and stakeholders to plan, prioritize, and coordinate suicide prevention efforts. Public health agencies are also well positioned to collect and disseminate data, implement preventive measures, evaluate programs, and track progress. Although public health can play a leadership role in preventing suicide, the strategies and approaches outlined in this technical package cannot be accomplished by the public health sector alone. As noted in the National Strategy to Prevent Suicide, the integration and coordination of prevention activities across sectors and settings is critical for expanding the reach and impact of suicide prevention efforts.

Other sectors vital to implementing this package include, but are not limited to, education, government (local, state, and federal), social services, health services, business, labor, justice, housing, media, and organizations that comprise the civil society sector such as faith-based organizations, youth-serving organizations, foundations, and other non-governmental organizations. Collectively, these sectors can make a difference in preventing suicide by impacting the various contexts and underlying risks that contribute to suicide.

The strategies and approaches described in this technical package are summarized in Appendix A along with the relevant sectors that are well positioned to lead implementation efforts. For example, business and labor, health care insurers and providers, and government entities are in the best position to implement programs and policies that *Strengthen Economic Supports and Access to Mental Health Care*. These types of supports go beyond individual behavior change and require commitment and support from those sectors that can directly address some of the underlying risks and the environmental contexts that increase the risk for suicide. Public health entities can play an important role by gathering and synthesizing information to inform policy, raise awareness, and evaluate the effectiveness of various policies. Moreover, partnerships with non-governmental and community organizations can be instrumental in increasing awareness of and garnering support for policies affecting individuals and families.

The public health sector has been at the forefront of many community-based prevention efforts, working collaboratively with schools and community-based organizations, to change social norms and positively impact health behavior. Public health is well suited to take on a similar leadership role in *Promoting Connectedness* through peer norm and community engagement activities and supporting the development, evaluation, and adoption of effective programs that *Teach Coping and Problem-Solving Skills* to prevent suicide from happening in the first place. These programs are often delivered in school and community settings, making education and non-governmental organizations vital partners in prevention.

Businesses, workplaces, and local and state government entities, on the other hand, are in the best position to establish policies and support practices that *Create Protective Environments* where people live, work, and play. Public health entities can play an important role by gathering and synthesizing information, working with other agencies within the executive branch of their state or local government in support of policy and other approaches, and evaluating the effectiveness of measures taken. In a similar fashion, public health entities can partner with schools, workplaces, and community organizations to implement and evaluate prevention programs, policies and practices geared toward creating safe, healthy, and supportive environments.

Finally, this technical package includes a number of interventions delivered in hospital, primary care, behavioral health care, and community settings designed to *Identify and Support People At-Risk* and to *Lessen Harms and Prevent Future Risk*. The intensity and activities of these interventions require the expertise of professionals who are licensed and trained to deliver critical intervention support. The health care, social services, and justice sectors can work collaboratively to support individuals at high-risk for suicide and their families. These activities also require coordination of supports across various service providers and community organizations.

Regardless of strategy, action by many sectors will be necessary for the successful implementation of this package. In this regard, all sectors can play an important and influential role in preventing suicide from happening in the first place and lessening the immediate and long-term harms of suicidal behavior by helping those in times of crisis get the services and support they need.



## Monitoring and Evaluation

Monitoring and evaluation are necessary components of the public health approach to prevention. It is important to have timely and reliable data to monitor the extent of the problem and to evaluate the impact of prevention efforts. Data are necessary for program implementation as planning, implementation, and assessment all rely on accurate measurement of the problem.

Surveillance data helps researchers and practitioners track changes in the burden of suicide. Surveillance systems exist at the federal, state, and local levels. It is important to assess the availability of surveillance data and data systems across these levels to identify and address gaps in the systems. CDC's National Vital Statistics System and the National Violent Death Reporting System (NVDRS) are examples of surveillance systems that provide data on deaths from suicide. NVDRS, for example, is a state-based surveillance system that combines data from death certificates, law enforcement reports, and coroner or medical examiner reports to provide detailed information on the circumstances of violent deaths, including suicide, which can assist communities in guiding prevention approaches (Blair, Fowler, Jack, & Crosby, 2016). The National Electronic Injury Surveillance System-All Injury Program (NEISS-AIP) provides nationally representative data about all types and causes of nonfatal injuries treated in U.S. hospital emergency departments, and can be used to assess national rates of, and trends in, self-harm injuries by cause (e.g., falls, poisoning, etc.), age, race/ethnicity, sex, disposition (where the injured person goes when released from the Emergency Department).

In addition to information on deaths and nonfatal injuries, there are also surveillance systems that provide national, state, and some local estimates of suicidal behavior. The Youth Risk Behavior Surveillance System (YRBSS) collects information from a nationally representative sample of 9-12 grade students and is a key resource in monitoring health-risk behaviors among youth, including whether youth have seriously considered attempting suicide, attempted suicide, made a plan, or required treatment by a doctor or nurse for a suicide attempt that resulted in an injury, poisoning, or overdose (Brener et al., 2013). The YRBSS data are obtained from a national school-based survey conducted by CDC as well as from state, territorial, tribal, and large urban school district surveys conducted by education and health agencies. The National Survey on Drug Use and Health (NSDUH) is an annual nationwide survey of individuals aged 12 years and older that provides national and state-level estimates of drug use and mental health-related issues, including suicide ideation and suicide attempts.

It is also important at all levels (local, state, and federal) to address gaps in responses, track progress of prevention efforts and evaluate the impact of those efforts, including the impact of this technical package. Evaluation data, produced through program implementation and monitoring, is essential to provide information on what does and does not work to reduce rates of suicide and its associated risk and protective factors. Theories of change and logic models that identify short, intermediate, and long-term outcomes are an important part of program evaluation.

**Comment [A]:** From TS: This description seems incomplete compared to the description of YRBS



The evidence-base for suicide prevention has advanced greatly over the last few decades. However, additional research is needed to understand the impact of programs, policies, and practices on preventing suicide and suicide attempts, as opposed to merely examining the effectiveness of programs to impact risk factors associated with suicide. More research is also needed to examine the effectiveness of upstream and community-level strategies to prevent suicide at the population level. Lastly, it will be important for researchers to test the effectiveness of combinations of the strategies and approaches included in this package. Most existing evaluations focus on approaches implemented in isolation, but there is potential to understand the synergistic effects within a comprehensive prevention approach. ~~Additional research is needed to understand the extent to which combinations of strategies and approaches result in greater reductions in suicide than individual programs, practices, or policies.~~

**Comment [A]:** From TS: Should this be programs, policies, and practices to be consistent?

**Comment [A]:** From JH: including attempts?

**Comment [A]:** From JH: redundant with prior sentence.

**Comment [A]:** From TS: I found this somewhat awkward. The idea of suicide struggling seemed off and the point is not entirely clear. I think you can be more specific and reference an earlier point in the media recommendations section.

**Comment [A]:** From JH: Upstream/downstream is jargon.

**Comment [A]:** From TS: I think you can drop this and just use the more descriptive text. You don't need both. You could describe this as a range.

## Conclusion

Suicide is a serious public health problem whose rates have been on the rise for more than a decade and whose costs stretch well into the billions of dollars each year. While suicide is a rare outcome statistically, its human impact has a ripple effect that is far-reaching. Each of us likely interacts with suicide survivors, those with lived experience, and those with thoughts of suicide, on a daily basis--at home, at work, and in our communities. Suicide and suicide attempts are therefore public health issues of societal concern. Fortunately, like many public health problems, suicide is preventable, and fortunately more is being done to prevent suicide than ever before, as evidenced by the work of the National Action Alliance for Suicide Prevention, the release of the first world report on suicide, and more timely surveillance data, to name just a few examples. Unfortunately and unlike most other public health problems, suicide still struggles against stigma, shame, and secrecy related to help-seeking, mental illness, being a survivor, or someone with lived experience; misplaced fear of asking someone about their risk of suicide (versus the fear and consequence of not asking), and fear of taking up certain strategies known to be effective but perhaps unpopular; misinformation about suicide preventability, and disproportionate funding given the public health burden. Suicide also struggles against the right degree of awareness where too much information, for example by well-meaning reporters and others, may actually do harm.

In an effort to continue pushing the field and society further towards prevention, this technical package includes strategies and approaches that ideally would be used in a comprehensive fashion, in combination--in a multi-level, multi-sectoral way. This technical package includes strategies and approaches targeting upstream prevention (e.g., social emotional learning for children and youth), as well as strategies focused more downstream (e.g., cognitive behavioral treatment to prevent re-attempts). It includes universal, selective, and indicated strategies, or strategies that focus on the whole population regardless of risk to strategies that focus on those groups at highest risk. Importantly, this technical package extends the bounds of the typical prevention strategies to consider approaches at the



(outer levels of the social ecology), e.g., policies to stabilize housing and community engagement initiatives.

While the evidence base continues to emerge, the collection of programs, policies, and practices laid out here are available for implementation now. And in keeping with good public health practice, the intent is that monitoring and evaluation will play a key role in that implementation. Moreover, as new evidence becomes available, this technical package can be refined to reflect the current state of the science.

In closing, and in keeping with a message of resilience as spoken by those with lived experience, 'hope, help, and healing is possible.'

**Comment [A]:** From JM: Yes this is jargon, so the e.g., helps, but you might want to figure out a way to say this without referring to the outer levels of the social ecology.

**Comment [A]:** This sets you up for people to say oh yeah what about... AI/AN, transgendered people, prisoners etc.

## References

- Arsenault-Lapierre, G., Kim, C., & Turecki, G. (2004). Psychiatric diagnoses in 3275 suicides: a meta-analysis. *BMC Psychiatry*, 4, 37. doi:10.1186/1471-244X-4-37
- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*: Prentice-Hall, Inc.
- Basile, K. C., Espelage, D. L., Rivers, I., McMahon, P. M., & Simon, T. R. (2009). The theoretical and empirical links between bullying behavior and male sexual violence perpetration. *Aggression and violent behavior*, 14(5), 336-347.
- Basile, K. C., Hamburger, M. E., Swahn, M. H., & Choi, C. (2013). Sexual violence perpetration by adolescents in dating versus same-sex peer relationships: differences in associated risk and protective factors. *Western Journal of Emergency Medicine*, 14(4), 329.
- Beautrais, A. L. (2001). Effectiveness of barriers at suicide jumping sites: A case study. *Aust NZ J Psychiat*, 35. doi:10.1080/0004867010060501
- Beautrais, A. L., Gibb, S. J., Fergusson, D. M., Horwood, L. J., & Larkin, G. L. (2009). Removing bridge barriers stimulates suicides: An unfortunate natural experiment. *Aust NZ J Psychiat*, 43. doi:10.1080/00048670902873714
- Beyer, K. M., Layde, P. M., Hamberger, L. K., & Laud, P. W. (2015). Does neighborhood environment differentiate intimate partner femicides from other femicides? *Violence Against Women*, 21(1), 49-64. doi:10.1177/1077801214564075
- Blair, J. M., Fowler, K. A., Jack, S. P., & Crosby, A. E. (2016). The National Violent Death Reporting System: overview and future directions. *Inj Prev*, 22 Suppl 1, i6-i11. doi:10.1136/injuryprev-2015-041819
- Borowsky, I. W., Hogan, M., & Ireland, M. (1997). Adolescent sexual aggression: risk and protective factors. *Pediatrics*, 100(6), E7.
- Branas, C. C., Cheney, R. A., MacDonald, J. M., Tam, V. W., Jackson, T. D., & Ten Have, T. R. (2011). A difference-in-differences analysis of health, safety, and greening vacant urban space. *Am J Epidemiol*, 174(11), 1296-1306. doi:10.1093/aje/kwr273
- Brown, G. K., Ten Have, T., Henriques, G. R., Xie, S. X., Hollander, J. E., & Beck, A. T. (2005). Cognitive therapy for the prevention of suicide attempts: a randomized controlled trial. *JAMA*, 294(5), 563-570. doi:10.1001/jama.294.5.563
- Butchart, A., Phinney, A., Check, P., & Villaveces, A. (2004). *Preventing Violence: A Guide to Implementing the Recommendations of the World Report on Violence and Health*. Geneva, Switzerland: World Health Organization.
- Capaldi, D. M., Knoble, N. B., Shortt, J. W., & Kim, H. K. (2012). A Systematic Review of Risk Factors for Intimate Partner Violence. *Partner Abuse*, 3(2), 231-280. doi:10.1891/1946-6560.3.2.231
- Carter, M., McGee, R., Taylor, B., & Williams, S. (2007). Health outcomes in adolescence: associations with family, friends and school engagement. *J Adolesc*, 30(1), 51-62. doi:10.1016/j.adolescence.2005.04.002
- Cavanagh, J. T., Carson, A. J., Sharpe, M., & Lawrie, S. M. (2003). Psychological autopsy studies of suicide: a systematic review. *Psychol Med*, 33(3), 395-405.
- Centers for Disease Control and Prevention. (2009). Strategic direction for the prevention of suicidal behavior: Promoting individual, family, and community connectedness to prevent suicidal behavior. Retrieved from Available at: [http://www.cdc.gov/ViolencePrevention/pdf/Suicide\\_Strategic\\_Direction\\_Full\\_version-a.pdf](http://www.cdc.gov/ViolencePrevention/pdf/Suicide_Strategic_Direction_Full_version-a.pdf)
- Centers for Disease Control and Prevention. (2016a). Child Maltreatment: Risk and Protective Factors. Retrieved from Available at: <http://www.cdc.gov/violenceprevention/childmaltreatment/riskprotectivefactors.html>
- Centers for Disease Control and Prevention. (2016b). Elder Maltreatment: Risk and Protective Factors. Retrieved from Available at: <http://www.cdc.gov/ViolencePrevention/eldermaltreatment/riskprotectivefactors.html>



- Centers for Disease Control and Prevention. (2016c). Sexual Violence: Risk and Protective Factors. Retrieved from Available at: <http://www.cdc.gov/ViolencePrevention/sexualviolence/riskprotectivefactors.html>
- Centers for Disease Control and Prevention. (2016d). Web-Based Injury Statistics Query and Reporting System (WISQARS). Retrieved June 3, 2016 Available at: <http://www.cdc.gov/injury/wisqars/index.html>
- Centers for Disease Control and Prevention. (2016e). Youth Violence: Risk and Protective Factors. Retrieved from Available at: <http://www.cdc.gov/violenceprevention/youthviolence/riskprotectivefactors.html>
- Cerel, J., & Campbell, F. R. (2008). Suicide survivors seeking mental health services: a preliminary examination of the role of an active postvention model. *Suicide Life Threat Behav*, 38(1), 30-34. doi:10.1521/suli.2008.38.1.30
- Cerel, J., Maple, M., DE VENNE, J. V., Moore, M., Flaherty, C., & Brown, M. (2016). Exposure to Suicide in the Community: Prevalence and Correlates in One US State. *Public Health Reports*, 131(1).
- Cerel, J., McIntosh, J. L., Neimeyer, R. A., Maple, M., & Marshall, D. (2014). The Continuum of "Survivorship": Definitional Issues in the Aftermath of Suicide. *Suicide and life-threatening behavior*, 44(6), 591-600. doi:10.1111/sltb.12093
- Chapman, A. L., & Dixon-Gordon, K. L. (2007). Emotional antecedents and consequences of deliberate self-harm and suicide attempts. *Suicide Life Threat Behav*, 37(5), 543-552. doi:10.1521/suli.2007.37.5.543
- Cherpitel, C. J., Borges, G. L. G., & Wilcox, H. C. (2004). Acute alcohol use and suicidal behavior: A review of the literature. *Alcoholism: Clinical and Experimental Research*, 28(5 SUPPL.), 18S-28S.
- Classen, T. J., & Dunn, R. A. (2012). The effect of job loss and unemployment duration on suicide risk in the United States: a new look using mass-layoffs and unemployment duration. *Health Econ*, 21(3), 338-350. doi:10.1002/hecl.1719
- Coffey, C. E. (2006). Pursuing perfect depression care. *Psychiatr Serv*, 57(10), 1524-1526. doi:10.1176/ps.2006.57.10.1524
- Coffey, C. E., Coffey, M. J., & Ahmedani, B. K. (2013). An update on perfect depression care. *Psychiatr Serv*, 64(4), 396. doi:10.1176/appi.PS.640422
- Coffey, M., Coffey, C., & Ahmedani, B. K. (2015). Suicide in a health maintenance organization population. *JAMA Psychiatry*, 72(3), 294-296. doi:10.1001/jamapsychiatry.2014.2440
- Comtois, K. A., Jobes, D. A., S. O'Connor, S., Atkins, D. C., Janis, K., E. Chesson, C., . . . Yuodelis-Flores, C. (2011). Collaborative assessment and management of suicidality (CAMS): feasibility trial for next-day appointment services. *Depress Anxiety*, 28(11), 963-972. doi:10.1002/da.20895
- Coulton, C. J., Crampton, D. S., Irwin, M., Spilsbury, J. C., & Korbin, J. E. (2007). How neighborhoods influence child maltreatment: a review of the literature and alternative pathways. *Child Abuse Negl*, 31(11-12), 1117-1142. doi:10.1016/j.chiabu.2007.03.023
- Cox, G. R., Owens, C., Robinson, J., Nicholas, A., Lockley, A., Williamson, M., . . . Pirkis, J. (2013). Interventions to reduce suicides at suicide hotspots: a systematic review. *BMC Public Health*, 13(1), 1-12. doi:10.1186/1471-2458-13-214
- Crosby, A. E., Espitia-Hardeman, V., Ortega, L., & Lozano, B. (2013). Alcohol and suicide. *Alcohol: Science, Policy and Public Health*, 190.
- Crosby, A. E., Han, B., Ortega, L., Parks, S. E., & Gfroerer, J. (2011). Suicidal Thoughts and Behaviors Among Adults Aged ≥18 Years — United States, 2008–2009. *MMWR*, 60(No. SS-13), 1-22.
- Crosby, A. E., Ortega, L., & Melanson, C. (2011). *Self-directed Violence Surveillance: Uniform Definitions and Recommended Data Elements, Version 1.0*. Retrieved from Atlanta, GA:
- Crosby, A. E., & Sacks, J. J. (2002). Exposure to Suicide: Incidence and Association with Suicidal Ideation and Behavior: United States, 1994. *Suicide and life-threatening behavior*, 32(3), 321-328. doi:10.1521/suli.32.3.321.22170
- Cunningham, P. J. (2009). Beyond parity: primary care physicians' perspectives on access to mental health care. *Health Aff (Millwood)*, 28(3), w490-501. doi:10.1377/hlthaff.28.3.w490

- Curtin, S. C., Warner, M., & Hedegaard, H. (2016). *Increase in suicide in the United States, 1999-2014*. ( ). Hyattsville, MD: National Center for Health Statistics Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/25116188>.
- Cylus, J., Glymour, M. M., & Avendano, M. (2014). Do generous unemployment benefit programs reduce suicide rates? A state fixed-effect analysis covering 1968-2008. *Am J Epidemiol*, 180(1), 45-52. doi:10.1093/aje/kwu106
- Dahlberg, L. L., & Krug, E. G. (2002). Violence-a global public health problem. In E. Krug, L. L. Dahlberg, J. A. Mercy, A. B. Zwi, & R. Lozano (Eds.), *World Report on Violence and Health* (pp. 1-56). Geneva, Switzerland: World Health Organization.
- DeGue, S., Massetti, G. M., Holt, M. K., Tharp, A. T., Valle, L. A., Matjasko, J. L., & Lippy, C. (2013). Identifying links between sexual violence and youth violence perpetration: New opportunities for sexual violence prevention. *Psychology of violence*, 3(2), 140.
- Deisenhammer, E. A., Ing, C. M., Strauss, R., Kemmler, G., Hinterhuber, H., & Weiss, E. M. (2009). The duration of the suicidal process: how much time is left for intervention between consideration and accomplishment of a suicide attempt? *J Clin Psychiatry*, 70(1), 19-24.
- Desai, R. A., Dausey, D. J., & Rosenheck, R. A. (2005). Mental health service delivery and suicide risk: the role of individual patient and facility factors. *Am J Psychiatry*, 162(2), 311-318. doi:10.1176/appi.ajp.162.2.311
- Diamond, G. S., Wintersteen, M. B., Brown, G. K., Diamond, G. M., Gallop, R., Shelef, K., & Levy, S. (2010). Attachment-based family therapy for adolescents with suicidal ideation: a randomized controlled trial. *J Am Acad Child Adolesc Psychiatry*, 49(2), 122-131.
- Dunne, E. J., McIntosh, J. L., & Dunne-Maxim, K. (Eds.). (1987). *Suicide and its aftermath: Understanding and counseling the survivors*. New York: Norton.
- Durkheim, E. (1897/1951). *Suicide: A study in sociology* (JA Spaulding & G. Simpson, trans.). Glencoe, IL: Free Press. (Original work published 1897).
- Elgar, F. J., Craig, W., Boyce, W., Morgan, A., & Vella-Zarb, R. (2009). Income inequality and school bullying: multilevel study of adolescents in 37 countries. *J Adolesc Health*, 45(4), 351-359. doi:10.1016/j.jadohealth.2009.04.004
- Escobedo, L. G., & Ortiz, M. (2002). The relationship between liquor outlet density and injury and violence in New Mexico. *Accid Anal Prev*, 34(5), 689-694.
- Etzersdorfer, E., & Sonneck, G. (1998). Preventing suicide by influencing mass-media reporting: The Viennese experience, 1980-1996. *Arch Suicide Res*, 4.
- Ferdon, C., Crosby, A. E., Caine, E. D., Hindman J., Reed, G. A., & Iskander, J. (In press). CDC Public Health Grand Rounds: Preventing Suicide through a Comprehensive Public Health Approach. *MMWR*.
- Flavin, P., & Radcliff, B. (2009). Public policies and suicide rates in the American states. *Social Indicators Research*, 90(2), 195-209.
- Fleischmann, A., Bertolote, J. M., Wasserman, D., De Leo, D., Bolhari, J., Botega, N. J., . . . Thanh, H. T. (2008). Effectiveness of brief intervention and contact for suicide attempters: a randomized controlled trial in five countries. *Bulletin of the World Health Organization*, 86(9), 703-709. doi:S0042-96862008000900014 [pii]
- Florence, C., Simon, T., Haegerich, T., Luo, F., & Zhou, C. (2015). Estimated lifetime medical and work-loss costs of fatal injuries-United States, 2013. *MMWR: Morbidity and mortality weekly report*, 64(38), 1074-1077.
- Fowler, K. A., Gladden, R. M., Vagi, K. J., Barnes, J., & Frazier, L. (2015). Increase in suicides associated with home eviction and foreclosure during the US housing crisis: findings from 16 National Violent Death Reporting System States, 2005-2010. *Am J Public Health*, 105(2), 311-316. doi:10.2105/AJPH.2014.301945
- Freisthler, B., Merritt, D. H., & LaScala, E. A. (2006). Understanding the ecology of child maltreatment: a review of the literature and directions for future research. *Child Maltreat*, 11(3), 263-280. doi:10.1177/1077559506289524



- Ghahramanlou-Holloway, M., Bhar, S., Brown, G., Olsen, C., & Beck, A. T. (2012). Changes in problem-solving appraisal after cognitive therapy for the prevention of suicide. *Psychological Medicine*, 42(06), 1185-1193.
- Giesbrecht, N., Huguette, N., Ogden, L., Kaplan, M. S., McFarland, B. H., Caetano, R., . . . Nolte, K. B. (2015). Acute alcohol use among suicide decedents in 14 US states: impacts of off-premise and on-premise alcohol outlet density. *Addiction*, 110(2), 300-307. doi:10.1111/add.12762
- Godoy Garraza, L., Walrath, C., Goldston, D. B., Reid, H., & McKeon, R. (2015). Effect of the Garrett Lee Smith Memorial Suicide Prevention Program on Suicide Attempts Among Youths. *JAMA Psychiatry*, 72(11), 1143-1149. doi:10.1001/jamapsychiatry.2015.1933
- Goldsmith, S. K., Pellmar, T. C., Kleinman, A. M., & Bunney, W. E. (2002). *Reducing suicide: A national imperative*: National Academies Press.
- Gould, M. S., Cross, W., Pisani, A. R., Munfakh, J. L., & Kleinman, M. (2013). Impact of Applied Suicide Intervention Skills Training on the National Suicide Prevention Lifeline. *Suicide Life Threat Behav*, 43(6), 676-691. doi:10.1111/sltb.12049
- Gould, M. S., Kalafat, J., Harrismunfakh, J. L., & Kleinman, M. (2007). An evaluation of crisis hotline outcomes. Part 2: Suicidal callers. *Suicide Life Threat Behav*, 37(3), 338-352. doi:10.1521/suli.2007.37.3.338
- Grossman, D. C., Mueller, B. A., Riedy, C., Dowd, M. D., Villaveces, A., Prodzinski, J., . . . Harruff, R. (2005). Gun storage practices and risk of youth suicide and unintentional firearm injuries. *JAMA*, 293(6), 707-714. doi:10.1001/jama.293.6.707
- Haddon, W. (1980). Advances in the epidemiology of injuries as a basis for public policy. *Public Health Reports*, 95(5), 411-421.
- Han, B., Crosby, A. E., Ortega, L. A., Parks, S. E., Compton, W. M., & Gfroerer, J. (2016). Suicidal ideation, suicide attempt, and occupations among employed adults aged 18–64 years in the United States. *Comprehensive psychiatry*, 66, 176-186.
- Harris, E. C., & Barraclough, B. (1997). Suicide as an outcome for mental disorders. A meta-analysis. *Br J Psychiatry*, 170, 205-228.
- Harris, E. C., & Barraclough, B. (1998). Excess mortality of mental disorder. *Br J Psychiatry*, 173, 11-53.
- Harris, K. M., Carpenter, C., & Bao, Y. (2006). The effects of state parity laws on the use of mental health care. *Med Care*, 44(6), 499-505. doi:10.1097/01.mlr.0000215813.16211.00
- Hassanian-Moghaddam, H., Sarjani, S., Kolahi, A. A., & Carter, G. L. (2011). Postcards in Persia: randomised controlled trial to reduce suicidal behaviours 12 months after hospital-treated self-poisoning. *British Journal of Psychiatry*, 198(4), 309-316.
- Hawton, K. (2007). Restricting access to methods of suicide: Rationale and evaluation of this approach to suicide prevention. *Crisis*, 28. doi:10.1027/0227-5910.28.s1.4
- Heise, L., & Garcia-Moreno, C. (2002). Violence by Intimate Partners. In E. Krug, L. L. Dahlberg, J. A. Mercy, A. B. Zwi, & R. Lozano (Eds.), *World Report on Violence and Health* (pp. 87-121). Geneva, Switzerland: World Health Organization.
- Herman, K. C., Borden, L. A., Reinke, W. M., & Webster-Stratton, C. (2011). The Impact of the Incredible Years Parent, Child, and Teacher Training Programs on Children's Co-Occurring Internalizing Symptoms. *Sch Psychol Q*, 26(3), 189-201. doi:10.1037/a0025228
- Hong, J. S., Kral, M. J., Espelage, D. L., & Allen-Meares, P. (2012). The social ecology of adolescent-initiated parent abuse: a review of the literature. *Child Psychiatry Hum Dev*, 43(3), 431-454. doi:10.1007/s10578-011-0273-y
- Houle, J. N., & Light, M. T. (2014). The home foreclosure crisis and rising suicide rates, 2005 to 2010. *Am J Public Health*, 104(6), 1073-1079. doi:10.2105/AJPH.2013.301774
- Hunkeler, E. M., Katon, W., Tang, L., Williams, J. W., Jr., Kroenke, K., Lin, E. H., . . . Unutzer, J. (2006). Long term outcomes from the IMPACT randomised trial for depressed elderly patients in primary care. *BMJ*, 332(7536), 259-263. doi:10.1136/bmj.38683.710255.BE

- Inagaki, M., Kawashima, Y., Kawanishi, C., Yonemoto, N., Sugimoto, T., Furuno, T., . . . Yamada, M. (2015). Interventions to prevent repeat suicidal behavior in patients admitted to an emergency department for a suicide attempt: a meta-analysis. *J Affect Disord*, 175, 66-78. doi:10.1016/j.jad.2014.12.048
- Isometsa, E. T. (2001). Psychological autopsy studies--a review. *Eur Psychiatry*, 16(7), 379-385.
- Jobes, D. A. (2012). The Collaborative Assessment and Management of Suicidality (CAMS): an evolving evidence-based clinical approach to suicidal risk. *Suicide Life Threat Behav*, 42(6), 640-653. doi:10.1111/j.1943-278X.2012.00119.x
- Johnson, F. W., Gruenewald, P. J., & Remer, L. G. (2009). Suicide and alcohol: do outlets play a role? *Alcohol Clin Exp Res*, 33(12), 2124-2133. doi:10.1111/j.1530-0277.2009.01052.x
- Kaplan, M. S., McFarland, B. H., Huguet, N., Conner, K., Caetano, R., Giesbrecht, N., & Nolte, K. B. (2013). Acute alcohol intoxication and suicide: a gender-stratified analysis of the National Violent Death Reporting System. *Inj Prev*, 19(1), 38-43. doi:10.1136/injuryprev-2012-040317
- Kellam, S. G., Brown, C. H., Poduska, J. M., Ialongo, N. S., Wang, W., Toyinbo, P., . . . Wilcox, H. C. (2008). Effects of a universal classroom behavior management program in first and second grades on young adult behavioral, psychiatric, and social outcomes. *Drug Alcohol Depend*, 95 Suppl 1, S5-S28. doi:10.1016/j.drugalcdep.2008.01.004
- Kessler, R. C., Demler, O., Frank, R. G., Olfson, M., Pincus, H. A., Walters, E. E., . . . Zaslavsky, A. M. (2005). Prevalence and treatment of mental disorders, 1990 to 2003. *N Engl J Med*, 352(24), 2515-2523. doi:10.1056/NEJMSa043266
- Kitchener, B. A., & Jorm, A. F. (2004). Mental health first aid training in a workplace setting: a randomized controlled trial [ISRCTN13249129]. *BMC Psychiatry*, 4, 23. doi:10.1186/1471-244X-4-23
- Kitchener, B. A., & Jorm, A. F. (2006). Mental health first aid training: review of evaluation studies. *Aust N Z J Psychiatry*, 40(1), 6-8. doi:10.1111/j.1440-1614.2006.01735.x
- Kleiman, E. M., Riskind, J. H., Schaefer, K. E., & Weingarden, H. (2012). The moderating role of social support on the relationship between impulsivity and suicide risk. *Crisis*, 33(5), 273-279. doi:10.1027/0227-5910/a000136
- Klevens, J., Simon, T. R., & Chen, J. (2012). Are the perpetrators of violence one and the same? Exploring the co-occurrence of perpetration of physical aggression in the United States. *J Interpers Violence*, 27(10), 1987-2002. doi:10.1177/0886260511431441
- Knox, K. L., Litts, D. A., Talcott, G. W., Feig, J. C., & Caine, E. D. (2003). Risk of suicide and related adverse outcomes after exposure to a suicide prevention programme in the US Air Force: cohort study. *BMJ*, 327(7428), 1376.
- Knox, K. L., Pflanz, S., Talcott, G. W., Campise, R. L., Lavigne, J. E., Bajorska, A., . . . Caine, E. D. (2010). The US Air Force suicide prevention program: implications for public health policy. *Am J Public Health*, 100(12), 2457-2463. doi:10.2105/ajph.2009.159871
- Knox, M. S., Burkhart, K., & Hunter, K. E. (2010). ACT against violence parents raising safe kids program: Effects on maltreatment-related parenting behaviors and beliefs. *Journal of Family Issues*.
- Lang, M. (2013). The impact of mental health insurance laws on state suicide rates. *Health Econ*, 22(1), 73-88. doi:10.1002/hecl.1816
- Linehan, M. M., Comtois, K. A., Murray, A. M., Brown, M. Z., Gallop, R. J., Heard, H. L., . . . Lindenboim, N. (2006). Two-year randomized controlled trial and follow-up of dialectical behavior therapy vs therapy by experts for suicidal behaviors and borderline personality disorder. *Arch Gen Psychiatry*, 63(7), 757-766. doi:10.1001/archpsyc.63.7.757
- Losel, F., & Farrington, D. P. (2012). Direct protective and buffering protective factors in the development of youth violence. *Am J Prev Med*, 43(2 Suppl 1), S8-S23. doi:10.1016/j.amepre.2012.04.029
- Luo, F., Florence, C. S., Quispe-Agnoli, M., Ouyang, L., & Crosby, A. E. (2011). Impact of business cycles on US suicide rates, 1928-2007. *Am J Public Health*, 101(6), 1139-1146. doi:10.2105/ajph.2010.300010



- Maimon, D., Browning, C. R., & Brooks-Gunn, J. (2010). Collective efficacy, family attachment, and urban adolescent suicide attempts. *J Health Soc Behav*, 51(3), 307-324. doi:10.1177/0022146510377878
- Mark, T. L., Shern, D. L., Bagalman, J. E., & Cao, Z. (2007). Ranking America's mental health: An analysis of depression across the states. *Alexandria, VA: Mental Health America*.
- McIntosh, W. L., Spies, E., Stone, D. M., Lokey, C. N., Trudeau, A. R., & Bartholow, B. (2016). Suicide Rates by Occupational Group - 17 States, 2012. *MMWR Morb Mortal Wkly Rep*, 65(25), 641-645. doi:10.15585/mmwr.mm6525a1
- Miller, M., Warren, M., Hemenway, D., & Azrael, D. (2015). Firearms and suicide in US cities. *Inj Prev*, 21(e1), e116-119. doi:10.1136/injuryprev-2013-040969
- Mishara, B. L. (Ed.) (1995). *The Impact of Suicide*. New York: Springer.
- Mishara, B. L., & Martin, N. (2012). Effects of a comprehensive police suicide prevention program. *Crisis: Journal of Crisis Intervention & Suicide*, 33(3), 162-168.
- Mitchell, A. M., Kim, Y., Prigerson, H. G., & Mortimer-Stephens, M. (2004). Complicated grief in survivors of suicide. *Crisis*, 25(1), 12-18. doi:10.1027/0227-5910.25.1.12
- Motto, J. A., & Bostrom, A. G. (2001). A randomized controlled trial of postcrisis suicide prevention. *Psychiatr Serv*, 52(6), 828-833.
- Muennig, P., Cohen, A. K., Palmer, A., & Zhu, W. (2013). The relationship between five different measures of structural social capital, medical examination outcomes, and mortality. *Soc Sci Med*, 85, 18-26. doi:10.1016/j.socscimed.2013.02.007
- National Action Alliance for Suicide Prevention. (2014). Research Prioritization Task Force.(2014). *A prioritized research agenda for suicide prevention: An action plan to save lives*.
- National Action Alliance for Suicide Prevention Workplace Task Force. (2015). *Comprehensive Blueprint for Workplace Suicide Prevention*. Washington, D.C. : Author.
- National Action Alliance for Suicide Prevention: Suicide Attempt Survivors Task Force. (2014). *The Way Forward: Pathways to hope, recovery, and wellness with insights from lived experience*. Washington, D.C. : Author.
- National Action Alliance for Suicide Prevention: Survivors of Suicide Loss Task Force. (2015). *Responding to Grief, Trauma, and Distress After a Suicide: U.S. National Guidelines*. Washington, D.C. : Author.
- Niederkrotenthaler, T., & Sonneck, G. (2007). Assessing the impact of media guidelines for reporting on suicides in Austria: Interrupted time series analysis. *Aust N Z J Psychiatry*, 41. doi:10.1080/00048670701266680
- Olfson, M., Gerhard, T., Huang, C., Crystal, S., & Stroup, T. S. (2015). Premature Mortality Among Adults With Schizophrenia in the United States. *JAMA Psychiatry*, 72(12), 1172-1181. doi:10.1001/jamapsychiatry.2015.1737
- Owens, D. (2002). Fatal and non-fatal repetition of self-harm: Systematic review. *British Journal of Psychiatry*, 181(3), 193-199.
- Perron, S., Burrows, S., Fournier, M., Perron, P. A., & Ouellet, F. (2013). Installation of a bridge barrier as a suicide prevention strategy in Montreal, Quebec, Canada. *Am J Public Health*, 103(7), 1235-1239. doi:10.2105/ajph.2012.301089
- Pinchevsky, G. M., & Wright, E. M. (2012). The impact of neighborhoods on intimate partner violence and victimization. *Trauma Violence Abuse*, 13(2), 112-132. doi:10.1177/1524838012445641
- Pirkis, J., Too, L. S., Spittal, M. J., Kryszynska, K., Robinson, J., & Cheung, Y. T. D. (2015). Interventions to reduce suicides at suicide hotspots: a systematic review and meta-analysis. *The Lancet Psychiatry*, 2(11), 994-1001. doi:http://dx.doi.org/10.1016/S2215-0366(15)00266-7
- Pitman, A., Osborn, D., King, M., & Erlangsen, A. (2014). Effects of suicide bereavement on mental health and suicide risk. *Lancet Psychiatry*, 1, 86-94.
- Pollock, L. R., & Williams, J. M. (2004). Problem-solving in suicide attempters. *Psychol Med*, 34(1), 163-167.
- Reeves, A., Stuckler, D., McKee, M., Gunnell, D., Chang, S. S., & Basu, S. (2012). Increase in state suicide rates in the USA during economic recession. *Lancet*, 380(9856), 1813-1814. doi:10.1016/S0140-6736(12)61910-2

- Reid, M. J., Webster-Stratton, C., & Hammond, M. (2003). Follow-up of children who received the Incredible Years intervention for oppositional-defiant disorder: Maintenance and prediction of 2-year outcome. *Behavior Therapy, 34*(4), 471-491.
- Resnick, M. D., Ireland, M., & Borowsky, I. (2004). Youth violence perpetration: what protects? What predicts? Findings from the National Longitudinal Study of Adolescent Health. *J Adolesc Health, 35*(5), 424 e421-410. doi:10.1016/j.jadohealth.2004.01.011
- Rowhani-Rahbar, A., Simonetti, J. A., & Rivara, F. P. (2016). Effectiveness of Interventions to Promote Safe Firearm Storage. *Epidemiol Rev, 38*(1), 111-124. doi:10.1093/epirev/mxv006
- Runyan, C. W., Becker, A., Brandspiegel, S., Barber, C., Trudeau, A., & Novins, D. (2016). Lethal Means Counseling for Parents of Youth Seeking Emergency Care for Suicidality. *West J Emerg Med, 17*(1), 8-14. doi:10.5811/westjem.2015.11.28590
- Runyan, D., Wattam, C., Ikeda, R., Hassan, F., & Ramiro, L. (2002). Child abuse and neglect by parents and other caregivers. In E. Krug, L. L. Dahlberg, J. A. Mercy, A. B. Zwi, & R. Lozano (Eds.), *World Report on Violence and Health* (pp. 59-86). Geneva, Switzerland: World Health Organization.
- Sampson, R. J., Morenoff, J. D., & Gannon-Rowley, T. (2002). Assessing "Neighborhood Effects": Social Processes and New Directions in Research. *Annual Review of Sociology, 28*, 443-478.
- Schilling, E. A., Aseltine, R. H., Jr., & James, A. (2016). The SOS Suicide Prevention Program: Further Evidence of Efficacy and Effectiveness. *Prev Sci, 17*(2), 157-166. doi:10.1007/s11121-015-0594-3
- Shepard, D. S., Gurewicz, D., Lwin, A. K., Reed, G. A., Jr., & Silverman, M. M. (2016). Suicide and Suicidal Attempts in the United States: Costs and Policy Implications. *Suicide Life Threat Behav, 46*(3), 352-362. doi:10.1111/sltb.12225
- Silverman, M. M., & Maris, R. W. (1995). The prevention of suicidal behaviors: An overview. *Suicide and life-threatening behavior, 25*(1), 10-21.
- Simon, O. R., Swann, A. C., Powell, K. E., Potter, L. B., Kresnow, M. J., & O'Carroll, P. W. (2001). Characteristics of impulsive suicide attempts and attempters. *Suicide Life Threat Behav, 32*(1 Suppl), 49-59.
- Spoth, R. L., Gyll, M., & Day, S. X. (2002). Universal family-focused interventions in alcohol-use disorder prevention: cost-effectiveness and cost-benefit analyses of two interventions. *J Stud Alcohol, 63*(2), 219-228.
- Stack, S., & Wasserman, I. (2007). Economic strain and suicide risk: a qualitative analysis. *Suicide and life-threatening behavior, 37*(1), 103-112.
- Sudak, H., Maxim, K., & Carpenter, M. (2008). Suicide and stigma: a review of the literature and personal reflections. *Acad Psychiatry, 32*(2), 136-142. doi:10.1176/appi.ap.32.2.136
- Szumilas, M., & Kutcher, S. (2011). Post-suicide intervention programs: a systematic review. *Can J Public Health, 102*(1), 18-29.
- Townsend, E., Hawton, K., Altman, D. G., Arensman, E., Gunnell, D., Hazell, P., . . . Van Heeringen, K. (2001). The efficacy of problem-solving treatments after deliberate self-harm: meta-analysis of randomized controlled trials with respect to depression, hopelessness and improvement in problems. *Psychological Medicine, 31*(6), 979-988.
- Tyrer, P., Reed, G. M., & Crawford, M. J. (2015). Classification, assessment, prevalence, and effect of personality disorder. *Lancet, 385*(9969), 717-726. doi:10.1016/S0140-6736(14)61995-4
- U.S. Office of the Surgeon General, & National Action Alliance for Suicide Prevention. (2012). *2012 National Strategy for Suicide Prevention: Goals and Objectives for Action*. Washington, D.C.: HHS.
- U.S. Public Health Service. (1999). *The Surgeon General's Call to Action to Prevent Suicide*. Washington, D.C.
- Unutzer, J., Tang, L., Oishi, S., Katon, W., Williams, J. W., Jr., Hunkeler, E., . . . Langston, C. (2006). Reducing suicidal ideation in depressed older primary care patients. *J Am Geriatr Soc, 54*(10), 1550-1556.
- Visser, V. S., Comans, T. A., & Scuffham, P. A. (2014). Evaluation Of The Effectiveness Of A Community-Based Crisis Intervention Program For People Bereaved By Suicide. *Journal of Community Psychology, 42*(1), 19-28. doi:10.1002/jcop.21586



- Walrath, C., Garraza, L. G., Reid, H., Goldston, D. B., & McKeon, R. (2015). Impact of the Garrett Lee Smith youth suicide prevention program on suicide mortality. *Am J Public Health, 105*(5), 986-993. doi:10.2105/AJPH.2014.302496
- Wang, Y. C., Hsieh, L. Y., Wang, M. Y., Chou, C. H., Huang, M. W., & Ko, H. C. (2016). Coping Card Usage can Further Reduce Suicide Reattempt in Suicide Attempter Case Management Within 3-Month Intervention. *Suicide Life Threat Behav, 46*(1), 106-120. doi:10.1111/sltb.12177
- Wasserman, D., Hoven, C. W., Wasserman, C., Wall, M., Eisenberg, R., Hadlaczky, G., . . . Carli, V. (2014). School-based suicide prevention programmes: The SEYLE cluster-randomised, controlled trial. *The Lancet, 385*(9977), 1536-1544. doi:10.1016/S0140-6736(14)61213-7
- Webster-Stratton, C., & Hammond, M. (1997). Treating children with early-onset conduct problems: a comparison of child and parent training interventions. *J Consult Clin Psychol, 65*(1), 93-109.
- Webster-Stratton, C., Reid, M. J., & Hammond, M. (2001). Preventing conduct problems, promoting social competence: a parent and teacher training partnership in head start. *J Clin Child Psychol, 30*(3), 283-302. doi:10.1207/S15374424JCCP3003\_2
- Webster-Stratton, C. H., Reid, M. J., & Beauchaine, T. (2011). Combining parent and child training for young children with ADHD. *Journal of Clinical Child & Adolescent Psychology, 40*(2), 191-203.
- Webster-Stratton, C., Jamila Reid, M., & Stoolmiller, M. (2008). Preventing conduct problems and improving school readiness: evaluation of the incredible years teacher and child training programs in high-risk schools. *Journal of child psychology and psychiatry, 49*(5), 471-488.
- Widome, R., Sieving, R. E., Harpin, S. A., & Hearst, M. O. (2008). Measuring neighborhood connection and the association with violence in young adolescents. *J Adolesc Health, 43*(5), 482-489. doi:10.1016/j.jadohealth.2008.04.013
- Wilcox, H. C., Kellam, S. G., Brown, C. H., Poduska, J. M., Ialongo, N. S., Wang, W., & Anthony, J. C. (2008). The impact of two universal randomized first- and second-grade classroom interventions on young adult suicide ideation and attempts. *Drug Alcohol Depend, 95 Suppl 1*, S60-73.
- Wilson, W. J. (2011). *When work disappears: The world of the new urban poor*: Vintage.
- World Health Organization. (2014). *Suicide Prevention: A Global Imperative*. Geneva, Switzerland: WHO Press.
- Wyman, P. A., Brown, C. H., LoMurray, M., Schmeelk-Cone, K., Petrova, M., Yu, Q., . . . Wang, W. (2010). An outcome evaluation of the Sources of Strength suicide prevention program delivered by adolescent peer leaders in high schools. *Am J Public Health, 100*(9), 1653-1661. doi:
- Yip, P., Caine, E., Yousuf, S., Chang, S.-S., Wu, K., & Chen, Y.-Y. (2012). Means restriction for suicide prevention. *Lancet, 379*. doi:10.1016/s0140-6736(12)60521-2

## Appendix A: Summary of Strategies and Approaches to Prevent Suicide

Strategy	Approach/Program, Practice or Policy	Best Available Evidence			Lead Sectors <sup>1</sup>
		Suicide	Suicide Attempts or Ideation	Other Risk/Protective Factors for Suicide	
Strengthen economic supports	<b>Strengthen household financial security</b>				Government (local, state, Federal)
	<i>Unemployment benefit programs</i>	✓			
	<i>Other income supports</i>	✓			Business/labor
	<b>Housing stabilization policies</b>				Government (local, state, Federal)
	<i>The National Neighborhood Stabilization Program</i>			✓	
Strengthen access to mental health care	<b>Coverage of mental health conditions in health insurance policies</b>				Health care
	<i>Mental Health Parity Laws</i>	✓		✓	Government (state, Federal)
Establish protective environments	<b>Reducing access to lethal means among persons at-risk</b>				Government (local, state)
	<i>Intervening at suicide hot spots</i>	✓			
	<i>Safe storage practices</i>		✓	✓	Public Health
	<b>Organizational policies and culture</b>				Business/Labor
	<i>Together for Life</i>	✓			
	<i>US Air Force Suicide Prevention Program</i>	✓		✓	Government (local, state, Federal)



		Best Available Evidence			
	<b>Community-based policies to reduce excessive alcohol use</b>				Government (local, state)
	<i>Alcohol outlet density</i>	✓		✓	Business/labor
<b>Promote connectedness</b>	<b>Peer norm approaches</b>				Public Health
	<i>Sources of Strength</i>			✓	Education
	<b>Community-engagement activities</b>				Public Health
	<i>Greening vacant urban spaces</i>			✓	Government (local)
<b>Teach coping and problem-solving skills</b>	<b>Social emotional learning</b>				Public Health
	<i>Youth Aware of Mental Health Program</i>		✓		Education
	<i>Signs of Suicide</i>		✓	✓	
	<i>Good Behavior Game</i>		✓	✓	
	<b>Parenting skill and family relationship approaches</b>				Public Health
	<i>The Incredible Years</i>			✓	Education
	<i>Strengthening Families 10-14</i>			✓	
<b>Identify and</b>	<b>Gatekeeper training</b>				Public Health
	<i>Mental Health First Aid</i>			✓	Healthcare
	<b>Screening combined with care management</b>				Healthcare

		Best Available Evidence			
support people at-risk	<i>Henry Ford Perfect Depression Care (Pre-cursor to Zero Suicide)</i>	✓		✓	Social Services
	<b>Crisis Intervention</b>				Public Health
	<i>National Suicide Prevention Lifeline</i>		✓	✓	Social Services
	<i>Applied Suicide Intervention Skills Training</i>		✓	✓	
Intervene to lessen harms and prevent future risk	<b>Treatment for people at risk of suicide</b>				Healthcare
	<i>Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)</i>		✓	✓	Social Services Justice
	<i>Collaborative Assessment and Management of Suicidality (CAMS)</i>		✓	✓	
	<i>Dialectical Behavioral Therapy</i>		✓	✓	
	<i>Attachment-Based Family Therapy</i>		✓		
	<b>Treatment to prevent re-attempts</b>				Healthcare
	<i>ED Brief Intervention with Follow-up Visits</i>	✓			Social Services
	<i>Active follow-up contact approaches</i>	✓	✓		
	<i>CBT for Suicide Prevention</i>				
	<b>Postvention</b>				Healthcare



		Best Available Evidence			
	<i>StandBy Response Service</i>		✓		
	<b>Safe messaging following a suicide</b>				Public Health
	<i>Media Guidelines</i>	✓			Media

<sup>1</sup>This column refers to the lead sectors well positioned to bring leadership and resources to implementation efforts. For each strategy, there are many other sectors such as non-governmental organizations that are instrumental to prevention planning and implementing the specific programmatic activities.

**Policies, Programs, and Practices to Support  
Individuals, Families, & Communities:**

**A Technical Package to Prevent Suicide**

**Comment [A]:** From TS: “support” could be read in a very limited way – e.g., providing services. This seems inconsistent with our emphasis on upstream approaches and work across the ecology.

**Comment [A]:** From JM: The term support evokes a specific strategy. Some of what is contained in this package goes beyond support or takes other avenues such as many of the approaches within protective environments. Is there another broader word that could be used to characterize this package here?

**Prepared by:**

Deb Stone, ScD, MSW, MPH  
Kristin Holland, PhD, MPH  
Brad Bartholow, PhD  
Alex Crosby, MD, MPH  
Shane Davis, PhD  
Natalie Wilkins, PhD

Division of Violence Prevention  
National Center for Injury Prevention and Control (NCIPC)  
Centers for Disease Control and Prevention

2016



*Policies, Programs, and Practices to Support Individuals, Families, & Communities:*  
*A Technical Package to Prevent Suicide* is a publication of the National Center for Injury Prevention  
and Control of the Centers for Disease Control and Prevention.

Centers for Disease Control and Prevention  
Thomas R. Frieden, MD, MPH, Director

National Center for Injury Prevention and Control  
Debra E. Houry, MD, MPH, Director

Division of Violence Prevention  
James A. Mercy, PhD, Director

*Suggested Citation:* Stone, D.M., Holland, K.M., Bartholow, B., Crosby, A.E., Davis, S., and Wilkins, N.  
Policies, Programs, and Practices to Support Individuals, Families, and Communities: *A Technical  
Package to Prevent Suicide*. Atlanta, GA: National Center for Injury Prevention and Control, Centers for  
Disease Control and Prevention, 2016.

## Contents

Acknowledgements.....	4
External Reviewers.....	5
Overview of Technical Package.....	6
Strengthen Economic Supports.....	13
Strengthen Access to Mental Health Care.....	16
Create Protective Environments.....	18
Promote Connectedness.....	22
Teach Coping and Problem-Solving Skills.....	24
Identify and Support People At-Risk.....	28
Intervene to Lessen Harms and Prevent Future Risk.....	32
Sector Involvement.....	37
Monitoring and Evaluation.....	39
Conclusion.....	40
References.....	42
Appendix A.....	50



## Acknowledgments

[to be inserted later]

## External Reviewers

[to be inserted later]



## Overview

This technical package represents a select group of strategies based on the best available evidence to help communities and states sharpen their focus on prevention activities with the greatest potential to prevent suicide. These strategies include strengthening economic supports; strengthening access to mental health care; creating protective environments; promoting connectedness; teaching coping and problem-solving skills; identifying and supporting people at-risk; and intervening to lessen harms and prevent future risk. The strategies represented in this package include those with a focus on preventing suicide from happening in the first place as well as approaches to lessen the immediate and long-term harms of suicidal behavior for individuals, families, communities, and society. The strategies in the technical package support the goals and objectives of the National Strategy for Suicide Prevention and the National Action Alliance for Suicide Prevention's priority to strengthen community-based prevention. Commitment, cooperation, and leadership from numerous sectors, including public health, education, justice, health care, social services, business, labor, and government can bring about the successful implementation of this package.

### What is a Technical Package?

A technical package is a compilation of a core set of strategies to achieve and sustain substantial reductions in a specific risk factor or outcome (Frieden, 2014). Technical packages help communities and states prioritize prevention activities based on the best available evidence. This technical package has three components. The first component is the **strategy** or the preventive direction or actions to achieve the goal of preventing suicide. The second component is the **approach**. The approach includes the specific ways to advance the strategy. This can be accomplished through *programs, policies, and practices*. The approaches included come primarily from studies based in the United States. The **evidence** for each of the approaches in preventing suicide or its associated risk factors is included as the third component. This package is intended as a resource to guide and inform prevention decision-making in communities and states.

### Preventing Suicide is a Priority

Suicide, as defined by the Centers for Disease Control and Prevention (CDC), is part of a broader class of behavior called *self-directed violence*. Self-directed violence refers to behavior directed at oneself that deliberately results in injury or the *potential* for injury (Crosby, Ortega, & Melanson, 2011). Self-directed violence may be *suicidal* or *non-suicidal* in nature. For the purposes of this document, we refer only to behavior where suicide is intended:

- **Suicide** is a death caused by self-directed injurious behavior with any intent to die as a result of the behavior.



- **Suicide attempt** is defined as a *non-fatal* self-directed and potentially injurious behavior with any intent to die as a result of the behavior. A suicide attempt may or may not result in injury.

**Suicide is highly prevalent.** Suicide presents a major challenge to public health in the United States and worldwide. It contributes to premature death, morbidity, lost productivity, and health care costs (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014). In 2014 (the most recent year of available death data), suicide was responsible for 42,773 deaths in the U.S., which is approximately one suicide every 12 minutes (Centers for Disease Control and Prevention, 2016d). In 2014, suicide ranked as the 10th leading cause of death and has been among the top 12 leading causes of death since 1975 in the U.S (Centers for Disease Control and Prevention, 2016d). Overall suicide rates have increased 24% from 1999 to 2014 (Curtin, Warner, & Hedegaard, 2016). ~~Suicide is a problem throughout the life span; it is the second leading cause of death among those aged 10–3419 years, also second among persons in their 20s and 30s; it is the fourth leading cause among persons in their 40s and seventh among persons in their 50s~~ (Centers for Disease Control and Prevention, 2016d)).

Suicides reflect only a portion of the problem (Crosby, Han, Ortega, Parks, & Gfroerer, 2011). Substantially more people are hospitalized as a result of nonfatal suicidal behavior (i.e. suicide attempts) than are fatally injured, and an even greater number are either treated in ambulatory settings (e.g., emergency departments) or not treated at all (Crosby, Han, et al., 2011). For example, during 2014, among adults aged 18 years and older, for every one suicide there were 9 adults treated in hospital emergency departments for self-harm injuries, 27 who reported making a suicide attempt, and over 227 who reported seriously considering suicide (i.e. ideation) (Ferdon et al., In press).

**Suicide is associated with several risk and protective factors.** Suicide, like other human behaviors, is ~~complex with~~ has no single determining cause. Instead, suicide occurs in response to multiple biological, psychological, interpersonal, environmental and societal influences that interact with one another, often over time. The social-ecological model-- encompassing multiple levels of focus from the individual, relationship, community, and societal-- is a useful framework for viewing and understanding suicide risk factors identified in the literature (Dahlberg & Krug, 2002). Risk and protective factors for suicide exist at each level. For example, risk factors include:

- **Individual level:** History of depression and other mental illnesses, hopelessness, alcohol and drug abuse, previous suicide attempt, violence ~~victimization~~, and genetic and biological determinants
- **Relationship level:** High conflict or violent relationships, sense of isolation and lack of social support, family/loved one's history of suicide, financial and work stress
- **Community level:** Inadequate community connectedness, barriers to health care (e.g., lack of access to providers and medications)

**Comment [A]:** Add AI/AN stats, racial/ethnic stats

**Comment [A]:** From JM: Seems like too much detail on leading causes, suggest looking for a way to condense. See suggested edit.

**Comment [A]:** It might be helpful to balance the description of suicide as complex with multiple influencers with a positive message about this meaning that there are multiple opportunities for prevention. We don't want readers to think we need to address all of the complex factors to make a difference.

**Comment [A]:** From JH: Is it worth mentioning terminal disease or condition?

**Comment [A]:** From TS: Could broaden this to include perpetration too.



- **Societal level:** Availability of lethal means of suicide, unsafe media portrayals of suicide, stigma associated with help-seeking and mental illness (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014).

It is important to recognize that the vast majority of individuals who are depressed or who have other risk factors noted, do *not* die by suicide. Furthermore, the relevance of each risk factor can vary by age, race, gender, sexual orientation, residential geography, and socio-cultural and economic status (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014).

Protective factors, or those influences that guard *against* the risk for suicide, can also be found across the different levels of the social-ecological model. Protective factors identified in the literature include: effective coping and problem solving skills, moral objections to suicide, strong and supportive relationships with partners, friends, and family; connectedness to school, community and other social institutions; availability of quality and ongoing physical and mental health care, and reduced access to lethal means (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014). These protective factors can either counter a specific risk factor or guard against a number of risks associated with suicide.

**Suicide is connected to other forms of violence.** Suicide and other forms of violence often share some of the same root causes (Butchart, Phinney, Check, & Villaveces, 2004; Kleven, Simon, & Chen, 2012). For example, in neighborhoods where there is low social cohesion, or where residents don't support and trust each other, people are at higher risk for suicide (Desai, Dausey, & Rosenheck, 2005) as well as perpetration of child maltreatment (Coulton, Crampton, Irwin, Spilsbury, & Korbin, 2007; Freisthler, Merritt, & LaScala, 2006), teen dating violence (Capaldi, Noble, Shortt, & Kim, 2012), intimate partner violence (Pinchevsky & Wright, 2012), and youth violence (Sampson, Morenoff, & Gannon-Rowley, 2002). Additionally, a lack of economic opportunities and unemployment are associated with suicide (Luo, Florence, Quispe-Agnoli, Ouyang, & Crosby, 2011; Reeves et al., 2012), as well as perpetration of child maltreatment (D. Runyan, Wattam, Ikeda, Hassan, & Ramiro, 2002), intimate partner violence (Heise & Garcia-Moreno, 2002; Pinchevsky & Wright, 2012), sexual violence (Centers for Disease Control and Prevention, 2016c) and youth violence (Wilson, 2011). Other shared risk factors for suicide and violence occur at the individual level and include substance abuse, mental health problems, witnessing violence, and a lack of problem-solving skills (Centers for Disease Control and Prevention, 2016a, 2016c, 2016e; U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012).

Just as risk factors may be shared across suicide and violence, so too may protective factors overlap. For example, **connectedness increases individual's and communities' resilience to suicide and other forms of violence, including connectedness to one's community** (Basile, Hamburger, Swahn, & Choi, 2013; Borowsky, Hogan, & Ireland, 1997; Centers for Disease Control and Prevention, 2016b; Coulton et al.,

**Comment [A]:** From TS: I found this wording somewhat awkward.



2007; Kleiman, Riskind, Schaefer, & Weingarden, 2012; Pinchevsky & Wright, 2012; Widome, Sieving, Harpin, & Hearst, 2008), school (Basile, Espelage, Rivers, McMahon, & Simon, 2009; Capaldi et al., 2012; Carter, McGee, Taylor, & Williams, 2007; DeGue et al., 2013; Hong, Kral, Espelage, & Allen-Meares, 2012; Losel & Farrington, 2012), family (Capaldi et al., 2012; Centers for Disease Control and Prevention, 2016a; Elgar, Craig, Boyce, Morgan, & Vella-Zarb, 2009; Maimon, Browning, & Brooks-Gunn, 2010; Resnick, Ireland, & Borowsky, 2004), caring adults (Capaldi et al., 2012; Losel & Farrington, 2012; Maimon et al., 2010), and pro-social peers (Capaldi et al., 2012; Losel & Farrington, 2012).

**The health and economic consequences of suicide are substantial.** Suicide and suicide attempts have far-reaching consequences for individuals, families, and communities (Dunne, McIntosh, & Dunne-Maxim, 1987; Mishara, 1995; National Action Alliance for Suicide Prevention: Suicide Attempt Survivors Task Force, 2014; National Action Alliance for Suicide Prevention: Survivors of Suicide Loss Task Force, 2015). By one conservative estimate, for every death by suicide six people are directly impacted (i.e. survivors). Based on this figure it is estimated that there are over 13 million survivors in the U.S. and unfortunately, survivorship itself is a risk factor for suicide (Crosby & Sacks, 2002). Research indicates that the health consequences of violence, including suicide, are also much more extensive than injury and death. Suicide attempt survivors (i.e. those with lived experience) may suffer long-term health and mental health consequences ranging from anger, guilt, and physical impairment, depending on the means and severity of the attempt (Chapman & Dixon-Gordon, 2007). Similarly, survivors of a loved one's suicide may experience ongoing pain and suffering including complicated grief (Mitchell, Kim, Prigerson, & Mortimer-Stephens, 2004), stigma, depression, anxiety, post-traumatic stress disorder, and increased risk of suicidal ideation and suicide (Julie Cerel, McIntosh, Neimeyer, Maple, & Marshall, 2014; Sudak, Maxim, & Carpenter, 2008).

The economic toll of suicide is immense as well. The total lifetime costs associated with nonfatal injuries and deaths caused by self-directed violence in 2013 were approximately \$93.5 billion after adjusting for under-reporting of suicide (Shepard, Gurewich, Lwin, Reed, & Silverman, 2016). The overwhelming burden of these costs results from lost productivity over the life course, with the average cost per suicide being over \$1.3 million (Shepard et al., 2016).

**Suicide can be prevented.** Despite the myths surrounding suicide, like most public health problems, suicide is preventable (U.S. Public Health Service, 1999). And while progress will continue to be made into the future, evidence for numerous programs, practices, and policies currently exists, and many programs are ready to be implemented now. Just as suicide is not caused by a single factor, research suggests that suicide will not be prevented by any single intervention taking place in any single setting (Silverman & Maris, 1995; U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). Rather, suicide prevention is best achieved by a focus across the individual, relationship, family, community, and societal-levels and across all sectors, private and public (e.g.,

**Comment [A]:** From LLD: The Crosby & Sacks reference is missing from the reference list. I looked it up online and noticed that the 13 million estimate is based on knowing a suicide decedent in the past year. Knowing someone who died by suicide seems potentially broader to me than being directly impacted.

**Comment [A]:** From TS: Has anyone updated this? It would be good to check.

**Comment [A]:** From TS: I don't think you need to start with "violence" and then focus on suicide.

**Comment [A]:** From LLD: they may also be impacted in other ways (e.g., loss of family income, etc.)

**Comment [A]:** From TS: It seems like it would be appropriate to acknowledge the CDC estimate too. Consider using that as a minimum and then say that others have estimated that the costs could be considerably higher after adjusting for under-reporting of suicide.



business, public health, physical and behavioral healthcare, justice, education, labor) (National Action Alliance for Suicide Prevention, 2014; World Health Organization, 2014).

### Assessing the Evidence

This technical package includes programs, practices, and policies with evidence of impact on suicide or risk or protective factors for suicide. To be considered for inclusion in the technical package, the program, practice, or policy selected had to meet at least one of these criteria: a) meta-analyses or systematic reviews showing impact on suicide; b) evidence from at least one rigorous (e.g., randomized controlled trial [RCT] or quasi-experimental design) evaluation study that found significant preventive effects on suicide; c) meta-analyses or systematic reviews showing impact on risk or protective factors for suicide, or d) evidence from at least one rigorous (e.g., RCT or quasi-experimental design) evaluation study that found significant impacts on risk or protective factors for suicide. Finally, consideration was also given to the likelihood of achieving beneficial effects on multiple forms of violence; no evidence of harmful effects on specific outcomes or with particular subgroups; and feasibility of implementation in a U.S. context if the program, policy, or practice has been evaluated in another country.

Within this technical package, some approaches do not yet have research evidence demonstrating impact on rates of suicide but instead are supported by evidence indicating impacts on risk or protective factors for suicide (e.g., help-seeking, stigma reduction, depression, connectedness). In terms of the strength of the evidence, programs that have demonstrated effects on suicidal behavior (e.g., reductions in deaths, attempts) provide a higher-level of evidence, but the evidence base is not that strong in all areas. For instance, there has been less evaluation of community engagement and family programs on suicidal behavior. Thus, approaches in this package that have effects on risk or protective factors reflect the **developmental** nature of the evidence base and the use of the best available evidence at a given time.

It is also important to note that there is often significant heterogeneity among the programs, policies, or practices that fall within one approach or strategy area in terms of the nature and quality of the available evidence. Not all programs, policies, or practices that utilize the same approach (e.g., gatekeeper training) are equally effective, and even those that are effective may not work across all populations. Tailoring programs and more evaluation may be necessary to address different population groups. The examples provided are not intended to be a comprehensive list of evidence-based programs, policies, or practices for each approach, but rather illustrate models that have been shown to impact suicide or have beneficial effects on risk or protective factors for suicide. In practice, the effectiveness of the programs, policies and practices identified in this package will be strongly dependent on the quality of their implementation and the communities in which they are implemented. Implementation guidance to assist practitioners, organizations and communities will be developed separately.

**Comment [A]:** From TS: “developmental nature” doesn’t seem correct. Do you mean the “current status”

## Context and Cross-Cutting Themes

The strategies and approaches that have been included in this technical package represent different levels of the social ecology, with efforts intended to impact the community and societal levels, as well individual and relationship levels. The strategies and approaches are intended to work in combination and reinforce each other to prevent suicide (see box below). The strategies are arranged in order such that those strategies hypothesized to have the greatest potential for broad public health impact on suicide are included first, followed by those that might impact more select populations (e.g., persons who have already made a suicide attempt).

Preventing Suicide	
Strategy	Approach
Strengthen economic supports	<ul style="list-style-type: none"><li>• Strengthen household financial security</li><li>• Housing stabilization policies</li></ul>
Strengthen access to mental health care	<ul style="list-style-type: none"><li>• Coverage of mental health conditions in health insurance policies</li></ul>
Create protective environments	<ul style="list-style-type: none"><li>• Reducing access to lethal means among persons at-risk of suicide</li><li>• Organizational policies and culture</li><li>• Community-based policies to reduce excessive alcohol use</li></ul>
Promote connectedness	<ul style="list-style-type: none"><li>• Peer norm approaches</li><li>• Community engagement activities</li></ul>
Teach coping and problem-solving skills	<ul style="list-style-type: none"><li>• Social-emotional learning</li><li>• Parenting skill and family relationship approaches</li></ul>
Identify and support people at risk	<ul style="list-style-type: none"><li>• Gatekeeper training</li><li>• Screening combined with care management</li><li>• Crisis intervention</li></ul>
Intervene to lessen harms and prevent future risk	<ul style="list-style-type: none"><li>• Treatment for people at-risk of suicide</li><li>• Treatment to prevent re-attempts</li><li>• Postvention</li><li>• Safe messaging following a suicide</li></ul>

The example programs, policies, and practices have been implemented within particular contexts. The social and cultural context of communities is critically important to take into account when selecting strategies and approaches. Practitioners in the field may be in the best position to assess the needs and strengths of their communities and work with community members to make decisions about the combination of approaches included here that are best suited to their context.



Suicide ideation, attempts, morbidity and mortality vary by gender, race/ethnicity, age, occupation, and other important population characteristics. Barriers to disclosure, help seeking, timely access to quality care, and ongoing support may also vary by population and community characteristics. Ideally, the availability of multiple approaches tailored to the economic, cultural, and environmental context of individuals and communities are desirable as they may increase the likelihood of removing barriers to supportive and effective care and provide opportunities to develop individual and community resilience. These culturally appropriate approaches can then be included in comprehensive strategies to maximize the public health impact on reducing suicide-related morbidity and mortality among individuals and within communities.

This package includes strategies where public health agencies are well positioned to bring leadership and resources to implementation efforts. It also includes strategies where public health can serve as an important collaborator (e.g., strategies addressing community and societal level risks), but where leadership and commitment from other sectors such as business, labor or health care is critical to implement a particular policy or program (e.g., workplace policies; screening combined with care management). The role of various sectors in the implementation of a strategy or approach in preventing suicide is described further in the section on *Sector Involvement*.

In the sections that follow, the strategies and approaches with the best available evidence for preventing suicide are described.

## Strengthen Economic Supports

### Rationale

Studies from the U.S. examining historical trends indicate that suicide rates increase during economic recessions marked by high unemployment rates, job losses, and economic instability and decrease during economic expansions and periods marked by low unemployment rates, particularly for working-age individuals 25 to 64 years old (Luo et al., 2011; Fowler et al., 2015). Economic and financial strain, such as job loss, long periods of unemployment, reduced income, difficulty covering medical, food, and housing expenses, and even the anticipation of such financial stress, can directly or indirectly increase an individual's risk for suicide; buffering these risks can therefore, potentially protect against suicide (Stack & Wasserman, 2007). For example, strengthening economic support systems can help people pay stay in their homes or obtain affordable housing while also paying for necessities such as food and medical care, job training, child care, among other expenses required for daily living. In providing this support, stress and anxiety and the potential for a crisis situation may be reduced, thereby preventing suicide.

### Approaches

Economic supports for individuals and families can be strengthened by targeting household financial security and ensuring stability in housing during periods of economic stress.

- **Strengthening household financial security** can potentially buffer the risk of suicide by providing individuals with the financial means to lessen the stress and hardship associated with a job loss or other unanticipated financial problems. The provision of unemployment benefits and other forms of temporary assistance, livable wages, medical benefits, and retirement and disability insurance to help cover the cost of necessities or to offset costs in the event of disability, are examples of ways to strengthen household financial security.
- **Housing stabilization policies** aim to keep people in their homes and provide housing options for those in need during times of financial insecurity. This may occur through programs that provide affordable housing such as through government subsidies or through other options available to potential homebuyers such as loan modification programs, move-out planning, or financial counseling services that help minimize the risk or impact of foreclosures and eviction.

### Potential Outcomes

- Reduced suicide rates
- Lower foreclosure rates
- Lower eviction rates
- Reduced emotional distress

**Comment [A]:** From TS: I was thinking that it might be good to work in a point about how these risks can be directly or indirectly associated with suicide risk because these stressors can exacerbate relationship as well physical and mental health problems.

**Comment [A]:** From TS: I like this clear and succinct summary.

**Comment [A]:** From JH: Consistent tense – reduced vs. reduce

**Comment [A]:** From LLD: the other packages use "Reductions in..."; you may want to consider using similar language for your potential outcomes.



## Evidence

There is evidence suggesting that strengthening household financial security and stabilizing housing can reduce suicide risk.

- **Strengthen household financial security.** An examination of variations in U.S. *unemployment benefit programs* across states demonstrated that the impact of unemployment on suicide was offset in those states that provided greater than average unemployment benefits (Cylus, Glymour, & Avendano, 2014). Another U.S. study examining the link between unemployment and suicide risk using monthly suicide data, length of unemployment, and job losses found that the duration of unemployment, as opposed to just the loss of job, predicted suicide risk (Classen & Dunn, 2012). Together, these results suggest that not only should state unemployment benefit programs be generous in their financial allocations, but also in their duration.

Other measures to strengthen household financial security (e.g., transfer payments related to retirement and disability insurance, unemployment insurance compensation, medical benefits, and other forms of family assistance) have also shown an impact on suicide. A study by Flavin and Radcliff (2009) examined the impact of states' per capita spending on transfer payments, medical benefits, and family assistance (Temporary Assistance to Needy Families – TANF) and total state spending on suicide rates between 1990-2000, controlling for a number of suicide risk factors (e.g., residential mobility, divorce rate, unemployment rate) at the state level. As per capita spending on total transfer payments, medical benefits, and family assistance increased there was an associated decrease in state suicide rates. Moreover, it wasn't spending in general that was associated with the reduction but spending on these types of assistance. In terms of lives saved, Flavin & Radcliff calculated the cost of reducing a state's suicide rate by a full point for the years studied. At the national level, they estimated that 3,000 fewer suicides would occur per year nationwide if every state increased their per capita spending on these types of assistance by \$45 per year (Flavin & Radcliff, 2009).

- **Housing stabilization policies.** The *National Neighborhood Stabilization Program* was designed to help neighborhoods suffering from high rates of foreclosure and abandonment by slowing the deterioration of the neighborhoods and providing affordable housing options for low, moderate, and middle-income homebuyers. This program also offers financial assistance to eligible individuals for the purchase of a new home. Although this program has not been rigorously evaluated for its impact on suicide outcomes, it addresses foreclosure and eviction, which are risk factors for suicide. A longitudinal analysis of annual data on suicides and foreclosures demonstrated that as the proportion of foreclosed properties increased in U.S. states, so did the state suicide rate, particularly among working-aged adults (Houle & Light, 2014). Another study

**Comment [A]:** From TS: Consider including a point about this being a correlational study and more evaluation work is needed but it suggests the potential benefits of policies that reach those who are particularly vulnerable at the times when they are in greatest need.

of data from 16 U.S. states participating in the National Violent Death Reporting System found that suicides precipitated by home foreclosures and evictions increased more than 100% from 2005 (before the housing crisis began) to 2010 (after it had peaked; Fowler, Gladden, Vagi, Barnes, and Frazier (2015)). Most of these suicides occurred prior to the actual loss of the decedent's home. These findings suggest that integrating suicide prevention resources, messaging, and referrals into financial, foreclosure, and move-out planning and counseling services may help to prevent suicide.



## Strengthen Access to Mental Health Care

### Rationale

While most people with mental health problems do not attempt or die by suicide (Olfson, Gerhard, Huang, Crystal, & Stroup, 2015; Owens, 2002), and risk conferred by mental illnesses differ (Arsenault-Lapierre, Kim, & Turecki, 2004; E. C. Harris & Barraclough, 1997; Tyrer, Reed, & Crawford, 2015), previous research indicates that mental illness is an important risk factor for suicide (E. C. Harris & Barraclough, 1998; World Health Organization, 2014). Studies suggest that up to 90% of people who die by suicide may have had a mental illness at the time of their deaths (Arsenault-Lapierre et al., 2004; Cavanagh, Carson, Sharpe, & Lawrie, 2003; Isometsa, 2001). State-level suicide rates have also been found to be correlated with general mental health measures such as depression (Lang, 2013; Mark, Shern, Bagalman, & Cao, 2007). Findings from the National Comorbidity Survey indicate that relatively few people in the U.S. with mental health disorders receive treatment for those conditions (Kessler et al., 2005). Lack of access to mental health care is one of the contributing factors related to the underuse of mental health services (Cunningham, 2009). Identifying ways to improve access to timely, affordable, and quality mental health care for people in need is a critical component to suicide prevention (World Health Organization, 2014). Apart from the treatment benefits, it can also serve to normalize help-seeking behavior and increase the use of such services.

### Approaches

One approach to strengthening access to mental health care is through the provision of mental health coverage in health insurance policies.

- **Coverage of mental health conditions in health insurance policies.** Federal and state laws include provisions for equal coverage of mental health services in health insurance plans that is on par with coverage for other health concerns (i.e., mental health parity). Benefits and services covered include such things as the number of visits, co-pays, deductibles, inpatient/outpatient services, prescription drugs, and hospitalizations. If a state has a stronger mental health parity law than the federal parity law, then insurance plans regulated by the state must follow the state parity law. Federal parity replaces the state law only in cases where the state law prevents the application of the federal parity law (e.g., includes coverage for some mental health conditions but not others). Equal coverage does not necessarily imply good coverage as health insurance plans vary in the extent to which benefits and services are offered to address various health conditions. Rather it helps to ensure that mental health services are covered on par with other health concerns.

### Potential Outcomes

- Increased utilization of mental health services

**Comment [A]:** From JM: I assume this means that different types of mental health problems pose different risks for suicide, but wasn't sure? May want to make the point more explicit

**Comment [A]:** From TS: Isn't this including substance abuse disorder? It would be good to state this explicitly.

**Comment [A]:** From TS: I found this sentence confusing. Can you reword to simplify this.

From LLD: could say: "if a state has a weaker parity law than the federal parity law (e.g., includes coverage for some mental health conditions but not others), then the federal parity law will replace the state law."

- Decreased symptoms of mental illnesses
- Decreased rates of suicide attempts
- Decreased rates of suicide

### Evidence

There is evidence suggesting that coverage of mental health conditions in health insurance policies can reduce risk factors associated with suicide and may directly impact suicide rates.

- **Coverage of mental health conditions in health insurance policies.** The National Survey of Drug Use and Health is a nationally representative survey of the U.S. population that provides data on substance use, mental health conditions, and services utilization. Using data from this survey, K. M. Harris, Carpenter, and Bao (2006) found that 12 months after states enacted *mental health parity laws*, self-reported use of mental healthcare services significantly increased. Moreover, subsequent research by Lang (2013) examined state mental health laws and suicide rates between 1990 and 2004 and found that mental health parity laws, specifically, were associated with an approximate 5% reduction in suicide rates. This reduction, in the 29 states with parity laws, equated to the prevention of 592 suicides per year and a cost savings of \$1.3-3.1 million per suicide prevented (Lang, 2013).

**Comment [A]:** From TS: I don't think this is accurate. I was curious about this study and checked out the paper. I think they are saying that this is the cost incurred per suicide prevented. They go on to explain that this is the upper bound and does not reflect the benefits to non-suicidal individuals. Please confirm this. If you are going to include this then it will be important to explain it further.



## Create Protective Environments

### Rationale

Prevention efforts that focus not only on individual behavior change (e.g., help-seeking, treatment interventions) but on changes to the environment can increase the likelihood of positive behavioral and health outcomes (Haddon, 1980). Creating environments that address risk and protective factors where individuals live, work, and play, can help prevent suicide (Dahlberg & Krug, 2002; U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). For example, rates of suicide and suicide attempts are elevated in certain occupational groups (Han et al., 2016; McIntosh et al., 2016), therefore, changes to the organizational culture in these occupations, by way of implementation of supportive policies or even physical modifications to the workplace environment, can change social norms, encourage help-seeking, and demonstrate that good health and mental health are valued and that stigma and other risk factors for suicide are not (K. L. Knox et al., 2010; National Action Alliance for Suicide Prevention Workplace Task Force, 2015). Similarly, modifying the characteristics of the environment to prevent harmful behavior such as access to lethal means can reduce suicide rates, particularly in times of crisis (Beautrais, Gibb, Fergusson, Horwood, & Larkin, 2009; Crosby, Espitia-Hardeman, Ortega, & Lozano, 2013; Kaplan et al., 2013; Miller, Warren, Hemenway, & Azrael, 2015; C. W. Runyan et al., 2016).

### Approaches

The current evidence suggests three **promising** approaches for creating environments that protect against suicide.

- **Reducing access to lethal means among persons at-risk of suicide.** Means of suicide such as firearms, hanging/suffocation, or jumping from heights provide little opportunity for rescue and, as such, have high case fatality rates (e.g., about 85% of people who use a firearm in a suicide attempt will die from the injury). Research also indicates that 1) the interval between thinking about and attempting suicide can be as short as 5 or 10 minutes (Deisenhammer et al., 2009; Simon et al., 2001) and 2) that people tend *not* to substitute a different method when a highly lethal method is unavailable or difficult to access (Hawton, 2007; Yip et al., 2012). Therefore, increasing the time interval between the thought and the suicide attempt, for example, by making it more difficult to access lethal means, can be lifesaving. The following are examples of approaches reducing access to lethal means for persons at-risk of suicide:
  - *Intervening at Suicide Hotspots.* Suicide hotspots, or places where suicides may take place relatively easily, include tall structures (e.g., bridges and cliffs), railway tracks, and isolated locations such as parks. Efforts to prevent suicide at these locations include

**Comment [A]:** From JM: The word promising has certain connotations when using it around evidence. You say later that the evidence around this strategy is some of the strongest for suicide. These two statements seem somewhat inconsistent. I would use a different word here then promising if you truly believe there is strong evidence.

From JH: suggest deleting the word "promising"

From LLD: since we don't want to infer that these are the only approaches for creating protective environments, I might be inclined to change the word "promising" to "potential" or "possible" or something along those lines.

erecting barriers to prevent jumping and installing signs and telephones to encourage individuals who are considering suicide, to seek help (Cox et al., 2013).

- *Safe Storage Practices.* Safe storage of medications, firearms, and other household products can reduce the risk for suicide by separating individuals who may be vulnerable and/or impulsive from easy access to lethal means. Such practices may include education and counseling around storing firearms--locked in a secure place (e.g., in a gun safe or lock box), unloaded and separate from the ammunition--and keeping medicines in a locked cabinet or other secure location away from people who may be at risk or who have made prior attempts (Rowhani-Rahbar, Simonetti, & Rivara, 2016; C. W. Runyan et al., 2016).

- **Organizational policies and culture** that promote protective environments may be implemented in places of employment. Such policies and cultural values may promote prosocial behavior (e.g., asking for help), skill building, changing social norms, referral and access to helping services (e.g. mental health, substance abuse treatment, financial counseling), and encourage leadership support from the top down. Such policies and cultural shifts can positively impact organizational climate and morale and help prevent suicide and its related risk factors (e.g. depression, social isolation) (National Action Alliance for Suicide Prevention Workplace Task Force, 2015).
- **Community-based policies to reduce excessive alcohol use.** Research studies in the United States have found that greater alcohol availability is positively associated with alcohol-involved suicides (Escobedo & Ortiz, 2002; Giesbrecht et al., 2015). Policies to reduce excessive alcohol use broadly include zoning to limit alcohol outlet locations and density, taxes on alcohol, and bans on the sale of alcohol for individuals under the legal drinking age. These policies are important because acute alcohol use has been found to be associated with more than one-third of suicides and approximately 40% of suicide attempts (Cherpitel, Borges, & Wilcox, 2004).

#### Potential Outcomes

- Increase in safe storage of means
- Reduction in suicide attempts
- Reduction in suicide deaths
- Increase in help-seeking
- Reduction in alcohol-related suicide deaths

#### Evidence

The evidence for the effectiveness reducing access to lethal means for person at-risk of suicide and other ways to establish protective environments is some of the strongest in the field (Zalsman et al., 2016).

**Comment [A]:** From JM: Consistent with promising used earlier? Is it the strongest?



- **Reducing access to lethal means among persons at-risk of suicide.** A meta-analysis examining the impact of *suicide hotspot interventions* implemented in combination or in isolation, both in the U.S. and abroad, found associated reduced rates of suicide (Cox et al., 2013; Pirkis et al., 2015). For example, after erecting a barrier on the Jacques-Cartier bridge in Canada, the suicide rate from jumping from the bridge decreased from about 10 suicide deaths per year to about 3 deaths per year (Perron, Burrows, Fournier, Perron, & Ouellet, 2013). Moreover, the reduction in suicides by jumping was sustained even when all bridges and nearby jumping sites were considered, suggesting little to no displacement of suicides to other jumping sites (Perron et al., 2013). Further evidence for the effectiveness of bridge barriers was demonstrated by a study examining the impact of the *removal* of safety barriers from the Grafton Bridge in Auckland, New Zealand. After removal of the barrier, *sadly*, both the number and rate of suicide increased fivefold (Beautrais, 2001; Beautrais et al., 2009).

Another form of means reduction involves implementation of *safe storage practices*. In a case-control study of firearm-related events identified from 37 counties in Washington, Oregon, and Missouri, and from 5 trauma centers, Grossman et al. (2005) found that storing firearms unloaded, separate from ammunition, in a locked place or secured with a safety device was protective of suicide attempts among adolescents. Further, a recent systematic review of clinic and community-based education and counseling interventions suggested that the provision of safety devices significantly increased safe firearm storage practices compared to counseling alone or compared to the provision of economic incentives to acquire safety devices on one's own (Rowhani-Rahbar et al., 2016).

Another program, *The Emergency Department Counseling on Access to Lethal Means (ED CALM)*, trained psychiatric emergency clinicians in a large children's hospital to provide lethal means counseling and safe storage boxes to parents of patients under age 18 receiving care for suicidal behavior. In a pre-post quality improvement project, Runyan et al (2016) found that at post-test 76% (of the 55% of parents followed up, n=114) reported that all medications in the home were locked up as compared to fewer than 10% at the time of the initial emergency department visit. Among parents who indicated the presence of guns in the home at pre-test (i.e. 67%), all (100%) reported guns were currently locked up at post-test (C. W. Runyan et al., 2016).

- **Organizational policies and culture.** *Together for Life* is a workplace program of the Montreal Police Force implemented to address suicide among officers. Policy and program components were designed to foster an organizational culture that promoted mutual support and solidarity among all members of the Force. The program included training of supervisors, managers and all units to improve competencies in identifying suicidal risk and to improve use and awareness of existing resources. The program also included an education campaign to improve awareness and help-seeking (Mishara & Martin, 2012). Police suicides were tracked over 12 years and



compared to rates in the control city of Quebec. The suicide rate in the intervention group decreased significantly by 78.9% to a rate of 6.4 suicides per 100,000 population per year compared to an 11% increase in the control city (~~rate: 29.0~~ per 100,000) (Mishara & Martin, 2012).

Another example of this approach is the *United States Air Force Suicide Prevention Program (AFSPP)*. AFSPP included 11 policy and education initiatives and was designed to change the culture of the Air Force surrounding suicide. The program uses leaders as role models and agents of change, establishes expectations for behavior related to awareness of suicide risk, develops population skills and knowledge (i.e., education and training), and investigates every suicide (i.e., outcomes measurement). The program represents a fundamental shift from viewing suicide and mental illness solely as medical problem and instead sees them as larger service-wide problems impacting the whole community (K. L. Knox, Litts, Talcott, Feig, & Caine, 2003). Using a time-series design to examine the impact of the AFSPP program on various violence-related outcomes, researchers found that the program was associated with a 33% relative risk reduction in suicide (K. L. Knox et al., 2003). The program was also associated with relative risk reductions in related outcomes including moderate and severe family violence (30% and 54%, respectively), homicide (51%), and accidental death (18%) (K. L. Knox et al., 2003). A longitudinal assessment of the program over the period 1981 to 2008 (16 years before the 1997 launch of the program and 11 years post-launch) found significantly lower rates of suicide after the program was launched than before (K. L. Knox et al., 2010). These effects were sustained over time, except in 2004, which the authors found was associated with less rigorous implementation in that year than in the other years (K. L. Knox et al., 2010).

- **Community-based policies to reduce excessive alcohol use.** While multiple policies to limit excessive use of alcohol ~~use~~ exist, several studies on alcohol outlet *density*, specifically, suggest that measures to reduce alcohol outlet density can potentially reduce alcohol-involved suicides. Additionally, a longitudinal analysis of alcohol outlet density, suicide mortality, and hospitalizations for suicide attempts over 6 years in 581 California zip codes indicated that the density of bars, specifically, is related to suicide and suicide attempts, particularly in rural areas (Johnson, Gruenewald, & Remer, 2009).



## Promote Connectedness

### Rationale

Sociologist, Emile Durkheim theorized in 1897 that weak social bonds, i.e. lack of connectedness, are among the chief causes for suicidality (Durkheim, 1897/1951). *Connectedness* is the degree to which an individual or group of individuals are socially close, interrelated, or share resources with others (Centers for Disease Control and Prevention, 2009). Social connections can be formed within and between multiple levels of the social ecology (Dahlberg & Krug, 2002), for instance between individuals (e.g. peers, neighbors, co-workers), families, schools, neighborhoods, workplace, faith communities, cultural groups, and society as a whole. Related to connectedness, *social capital* refers to a sense of trust in one's community and neighborhood, social integration, and also the availability and participation in social organizations (Beyer, Layde, Hamberger, & Laud, 2015; Muennig, Cohen, Palmer, & Zhu, 2013). Many ecological cross-sectional and longitudinal studies have examined the impact of aspects of social capital on depression symptoms, depressive disorder, mental health more generally, and suicide. While the evidence is still being built the pattern is towards an inverse association between social capital measured by social trust, community/ neighborhood engagement, and improved mental health. Connectedness and social capital together can serve to protect against suicidal behaviors by decreasing isolation, encouraging adaptive coping behaviors, increasing belongingness, personal value and worth all of which helps individuals to build resilience in the face of adversity. Connectedness can also provide individuals with better access to formal supports and resources, mobilize communities to meet the needs of its members and provide collective primary prevention activities to the community as a whole (Centers for Disease Control and Prevention, 2009).

### Approaches

Promoting connectedness among individuals and within communities through modeling peer norms and enhancing community engagement can protect against suicide.

- **Peer norm approaches** seek to normalize prosocial behaviors/protective factors for suicide such as help-seeking, reaching out and talking to trusted adults, and peer connectedness. These approaches typically target youth and are delivered in school settings but can also be implemented in community settings.

**Comment [A]:** From JM: Seems like a nuance you can delete from this paragraph. You don't really pick up on this later and it probably requires more explanation

**Comment [A]:** From JH: Awkward wording. Consider, while the evidence is limited, existing studies suggest...

**Comment [A]:** From TS: I think you meant to say a "positive" association rather than "inverse".

**Comment [A]:** From JM: This implies that prosocial behavior is currently abnormal. Maybe promote is a better word?

From JH: suggest deleting "seek to normalize" and say "Peer norm approaches encourage prosocial behavior..."



- **Community engagement activities.** Community engagement is an aspect of social capital. Community engagement approaches may involve residents participating in a range of activities, including religious activities, community clean-up and greening activities, and physical exercise. These activities provide opportunities for residents to become more involved in the community and to connect with other community members, organizations, and resources, resulting in enhanced overall physical health, reduced stress, and decreased depressive symptoms, thereby reducing risk of suicide.

### Potential Outcomes

- Reduction in maladaptive coping attitudes and behaviors
- Increase in healthy coping attitudes and behaviors
- Increase in referrals for youth in distressed
- Increase help-seeking behaviors
- Positive perception of adult support

### Evidence

Current evidence suggests that peer norm approaches and community engagement can reduce risk factors associated with suicidal behaviors.

- **Peer norm approaches.** Evaluations show that programs such as *Sources of Strength* can improve school norms and beliefs about suicide that are created and disseminated by student peers. In a randomized controlled trial of *Sources of Strength* conducted with 18 high-schools (6 metropolitan, 12 rural), Wyman et al. (2010) found that the program improved peer leaders' adaptive norms regarding suicide, their connectedness to adults, and school engagement. Peer leaders were also more likely than controls to refer a suicidal friend to an adult. Among students, the intervention increased perceptions of adult support for suicidal youths and the acceptability of seeking help. Perception of adult support increased most in students with a history of suicidal ideation. Finally, trained peer leaders also reported a greater decrease in maladaptive coping attitudes compared with untrained leaders (Wyman et al., 2010).
- **Community engagement activities.** A vacant lot greening initiative was undertaken in Philadelphia between 1999 and 2008. Local residents and community members worked together to green 4,436 lots (or 7.8 million square feet) in 4 areas of the city. Researchers found significant associated reductions in community residents' self-reported stress levels and engagement in more physical exercise than residents in control vacant lot areas. Other benefits included reductions in firearm assaults and vandalism (Branas et al., 2011).

**Comment [A]:** From JH: Cite findings from Let's Connect intervention program? While the intervention didn't significantly reduce suicidal behavior, there were significant improvements in connectedness (a protective factor for suicide).

**Comment [A]:** From TS: Is there any evidence on outcomes more proximal to suicide? Did they look for any and not find them? It is important to describe relevant null effects when they were found.

**Comment [A]:** From JM: Not seeing strong evidence here. Are you suggesting that this affects documented risk factors for suicide by reducing stress and increasing physical exercise? I would like to see a stronger evidence statement here.

From LLD: you might want to incorporate a phrase in the statement along the lines of "which are risk factors for suicide"

**Comment [A]:** From TS: They had a follow up paper in 2013 that showed intervention sites felt significantly safer. The effects on crimes was encouraging but not significant. It seems important to mention this too.

From LLD: not sure I agree with Tom's last point about mentioning the nonsignificant effect on crime.



## Teach Coping and Problem-Solving Skills

### Rationale

Building life skills prepares individuals to successfully tackle every day challenges and adapt to stress and adversity. Life skills encompasses many concepts, but most often include coping and problem-solving skills, conflict resolution, and critical thinking. Life skills are important in shielding individuals from suicidal behaviors (World Health Organization, 2014). Suicide prevention programs that focus on life and social skills training are drawn from social cognitive theories (Bandura, 1986), surmising that **individuals** ~~(who) engage in~~ suicidal behavior is attributed to ~~(either)~~ direct learning, modeling, and environmental and individual (e.g. hopelessness) characteristics. The literature linking life skills and suicide is robust. The inability to employ adequate ~~cop~~ing strategies to cope with immediate stressors or identify and find solutions for problems ~~has~~ve been characterized among suicide attempters (Pollock & Williams, 2004). Treatments that include bolstering skills (Goldsmith, Pellmar, Kleinman, & Bunney, 2002) and include problem-solving techniques (Ghahramanlou-Holloway, Bhar, Brown, Olsen, & Beck, 2012; Townsend et al., 2001) appear to reduce suicidal ideation and attempts more effectively. Prevention programs focused on teaching these skills target youth, parents and families and have been used with both universal and at-risk populations. While many do not target suicidal behaviors directly, these programs strive to train youth and parents in important life skills to offset the underlying vulnerabilities that contribute to engaging in high-risk behaviors early in life.

Comment [A]: Specific edits needed here.

Comment [A]: From LLD: the word "either" here implies another comparative clause; should the word "or" be inserted before the word "modeling"? May want to just delete the word "either"

### Approaches

Current evidence provides support for the following two approaches:

- **Social emotional learning programs** focus on developing and strengthening communication and problem-solving skills, emotion regulation, conflict resolution, help seeking and coping skills. These approaches address a range of risk and protective factors for suicidal behavior. They provide children and youth with skills to resolve problems in relationships, school, and with peers, and help youth to address other negative influences (e.g., substance use) associated with suicide. These approaches are typically delivered to all students in a particular grade or school, although some programs also focus on groups of students considered to be at high risk for suicide. Opportunities to practice and reinforce skills are an important part of programs that work (Herman, Borden, Reinke, & Webster-Stratton, 2011).
- **Parenting skill and family relationship programs** are designed to strengthen parenting skills, enhance positive parent-child interactions, and improve children's behavioral and emotional skills and abilities. Several parenting and family relationship programs have been shown in rigorous evaluations to improve resilience and reduce risk factors for various behaviors, including

ones closely related to suicide, such as depression, internalizing behaviors, and substance abuse (M. S. Knox, Burkhart, & Hunter, 2010).

### Potential Outcomes

- Reduction in suicide attempts and suicide ideation
- Enhanced knowledge of risk and protective factors associated with suicide
- Reduction in suicide risk behaviors (i.e., depression, anxiety, conduct problems, substance abuse)
- Improve and normalize help-seeking behavior
- Enhance social competence and emotional regulation skills
- Enhance problem-solving and conflict management skills

### Evidence

There are several programs with evidence that support teaching social, emotional and parenting skills to reduce suicidal behaviors and associated risk factors.

- **Social emotional learning programs.** The *Youth Aware of Mental Health Program (YAM)* is a program developed for teenagers that uses interactive dialogue and role-playing to teach adolescents about the risk and protective factors associated with suicide (including knowledge about depression and anxiety) and enhances their problem-solving skills for dealing with adverse life events, stress, school and other problems. The program includes 3 hours of role-play sessions and interactive workshops combined with a booklet that students can keep, educational posters displayed in classroom, and interactive lectures about mental health at the beginning and end of the program (Wasserman et al., 2014). In a cluster-randomized controlled trial of YAM conducted across 10 European Union countries and 168 schools, students participating in the YAM program were significantly less likely to have an incident suicide attempt (OR 0.45, 95%CI 0.24–0.85;  $p=0.014$ ) and severe suicidal ideation (0.50, 0.27–0.92;  $p=0.025$ ) at the 12-month follow-up compared to the control group. Additionally, related to severe suicide ideation, in the YAM group absolute risk fell by 0.50% and relative risk fell by 49.6% (Wasserman et al., 2014).

*Signs of Suicide (SOS)* is another school-based prevention program for students aged 13–17. The program includes guided classroom discussions about suicide and depression. As part of the program, students are screened for depression and suicide risk and referred for professional help as indicated. The program is designed to increase knowledge about suicide and risk factors associated with suicidal behavior as well as improve and normalize help-seeking behavior (Schilling, Aseltine, & James, 2016). In a randomized controlled trial, SOS was shown to reduce self-reported suicide attempts at 3-months post intervention among

**Comment [A]:** From JH: Report ages (compare to SOS below)

**Comment [A]:** From JH: Suggest translating OR and 95% CI for wider audience.

From LLD: agree; this is too technical for a wider audience. See Tom's suggestion below.

**Comment [A]:** From JH: state if the control group received any kind of intervention

**Comment [A]:** From JH: significant?

**Comment [A]:** From TS: The Lancet paper has a 2015 publication date.

The authors provide the absolute and RR for suicide attempts too and they give a clear way of thinking about this – i.e., for RR “Of 1000 pupils, 11 attempted suicide in the control group vs five attempts in YAM”

It might be worth using the attempt example so you can provide this explanation.

**Comment [A]:** From JH: significant? Effect size/magnitude of reduction?



participating students compared to **control** students. The SOS program also **increased** students' knowledge of how to get help for themselves or friends for depression and/or suicidal thoughts, and favorable attitudes toward help-seeking. SOS participants with a lifetime history of suicide attempt were also less likely to report planning a suicide in the 3 months following the program compared to **lower-risk participants** (Schilling et al., 2016).

Finally, the *Good Behavior Game (GBG)* is a classroom-based program for elementary school children aged 6-10; **it represents an example of upstream suicide prevention programming**. The program uses a team-based behavior management strategy that promotes good behavior by setting clear expectations for good behavior and consequences for maladaptive behavior. The goal of the GBG is to create an integrated classroom social system that is supportive of all children being able to learn with little aggressive or disruptive behavior (Wilcox et al., 2008). **In an outcome evaluation of the GBG, first graders assigned to GBG reported half the adjusted odds of suicidal ideation and suicide attempts**. The beneficial effect of the program was consistent for suicidal ideation regardless of whether baseline covariates were included. The GBG effect on attempts was less robust in some adjusted models including caregiver mental health. In the **second cohort** of GBG students, neither suicidal ideation nor suicide attempts were significantly different between GBG and the control interventions (Wilcox et al., 2008). **This finding likely arose due to the lack of implementation fidelity** and pointed to the need for GBG to be delivered with precision, consistency, and teacher support. GBG was also found to be associated with reduced risk of later substance abuse, a risk factor for suicide (Kellam et al., 2008).

- **Parenting skill and family relationship programs.** Parenting and family skills training approaches have shown promising impacts in preventing key risk factors associated with suicide. For example, the *Incredible Years (IY)* is a comprehensive group training program for parents, teachers and children designed to reduce conduct and substance abuse problems, two important suicide risk factors, in youth by improving protective factors such as responsive and positive parent-teacher-child interactions and relationships, emotion self-regulation and social competence (all protective factors for suicide) (Herman et al., 2011). The program includes 9- 20 sessions offered in community-based settings (e.g., religious, recreation centers, mental health treatment centers, and hospitals). Several studies have demonstrated the effect of the IY program on reducing internalizing symptoms, such as anxiety and depression, and child conduct problems (C. H. Webster-Stratton, Reid, & Beauchaine, 2011; Webster-Stratton, Jamila Reid, & Stoolmiller, 2008). The program is also associated with improved problem-solving and conflict management; these skills were maintained at 1-year follow-up (Reid, Webster-Stratton, & Hammond, 2003; C. Webster-Stratton & Hammond,

**Comment [A]:** From JH: define control condition

**Comment [A]:** From JH: significant?

**Comment [A]:** From JH: Lower-risk? Do you mean students with no prior reported history of suicide attempts?

**Comment [A]:** From LLD: Jeff had questions about what is meant by upstream. You are referring to primary prevention but some of the other examples – YAM – are also primary prevention. Suggest just deleting this statement.

**Comment [A]:** From JH: compared to?

**Comment [A]:** From JH: Suggest stating clearly there are two separate cohorts of students receiving the intervention. How do these cohorts differ (time, location)?

**Comment [A]:** From TS: It is important to help the reader to understand that this study looked at the suicidal ideation when the first graders were age 19-21. This is not clear currently.

**Comment [A]:** From JH: Is this the authors' comment or your interpretation of the data? Please clarify.

1997; C. Webster-Stratton, Reid, & Hammond, 2001). The program demonstrated greater benefits as the dosage of the intervention increased (Herman et al., 2011).

Additionally, *Strengthening Families 10-14* is a program that involves sessions between parents, youth, and family with the goal of improving parents' skills for disciplining, managing emotions and conflict, and communicating with their children; promoting youths' interpersonal and problem-solving skills; and creating family activities to build cohesion and positive parent-child interactions. The premise of the program is that developing these skills for both parents and children will reduce internalizing behavior and adolescent substance abuse, two important risk factors for suicide (Spoth, Gyll, & Day, 2002). *Strengthening Families* has been shown to decrease externalizing behaviors, alcohol use, and drug use among youth participants and reductions in depression, alcohol use, and drug use among participating families (Spoth et al., 2002).

**Comment [A]:** From JH: significant? Also please define externalizing behaviors.

**Comment [A]:** From TS: This transition seems off.



## Identify and Support People At-Risk

### Rationale

In order to decrease suicide, attention to people at increased or high risk is necessary as these individuals tend to experience suicidal behavior at higher than average rates. These vulnerable or disadvantaged populations include, but are not limited to, individuals with lower socio-economic status or who are living with a mental health problem; people who have attempted suicide previously; individuals who are institutionalized, have been victims of violence, or are homeless; and members of certain racial and ethnic minority groups. Supporting these vulnerable groups requires proactive case finding along with access to, and retention in, mental health services. Finding effective ways of identifying at-risk or vulnerable groups, customizing services to make them accessible and maintaining engaged in care remain key challenges. For example, simply improving services does not guarantee that those services will be used by those most in need of them, nor will it necessarily increase the number of people who follow treatments that are recommended. People who are disadvantaged face social and economic issues that may adversely affect their ability to respond to the treatments or advice that are offered.

**Comment [A]:** From TS: This seems awkward as written. It might be better to say "...attention to people with specific vulnerabilities..."

### Approaches

The following three approaches focus on identifying and supporting people at increased risk.

- **Gatekeeper training** is designed to train teachers, coaches, providers and others in the community to identify people who may be at risk of suicide and to respond effectively, including facilitating treatment seeking and support services. Gatekeeper training is typically implemented in schools to identify at-risk youth and within health care settings to identify adults (and youth).
- **Screening combined with care management and overall continuity of care** has been used in primary care and behavioral health care settings to assure that people who may be at high-risk of suicide are identified and receive ongoing treatment as needed, particularly after inpatient discharge and other transitions within the healthcare system so they don't 'slip through the cracks'. These approaches typically employ screening for depression and/or suicide combined with collaborative treatment planning between patients and their providers and patient follow-up.
- **Crisis intervention.** These approaches provide support and referral services, typically by connecting a person in crisis (or a friend or family member of someone at-risk) to trained volunteers or professional staff via telephone hotline, online chat, or text messaging. Crisis intervention approaches are intended to impact key risk factors for suicide, including feelings of depression, hopelessness, and subsequent mental health care utilization. Like means reduction,

crisis interventions can put space or time between an individual who may be considering suicide and harmful behavior.

### Potential Outcomes

- Reduction in suicide attempts
- Reduction in suicide deaths
- Increased identification of individuals at-risk for suicidal behavior
- Increased at-risk individuals in treatment
- Increased community members trained to identify at-risk individuals
- Increased referrals for health care

### Evidence

There is evidence that community gatekeeper programs are successful in reducing suicides and suicide attempts but the efforts must be maintained (Substance Abuse and Mental Health Services Administration, 2014). However, there is limited evidence for effectiveness of screening programs, but at the same time, standard principles for public health screening make them promising (Pena & Caine, 2006). The number of studies evaluating crisis intervention services is limited, but a few studies do indicate that those who use the hotline services have decreased suicidal thoughts and behavior.

- **Gatekeeper training.** One example of gatekeeper training is the *Mental Health First Aid (MHFA)* program. This program is designed for the lay public and consists of three weekly sessions of three hours each. Participants learn the symptoms of people in mental health crises and/or in the early stages of mental health problems (i.e., those experiencing suicidal thoughts and behavior, acute stress reaction, panic attacks and acute psychotic behavior, and depression, anxiety, and psychotic disorders), possible risk factors, and where and how to get evidence-based effective help (Kitchener & Jorm, 2004). In a randomized controlled trial of 300 participants of MHFA, the intervention group reported significantly greater confidence in providing help to others, greater likelihood of advising people to seek professional help, improved concordance with health professionals about treatments, and decreased stigmatizing attitudes. Additionally, the intervention resulted in improved mental health of the participants themselves. All results were statistically significant at  $p < .05$ . (Kitchener & Jorm, 2004). Additional research rigorously evaluating MHFA for its impact on the first aid intervention recipients' themselves and suicidal behavior is needed (Kitchener & Jorm, 2006).

Gatekeeper training has also been a core part of all Garret Lee Smith (GLS) Suicide Prevention Program which is in place in 49 states and 48 tribes. A multi-site evaluation assessed the

**Comment [A]:** From LLD: suggest shortening this introductory statement about the evidence and making it consistent with the other sections. If you need to provide caveats, then you might want to take a look at the YV TP for example wording.

**Comment [A]:** From TS: Add cites here. Also this wording is awkward because it could be read as suggesting that those who chose to use the hotline are different from others at risk who did not. Maybe you could add the follow up period to the end – they have decrease suicidal thoughts and behavior at xx

**Comment [A]:** From LLD: wording is a bit awkward here

**Comment [A]:** From JH: compared to?

**Comment [A]:** From JH: significant? Is it possible to report magnitude of intervention effects?

**Comment [A]:** From JH: Overall mental health or specific facets (e.g., depression, etc.)? Please clarify

**Comment [A]:** From JH: Native American?



connection between community gatekeeper training and a reduction of suicide attempts and deaths by comparing the change in suicide mortality rates and nonfatal suicidal behavior among the population aged 10-24 in counties implementing *GLS* trainings, with the trajectory observed in similar counties that did not implement these trainings. Counties implementing *GLS* trainings had significantly lower youth suicide rates the year following the training implementation ( $-1.07$ ,  $p=.03$ ) (Walrath, Garraza, Reid, Goldston, & McKeon, 2015). This finding represents a decrease of 1 suicide death per 100,000 among youths 10 to 24 years of age or the avoidance of approximately 237 deaths in this age group between 2007 and 2010. Counties implementing *GLS* program activities also had significantly lower suicide attempt rates among youths 16 to 23 years of age in the year following implementation of the *GLS* program than did similar counties that did not implement *GLS* program activities (4.9 fewer attempts per 1000 youths [ $95\% \text{ CI}, 1.8-8.0$  fewer attempts per 1000 youths];  $p=.003$ ; (Godoy Garraza, Walrath, Goldston, Reid, & McKeon, 2015)). More than 79,000 suicide attempts may have been averted during the period studied following implementation of the *GLS* program.

- Screening combined with care management and overall continuity of care.** The Henry Ford Perfect Depression Care program was the pre-cursor to Zero Suicide, and its overall goal was to eliminate suicide. More broadly, though, the aim was to completely redesign depression care delivery to achieve breakthrough improvement in quality and safety by focusing on six aims: effectiveness, safety, patient centeredness, timeliness, efficiency, and equity among patients. The program developed concrete measures to assess progress on each of these aims and began with screening and assessment of each patient for suicide risk with coordinated continuous follow-up care system wide (C. E. Coffey, 2006). An examination of the impact of the Henry Ford Perfect Depression Care (Pre-cursor to Zero Suicide) program found that there was a dramatic and statistically significant decrease in the rate of suicide between the baseline years prior to the intervention (1999 and 2000) to the intervention years (2002-2009). During this time period, the suicide rate fell 82% (C. E. Coffey, 2006; C. E. Coffey, Coffey, & Ahmedani, 2013). Further, suicide rates also declined among HMO members who participated in targeted suicide prevention efforts and received mental health specialty services. However, for those HMO members who accessed only general medical services as opposed to specialty mental health services, the suicide rate increased (M. Coffey, Coffey, & Ahmedani, 2015).
- Crisis intervention.** Suicide prevention hotlines are one way to provide crisis intervention. In an evaluation of the effectiveness of the *National Suicide Prevention Lifeline (NSPL)* to prevent suicide, 1,085 suicidal individuals who called the hotline completed a standard risk assessment for suicide, and 380 of those completed a follow-up assessment between 1 and 52 days after the initial assessment. Researchers found that over half of the initial sample were seriously considering suicide when they called, and they had a plan for their suicide. Researchers also

**Comment [A]:** From JM: I think you need to provide a little more context on Henry Ford so the readers understands in what kind of population the reductions were experienced. I assume from the end that Henry Ford is some sort of HMO, but just a little more information would help clarify this description to readers.

**Comment [A]:** From JH: how much?

found that participants experienced significant decreases in suicidality over the course of the telephone session, and that levels of hopelessness and psychological pain continued to decrease after their initial call (Gould, Kalafat, Harrismunfakh, & Kleinman, 2007).

Comment [A]: From JH: Report magnitude of decrease?

Comment [A]: From JH: how long?

In another study, this time employing a randomized controlled trial, Gould, Cross, Pisani, Munfakh, and Kleinman (2013) assessed the impact of the *Applied Suicide Intervention Skills Training (ASIST)*, a widely implemented training program that helps hotline counselors, emergency workers, and other gatekeepers to identify and connect with suicidal individuals, understand their reasoning for living and dying, and assist with safely connecting those in need to available resources. The training was evaluated across the NSPL network of hotlines over the period 2008-2009. Using data from 1,410 suicidal individuals who called 17 Lifeline centers, researchers found that compared to callers who spoke to counselors that received the usual care training, individuals who spoke with counselors trained in *ASIST* were significantly more likely to feel less depressed, less suicidal, less overwhelmed, and more hopeful by the end of their call to the hotline. Counselors trained in *ASIST* were also more skilled at keeping callers on the phone longer and establishing a connection with them. However, training in *ASIST* did not result in more comprehensive suicide risk assessments than usual care training (Gould et al., 2013).



## Intervene to Lessen Harms and Prevent Future Risk

### Rationale

Individuals who have experienced mental health challenges, suicidal ideation, ~~and/or~~ who have made suicide attempts ~~and/or have~~ engaged in non-suicidal self-injury are at increased risk of suicide (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). Risk of suicide can also increase among those who have lost a friend, family member, co-worker, or other acquaintance to suicide (Pitman, Osborn, King, & Erlangsen, 2014). Exposure to sensationalized or uninformed reporting regarding on suicide may heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to suicide contagion (Etzersdorfer & Sonneck, 1998; Niederkrotenthaler & Sonneck, 2007).

### Approaches

A broad array of approaches to lesson harms and reduce future risk of suicide among those at increased risk include the provision of mental health care and improved continuity of care, improving linkage to care through active post-discharge planning and follow-up that decreases barriers to ongoing therapeutic support, increasing connectedness to supportive others, addressing bereavement, and framing communications to emphasize resilience, decrease negative affect, and to prevent contagion.

- **Treatment for people at-risk of suicide** typically includes various forms of psychotherapy delivered by licensed providers to help individuals with mental health problems and other risk factors for suicide with problem-solving, impulsivity and emotion regulation.
- **Treatment to prevent re-attempts.** These approaches typically include follow-up contact and use diverse modalities (e.g., home visits, mail, telephone, e-mail) to engage recent suicide attempt survivors in continued treatment to prevent re-attempts. Treatment may focus on improved coping skills, mindfulness, and other emotional regulation skills, and may include case management home visits to increase adherence to treatment and continuity of care; and one-on-one interpersonal therapy and/or group therapy. Approaches that engage and connect attempters to peers and providers are especially important because many attempters do not present to aftercare; 12%-25% reattempt within a year, and 3%-9% of attempt survivors die by suicide within 1 to 5 years of their initial attempt (Inagaki et al., 2015)
- **Postvention** approaches are implemented *after* a suicide has taken place and may include debriefing sessions, counseling, and/or bereavement support groups for surviving friends and family members/loved ones. These programs have not typically been evaluated for their impact on suicide or suicidal behavior but may reduce survivors' guilt, feelings of depression, and complicated grief (Szumilas & Kutcher, 2011).

**Comment [A]:** From LLD: simplify statement and make it consistent with the other introductory statements about approaches. You may also want to take a look at the introductory statements to this section in the other TPs.

**Comment [A]:** From LLD: Suggest fleshing this description out a bit. You may want to mention how these are typically delivered (e.g., one on one or group formats; typical number of sessions, location, etc.).

- **Safe messaging following a suicide.** The manner in which information on a recent suicide is communicated to the public (e.g. school assemblies, mass media, social media) can heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to suicide contagion. Therefore, responsible and safe reporting may help prevent suicide and suicide contagion.

**Comment [A]:** From JH: add something about contagion?

### Potential Outcomes

- Reduction in mental health-related sequelae
- Increase connectedness
- Improved coping skills
- Improved messaging following suicide
- Reduction in re-attempts

### Evidence

The evidence addressing strategies to lesson harm and prevent future risk of suicide includes the evaluation of effects of specific approaches on risk and protective factors as well as suicide-related mortality. However, because the evaluation of suicide-related mortality requires large sample sizes and extended follow-up, much of the evidence in this area primarily focuses on risk and protective factors.

- **Treatment for people at-risk of suicide.** There are a number of treatments with evidence of impact on risk and protective factors for suicide. One example is the *Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)* program. *IMPACT* aims to prevent suicide among older primary care patients by reducing suicide ideation and depression in primary care settings. It facilitates the development of a therapeutic alliance, a personalized treatment plan that includes patient preferences, as well as proactive follow-up (biweekly during an acute phase and monthly during continuation phase) by a depression care manager (Hunkeler et al., 2006). The program has been shown to significantly improve quality of life, and to reduce functional impairment, depression and suicidal ideation over 24-months of follow-up (Hunkeler et al., 2006; Unutzer et al., 2006) relative to patients who received care as usual.

Another example is *Collaborative Assessment and Management of Suicidality (CAMS)*, which is a therapeutic approach for suicide-specific assessment and treatment of patient's suicide risk. This flexible approach can be used across treatment settings and clinician theoretical orientations and involves the clinician and patient working together in an interactive assessment process to develop patient-specific treatment plans. *CAMS* sessions are collaborative and involve constant



patient about what is and is not working with the ultimate goal of enhancing the therapeutic alliance and increasing treatment motivation in the suicidal patient. CAMS been tested and supported in 6 correlational studies (Jobes, 2012), in a variety of inpatient and outpatient settings and in one RCT with several additional RCTs under way. CAMS has been associated with significant improvements in suicidal ideation, overall symptom distress, and feelings of hopelessness at 12 month follow-up among a community-based sample of suicidal outpatients. (Comtois et al., 2011).

Other examples include *Dialectical Behavioral Therapy (DBT)* and *Attachment-Based Family Therapy (ABFT)*. DBT is a multicomponent therapy for individuals at high risk for suicide and who may struggle with impulsivity and emotional regulation. The components of DBT include individual therapy, group skills training, between-session telephone coaching and a therapist consultation team. In a randomized controlled trial of women with recent suicidal or self-injurious behavior, those receiving DBT were half as likely to make a suicide attempt at two-year follow-up than women receiving community treatment (23% vs 46%), required less hospitalization for suicide ideation, and had lower medical risk across all suicide attempts and self-injurious acts combined (Linehan et al., 2006).

ABFT is a program for adolescents aged 12-18 and is designed to treat clinically diagnosed major depressive disorder, eliminate suicidal ideation, and reduce dispositional anxiety (Diamond et al., 2010). A randomized controlled trial of ABFT found that suicidal adolescents assigned to ABFT experienced significantly greater improvement in suicidal ideation over 24 weeks of follow-up than did adolescents assigned to enhanced usual care. Additionally, a significantly higher percentage of ABFT participants reported no suicidal ideation in the week prior to assessment at 12 weeks than did adolescents receiving enhanced usual care (69.2% vs. 34.6%;  $p = .01$ ;  $OR = 4.25$ ) and at 24 weeks (82.1% vs. 46.2%;  $p = .006$ ;  $OR = 5.37$ ) (Diamond et al., 2010).

- **Treatment to prevent re-attempts.** Several strategies that aim to prevent re-attempts have demonstrated impact on reducing suicidal behavior. For example, *Emergency Department Brief Intervention with Follow-up Visits* is a program that involves a one-hour discharge information session that addresses suicidal behavior, distress, risk and protective factors, alternatives to suicidal behavior, and referral options, combined with nine follow-up contacts over 18 months (at 1, 2, 4, 7, 11 weeks and 4, 6, 12, 18 months). Follow-up contacts are either conducted by phone or through home visits according to a specific time line for up to 18-months. A randomized controlled trial that enrolled suicide attempters from eight hospital emergency departments in five culturally different sites found that a brief intervention combined with 9 follow-up visits over 18-months was associated with significantly fewer deaths from suicide relative to a treatment-as-usual group (0.2% versus 2.2%, respectively;  $chi^2 = 13.83$ ,  $P < 0.001$ ) (Fleischmann et al., 2008).

Comment [A]: From TS: I think a word is missing – "patient input"?

Comment [A]: From JH: Unclear. According to the article, this program was evaluated in five countries. Please state the countries. Thnx.

Another example of treatment to prevent re-attempts involves *active follow-up contact approaches* such as postcards, letters, and telephone calls, ~~are~~ intended to increase a patient's sense of connectedness with health care providers and decrease isolation. These approaches include expression of care and support and typically invite patients to reconnect with their provider. Contacts are made periodically (e.g., monthly or every few months in the first 12 months post-discharge with some programs continuing contact for two or more years). In a meta-analysis conducted by Inagaki et al. (2015), interventions to prevent repeat suicidal behavior in patients admitted to an emergency department for suicide attempt were ~~These approaches have been found - in a meta-analysis conducted by Inagaki et al. (2015)~~ to reduce reattempts by approximately 17% for up to 12 months post-discharge; however, the long-term effects of these approaches on reattempts has not yet been demonstrated. Also, because the number of trials and associated sample sizes included in this meta-analysis were small, it was not possible to determine the effect of active contact and follow-up approaches on death by suicide. In a randomized controlled trial of the post-crisis suicide prevention long-term follow-up contact approach, Motto and Bostrom (2001) found that patients who refused ongoing care but who were randomized to be contacted by letter four times per year had a lower rate of suicide over two years of follow-up than did patients in the control group who received no further contact. Other studies have also shown post-crisis letters and coping cards to be protective against suicide ideation and attempts (Hassanian-Moghaddam, Sarjami, Kolahi, & Carter, 2011; Wang et al., 2016).

Finally, *Cognitive Behavior Therapy for Suicide Prevention (CBT-SP)* is an example of a therapeutic approach to prevent re-attempts. It uses a risk-reduction, relapse prevention approach that includes an analysis of proximal risk factors and stressors (e.g., relationship problems, school or work-related difficulties) leading up to and following the suicidal event; safety plan development; skill building; and psychoeducation. *CBT-SP* also has family skill modules focused on family support and communication patterns as well as improving the family's problem solving skills. A randomized controlled trial ~~found~~ of *CBT-SP* found that 10-session outpatient cognitive therapy designed to prevent repeat suicide attempts resulted in a 50% reduction in the likelihood of a suicide reattempt among adults who had been admitted to an emergency department for a suicide attempt relative to treatment as usual (Brown et al., 2005).

- **Postvention** programs are implemented with the goal of providing support to survivors of others' suicide to reduce their own risk of suicide. One example of a postvention program, *StandBy Response Service (StandBy)*, provides clients with face-to-face outreach and telephone support through a professional crisis response team. Site coordinators develop customized case management plans, referring clients to other existing community services matched to their needs

Comment [A]: From JH: Define (follow-ups greater than 1 year)

Comment [A]: From JH: Define

Comment [A]: From TS: "found" is repeated



(Visser, Comans, & Scuffham, 2014). In a study by Visser et al. (2014), *StandBy* clients were significantly less likely to be at high risk for suicidality than a suicide bereaved comparison group who had not had contact with the *StandBy* program (48% and 64% respectively). Additionally, research suggests that active postvention approaches in which outreach to suicide survivors occurs at the scene of a suicide is associated with intake into treatment sooner, greater attendance at support group meetings, and attendance at more meetings compared to passive postvention (versus passive approaches where survivors self-refer for services) (J. Cerel & Campbell, 2008).

- **Safe messaging following a suicide.** Safe messaging after a suicide can help assure that reporting of the event is done in such a way to reduce risk to consumers of news media and other messaging who may be particularly vulnerable. One way to ensure safe messaging following a suicide is to encourage that reporters adhere to *media guidelines for reporting on suicides*. Reports that are both inclusive of suicide prevention messages, stories of hope and resilience, risk and protective factors, and links to helping resources (e.g., hotline) and that avoid sensationalizing events or reducing suicide to one cause can help reduce the likelihood of suicide contagion. The most compelling evidence supporting the effect of *media guidelines* on reduction in suicides comes from Austria. After a sharp increase in suicides on the Viennese subway, media guidelines were introduced and an interrupted time series design was used to evaluate the national impact of the guidelines on subsequent suicides. Changes in the quality and quantity of media reporting resulted in a significant reduction of 81 suicides (annually) (95% confidence interval: -149 to -13; t = -2.32, df = 54, p < 0.024) in the (Viennese subway) system (Niederkrotenthaler & Sonneck, 2007).

**Comment [A]:** From TS: Don't you mean "Recommendations for Reporting on Suicide"? Please cite: <http://afsp.org/wp-content/uploads/2016/01/recommendations.pdf>

The media did not want "guidelines" and they reacted negatively to the idea of external guidelines.

**Comment [A]:** From TS: Are you sure that the 81 reduction was just on the subway system? I thought that was nationally. Please confirm.

**Comment [A]:** From JH: other evaluations available?

**Comment [A]:** From TS: Thomas also had a 2010 report that suggested benefits of good reporting. <http://bjp.rcpsych.org/content/bjprcpsych/197/3/234.full.pdf>

## Sector Involvement

Public health can play an important and unique role in addressing suicide. Public health agencies, which typically place prevention at the forefront of efforts and work to create broad population-level impact, can bring critical leadership and resources to bear on this problem. For example, these agencies can serve as a convener, bringing together partners and stakeholders to plan, prioritize, and coordinate suicide prevention efforts. Public health agencies are also well positioned to collect and disseminate data, implement preventive measures, evaluate programs, and track progress. Although public health can play a leadership role in preventing suicide, the strategies and approaches outlined in this technical package cannot be accomplished by the public health sector alone. As noted in the National Strategy to Prevent Suicide, the integration and coordination of prevention activities across sectors and settings is critical for expanding the reach and impact of suicide prevention efforts.

Other sectors vital to implementing this package include, but are not limited to, education, government (local, state, and federal), social services, health services, business, labor, justice, housing, media, and organizations that comprise the civil society sector such as faith-based organizations, youth-serving organizations, foundations, and other non-governmental organizations. Collectively, these sectors can make a difference in preventing suicide by impacting the various contexts and underlying risks that contribute to suicide.

The strategies and approaches described in this technical package are summarized in Appendix A along with the relevant sectors that are well positioned to lead implementation efforts. For example, business and labor, health care insurers and providers, and government entities are in the best position to implement programs and policies that *Strengthen Economic Supports and Access to Mental Health Care*. These types of supports go beyond individual behavior change and require commitment and support from those sectors that can directly address some of the underlying risks and the environmental contexts that increase the risk for suicide. Public health entities can play an important role by gathering and synthesizing information to inform policy, raise awareness, and evaluate the effectiveness of various policies. Moreover, partnerships with non-governmental and community organizations can be instrumental in increasing awareness of and garnering support for policies affecting individuals and families.

The public health sector has been at the forefront of many community-based prevention efforts, working collaboratively with schools and community-based organizations, to change social norms and positively impact health behavior. Public health is well suited to take on a similar leadership role in *Promoting Connectedness* through peer norm and community engagement activities and supporting the development, evaluation, and adoption of effective programs that *Teach Coping and Problem-Solving Skills* to prevent suicide from happening in the first place. These programs are often delivered in school and community settings, making education and non-governmental organizations vital partners in prevention.



Businesses, workplaces, and local and state government entities, on the other hand, are in the best position to establish policies and support practices that *Create Protective Environments* where people live, work, and play. Public health entities can play an important role by gathering and synthesizing information, working with other agencies within the executive branch of their state or local government in support of policy and other approaches, and evaluating the effectiveness of measures taken. In a similar fashion, public health entities can partner with schools, workplaces, and community organizations to implement and evaluate prevention programs, policies and practices geared toward creating safe, healthy, and supportive environments.

Finally, this technical package includes a number of interventions delivered in hospital, primary care, behavioral health care, and community settings designed to *Identify and Support People At-Risk* and to *Lessen Harms and Prevent Future Risk*. The intensity and activities of these interventions require the expertise of professionals who are licensed and trained to deliver critical intervention support. The health care, social services, and justice sectors can work collaboratively to support individuals at high-risk for suicide and their families. These activities also require coordination of supports across various service providers and community organizations.

Regardless of strategy, action by many sectors will be necessary for the successful implementation of this package. In this regard, all sectors can play an important and influential role in preventing suicide from happening in the first place and lessening the immediate and long-term harms of suicidal behavior by helping those in times of crisis get the services and support they need.

## Monitoring and Evaluation

Monitoring and evaluation are necessary components of the public health approach to prevention. It is important to have timely and reliable data to monitor the extent of the problem and to evaluate the impact of prevention efforts. Data are necessary for program implementation as planning, implementation, and assessment all rely on accurate measurement of the problem.

Surveillance data helps researchers and practitioners track changes in the burden of suicide. Surveillance systems exist at the federal, state, and local levels. It is important to assess the availability of surveillance data and data systems across these levels to identify and address gaps in the systems. CDC's National Vital Statistics System and the National Violent Death Reporting System (NVDRS) are examples of surveillance systems that provide data on deaths from suicide. NVDRS, for example, is a state-based surveillance system that combines data from death certificates, law enforcement reports, and coroner or medical examiner reports to provide detailed information on the circumstances of violent deaths, including suicide, which can assist communities in guiding prevention approaches (Blair, Fowler, Jack, & Crosby, 2016). The National Electronic Injury Surveillance System-All Injury Program (NEISS-AIP) provides nationally representative data about all types and causes of nonfatal injuries treated in U.S. hospital emergency departments, and can be used to assess national rates of, and trends in, self-harm injuries by cause (e.g., falls, poisoning, etc.), age, race/ethnicity, sex, disposition (where the injured person goes when released from the Emergency Department).

In addition to information on deaths and nonfatal injuries, there are also surveillance systems that provide national, state, and some local estimates of suicidal behavior. The Youth Risk Behavior Surveillance System (YRBSS) collects information from a nationally representative sample of 9-12 grade students and is a key resource in monitoring health-risk behaviors among youth, including whether youth have seriously considered attempting suicide, attempted suicide, made a plan, or required treatment by a doctor or nurse for a suicide attempt that resulted in an injury, poisoning, or overdose (Brener et al., 2013). The YRBSS data are obtained from a national school-based survey conducted by CDC as well as from state, territorial, tribal, and large urban school district surveys conducted by education and health agencies. The National Survey on Drug Use and Health (NSDUH) is an annual nationwide survey of individuals aged 12 years and older that provides national and state-level estimates of drug use and mental health-related issues, including suicide ideation and suicide attempts.

It is also important at all levels (local, state, and federal) to address gaps in responses, track progress of prevention efforts and evaluate the impact of those efforts, including the impact of this technical package. Evaluation data, produced through program implementation and monitoring, is essential to provide information on what does and does not work to reduce rates of suicide and its associated risk and protective factors. Theories of change and logic models that identify short, intermediate, and long-term outcomes are an important part of program evaluation.

**Comment [A]:** From TS: This description seems incomplete compared to the description of YRBS



The evidence-base for suicide prevention has advanced greatly over the last few decades. However, additional research is needed to understand the impact of prevention programs on preventing suicide, as opposed to merely examining the effectiveness of programs to impact risk factors associated with suicide. More research is also needed to examine the effectiveness of upstream and community-level strategies to prevent suicide at the population level. Lastly, it will be important for researchers to test the effectiveness of combinations of the strategies and approaches included in this package. Most existing evaluations focus on approaches implemented in isolation. However, but there is potential to understand the synergistic effects within a comprehensive prevention approach. Additional research is needed to understand the extent to which combinations of strategies and approaches result in greater reductions in suicide than individual programs, practices, or policies.

Comment [A]: From TS: Should this be programs, policies, and practices to be consistent?

Comment [A]: From JH: including attempts?

Comment [A]: From JH: great point!

Comment [A]: From JH: redundant with prior sentence.

Comment [A]: From TS: I found this somewhat awkward. The idea of suicide struggling seemed off and the point is not entirely clear. I think you can be more specific and reference an earlier point in the media recommendations section.

Comment [A]: From JH: Upstream/downstream is jargon.

Comment [A]: From TS: I think you can drop this and just use the more descriptive text. You don't need both. You could describe this as a range.

## Conclusion

Suicide is a serious public health problem whose rates have been on the rise for more than a decade and whose costs stretch well into the billions of dollars each year. And while suicide is a rare outcome statistically, its human impact has a ripple effect that is far-reaching. Each of us likely interacts with suicide survivors, those with lived experience, and those with thoughts of suicide, on a daily basis—at home, at work, and in our communities. Suicide and suicide attempts are therefore public health issues of societal concern. Fortunately, like many public health problems, suicide is preventable, and fortunately more is being done to prevent suicide than ever before, as evidenced by the work of the National Action Alliance for Suicide Prevention, the release of the first world report on suicide, and more timely surveillance data, to name just a few examples. Unfortunately and unlike most other public health problems, suicide still struggles against stigma, shame, and secrecy related to help-seeking, mental illness, being a survivor, or someone with lived experience; misplaced fear of asking someone about their risk of suicide (versus the fear and consequence of not asking), and fear of taking up certain strategies known to be effective but perhaps unpopular; misinformation about suicide preventability, and disproportionate funding given the public health burden. Suicide also struggles against the right degree of awareness where too much information, for example by well-meaning reporters and others, may actually do harm.

In an effort to continue pushing the field and society further towards prevention, this technical package includes strategies and approaches that ideally would be used in a comprehensive fashion, in combination—in a multi-level, multi-sectoral way. This technical package includes strategies and approaches targeting upstream prevention (e.g., social emotional learning for children and youth), as well as strategies focused more downstream (e.g., cognitive behavioral treatment to prevent re-attempts). It includes universal, selective, and indicated strategies, or strategies that focus on the whole population regardless of risk to strategies that focus on those groups at highest risk. Importantly, this technical package extends the bounds of the typical prevention strategies to consider approaches at the

(outer levels of the social ecology), e.g., policies to stabilize housing and community engagement initiatives. ~~In short, care and attention has been paid to all aspects of suicide prevention~~

While the evidence base continues to ~~be built~~emerge, the collection of programs, policies, and practices laid out here are available for implementation now. And in keeping with good public health practice, the intent is that monitoring and evaluation will play a key role in that implementation. Moreover, as new evidence becomes available, this technical package can be refined to reflect the current state of the science.

In closing, and in keeping with a message of resilience as spoken by those with lived experience, 'hope, help, and healing is possible.'

**Comment [A]:** From JM: Yes this is jargon, so the e.g., helps, but you might want to figure out a way to say this without referring to the outer levels of the social ecology.

**Comment [A]:** This sets you up for people to say oh yeah what about... AI/AN, transgendered people, prisoners etc.



## References

- Arsenault-Lapierre, G., Kim, C., & Turecki, G. (2004). Psychiatric diagnoses in 3275 suicides: a meta-analysis. *BMC Psychiatry*, 4, 37. doi:10.1186/1471-244X-4-37
- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*: Prentice-Hall, Inc.
- Basile, K. C., Espelage, D. L., Rivers, I., McMahon, P. M., & Simon, T. R. (2009). The theoretical and empirical links between bullying behavior and male sexual violence perpetration. *Aggression and violent behavior*, 14(5), 336-347.
- Basile, K. C., Hamburger, M. E., Swahn, M. H., & Choi, C. (2013). Sexual violence perpetration by adolescents in dating versus same-sex peer relationships: differences in associated risk and protective factors. *Western Journal of Emergency Medicine*, 14(4), 329.
- Beautrais, A. L. (2001). Effectiveness of barriers at suicide jumping sites: A case study. *Aust NZ J Psychiat*, 35. doi:10.1080/0004867010060501
- Beautrais, A. L., Gibb, S. J., Fergusson, D. M., Horwood, L. J., & Larkin, G. L. (2009). Removing bridge barriers stimulates suicides: An unfortunate natural experiment. *Aust NZ J Psychiat*, 43. doi:10.1080/00048670902873714
- Beyer, K. M., Layde, P. M., Hamberger, L. K., & Laud, P. W. (2015). Does neighborhood environment differentiate intimate partner femicides from other femicides? *Violence Against Women*, 21(1), 49-64. doi:10.1177/1077801214564075
- Blair, J. M., Fowler, K. A., Jack, S. P., & Crosby, A. E. (2016). The National Violent Death Reporting System: overview and future directions. *Inj Prev*, 22 Suppl 1, i6-i11. doi:10.1136/injuryprev-2015-041819
- Borowsky, I. W., Hogan, M., & Ireland, M. (1997). Adolescent sexual aggression: risk and protective factors. *Pediatrics*, 100(6), E7.
- Branas, C. C., Cheney, R. A., MacDonald, J. M., Tam, V. W., Jackson, T. D., & Ten Have, T. R. (2011). A difference-in-differences analysis of health, safety, and greening vacant urban space. *Am J Epidemiol*, 174(11), 1296-1306. doi:10.1093/aje/kwr273
- Brown, G. K., Ten Have, T., Henriques, G. R., Xie, S. X., Hollander, J. E., & Beck, A. T. (2005). Cognitive therapy for the prevention of suicide attempts: a randomized controlled trial. *JAMA*, 294(5), 563-570. doi:10.1001/jama.294.5.563
- Butchart, A., Phinney, A., Check, P., & Villaveces, A. (2004). *Preventing Violence: A Guide to Implementing the Recommendations of the World Report on Violence and Health*. Geneva, Switzerland: World Health Organization.
- Capaldi, D. M., Knoble, N. B., Shortt, J. W., & Kim, H. K. (2012). A Systematic Review of Risk Factors for Intimate Partner Violence. *Partner Abuse*, 3(2), 231-280. doi:10.1891/1946-6560.3.2.231
- Carter, M., McGee, R., Taylor, B., & Williams, S. (2007). Health outcomes in adolescence: associations with family, friends and school engagement. *J Adolesc*, 30(1), 51-62. doi:10.1016/j.adolescence.2005.04.002
- Cavanagh, J. T., Carson, A. J., Sharpe, M., & Lawrie, S. M. (2003). Psychological autopsy studies of suicide: a systematic review. *Psychol Med*, 33(3), 395-405.
- Centers for Disease Control and Prevention. (2009). Strategic direction for the prevention of suicidal behavior: Promoting individual, family, and community connectedness to prevent suicidal behavior. Retrieved from Available at: [http://www.cdc.gov/ViolencePrevention/pdf/Suicide\\_Strategic\\_Direction\\_Full\\_version-a.pdf](http://www.cdc.gov/ViolencePrevention/pdf/Suicide_Strategic_Direction_Full_version-a.pdf)
- Centers for Disease Control and Prevention. (2016a). Child Maltreatment: Risk and Protective Factors. Retrieved from Available at: <http://www.cdc.gov/violenceprevention/childmaltreatment/riskprotectivefactors.html>
- Centers for Disease Control and Prevention. (2016b). Elder Maltreatment: Risk and Protective Factors. Retrieved from Available at: <http://www.cdc.gov/ViolencePrevention/eldermaltreatment/riskprotectivefactors.html>

- Centers for Disease Control and Prevention. (2016c). Sexual Violence: Risk and Protective Factors. Retrieved from Available at: <http://www.cdc.gov/ViolencePrevention/sexualviolence/riskprotectivefactors.html>
- Centers for Disease Control and Prevention. (2016d). Web-Based Injury Statistics Query and Reporting System (WISQARS). Retrieved June 3, 2016 Available at: <http://www.cdc.gov/injury/wisqars/index.html>
- Centers for Disease Control and Prevention. (2016e). Youth Violence: Risk and Protective Factors. Retrieved from Available at: <http://www.cdc.gov/violenceprevention/youthviolence/riskprotectivefactors.html>
- Cerel, J., & Campbell, F. R. (2008). Suicide survivors seeking mental health services: a preliminary examination of the role of an active postvention model. *Suicide Life Threat Behav*, 38(1), 30-34. doi:10.1521/suli.2008.38.1.30
- Cerel, J., McIntosh, J. L., Neimeyer, R. A., Maple, M., & Marshall, D. (2014). The Continuum of "Survivorship": Definitional Issues in the Aftermath of Suicide. *Suicide and life-threatening behavior*, 44(6), 591-600. doi:10.1111/sltb.12093
- Chapman, A. L., & Dixon-Gordon, K. L. (2007). Emotional antecedents and consequences of deliberate self-harm and suicide attempts. *Suicide Life Threat Behav*, 37(5), 543-552. doi:10.1521/suli.2007.37.5.543
- Cherpitel, C. J., Borges, G. L. G., & Wilcox, H. C. (2004). Acute alcohol use and suicidal behavior: A review of the literature. *Alcoholism: Clinical and Experimental Research*, 28(5 SUPPL.), 18S-28S.
- Classen, T. J., & Dunn, R. A. (2012). The effect of job loss and unemployment duration on suicide risk in the United States: a new look using mass-layoffs and unemployment duration. *Health Econ*, 21(3), 338-350. doi:10.1002/hec.1719
- Coffey, C. E. (2006). Pursuing perfect depression care. *Psychiatr Serv*, 57(10), 1524-1526. doi:10.1176/ps.2006.57.10.1524
- Coffey, C. E., Coffey, M. J., & Ahmedani, B. K. (2013). An update on perfect depression care. *Psychiatr Serv*, 64(4), 396. doi:10.1176/appi.PS.640422
- Coffey, M., Coffey, C., & Ahmedani, B. K. (2015). Suicide in a health maintenance organization population. *JAMA Psychiatry*, 72(3), 294-296. doi:10.1001/jamapsychiatry.2014.2440
- Comtois, K. A., Jobes, D. A., S. O'Connor, S., Atkins, D. C., Janis, K., E. Chessen, C., . . . Yuodelis-Flores, C. (2011). Collaborative assessment and management of suicidality (CAMS): feasibility trial for next-day appointment services. *Depress Anxiety*, 28(11), 963-972. doi:10.1002/da.20895
- Coulton, C. J., Crampton, D. S., Irwin, M., Spilsbury, J. C., & Korbin, J. E. (2007). How neighborhoods influence child maltreatment: a review of the literature and alternative pathways. *Child Abuse Negl*, 31(11-12), 1117-1142. doi:10.1016/j.chiabu.2007.03.023
- Cox, G. R., Owens, C., Robinson, J., Nicholas, A., Lockley, A., Williamson, M., . . . Pirkis, J. (2013). Interventions to reduce suicides at suicide hotspots: a systematic review. *BMC Public Health*, 13(1), 1-12. doi:10.1186/1471-2458-13-214
- Crosby, A. E., Espitia-Hardeman, V., Ortega, L., & Lozano, B. (2013). Alcohol and suicide. *Alcohol: Science, Policy and Public Health*, 190.
- Crosby, A. E., Han, B., Ortega, L., Parks, S. E., & Gfroerer, J. (2011). Suicidal Thoughts and Behaviors Among Adults Aged ≥18 Years — United States, 2008–2009. *MMWR*, 60(No. SS-13), 1-22.
- Crosby, A. E., Ortega, L., & Melanson, C. (2011). *Self-directed Violence Surveillance: Uniform Definitions and Recommended Data Elements, Version 1.0*. Retrieved from Atlanta, GA:
- Cunningham, P. J. (2009). Beyond parity: primary care physicians' perspectives on access to mental health care. *Health Aff (Millwood)*, 28(3), w490-501. doi:10.1377/hlthaff.28.3.w490
- Curtin, S. C., Warner, M., & Hedegaard, H. (2016). *Increase in suicide in the United States, 1999-2014*. ( ). Hyattsville, MD: National Center for Health Statistics Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/25116188>.
- Cylus, J., Glymour, M. M., & Avendano, M. (2014). Do generous unemployment benefit programs reduce suicide rates? A state fixed-effect analysis covering 1968-2008. *Am J Epidemiol*, 180(1), 45-52. doi:10.1093/aje/kwu106



- Dahlberg, L. L., & Krug, E. G. (2002). Violence-a global public health problem. In E. Krug, L. L. Dahlberg, J. A. Mercy, A. B. Zwi, & R. Lozano (Eds.), *World Report on Violence and Health* (pp. 1-56). Geneva, Switzerland: World Health Organization.
- DeGue, S., Massetti, G. M., Holt, M. K., Tharp, A. T., Valle, L. A., Matjasko, J. L., & Lippy, C. (2013). Identifying links between sexual violence and youth violence perpetration: New opportunities for sexual violence prevention. *Psychology of violence*, 3(2), 140.
- Deisenhammer, E. A., Ing, C. M., Strauss, R., Kemmler, G., Hinterhuber, H., & Weiss, E. M. (2009). The duration of the suicidal process: how much time is left for intervention between consideration and accomplishment of a suicide attempt? *J Clin Psychiatry*, 70(1), 19-24.
- Desai, R. A., Dausey, D. J., & Rosenheck, R. A. (2005). Mental health service delivery and suicide risk: the role of individual patient and facility factors. *Am J Psychiatry*, 162(2), 311-318. doi:10.1176/appi.ajp.162.2.311
- Diamond, G. S., Wintersteen, M. B., Brown, G. K., Diamond, G. M., Gallop, R., Shelef, K., & Levy, S. (2010). Attachment-based family therapy for adolescents with suicidal ideation: a randomized controlled trial. *J Am Acad Child Adolesc Psychiatry*, 49(2), 122-131.
- Dunne, E. J., McIntosh, J. L., & Dunne-Maxim, K. (Eds.). (1987). *Suicide and its aftermath: Understanding and counseling the survivors*. New York: Norton.
- Durkheim, E. (1897/1951). *Suicide: A study in sociology* (JA Spaulding & G. Simpson, trans.). Glencoe, IL: Free Press. (Original work published 1897).
- Elgar, F. J., Craig, W., Boyce, W., Morgan, A., & Vella-Zarb, R. (2009). Income inequality and school bullying: multilevel study of adolescents in 37 countries. *J Adolesc Health*, 45(4), 351-359. doi:10.1016/j.jadohealth.2009.04.004
- Escobedo, L. G., & Ortiz, M. (2002). The relationship between liquor outlet density and injury and violence in New Mexico. *Accid Anal Prev*, 34(5), 689-694.
- Etzersdorfer, E., & Sonneck, G. (1998). Preventing suicide by influencing mass-media reporting: The Viennese experience, 1980-1996. *Arch Suicide Res*, 4.
- Ferdon, C., Crosby, A. E., Caine, E. D., Hindman J., Reed, G. A., & Iskander, J. (In press). CDC Public Health Grand Rounds: Preventing Suicide through a Comprehensive Public Health Approach. *MMWR*.
- Flavin, P., & Radcliff, B. (2009). Public policies and suicide rates in the American states. *Social Indicators Research*, 90(2), 195-209.
- Fleischmann, A., Bertolote, J. M., Wasserman, D., De Leo, D., Bolhari, J., Botega, N. J., . . . Thanh, H. T. (2008). Effectiveness of brief intervention and contact for suicide attempters: a randomized controlled trial in five countries. *Bulletin of the World Health Organization*, 86(9), 703-709. doi:S0042-96862008000900014 [pii]
- Fowler, K. A., Gladden, R. M., Vagi, K. J., Barnes, J., & Frazier, L. (2015). Increase in suicides associated with home eviction and foreclosure during the US housing crisis: findings from 16 National Violent Death Reporting System States, 2005-2010. *Am J Public Health*, 105(2), 311-316. doi:10.2105/AJPH.2014.301945
- Freisthler, B., Merritt, D. H., & LaScala, E. A. (2006). Understanding the ecology of child maltreatment: a review of the literature and directions for future research. *Child Maltreat*, 11(3), 263-280. doi:10.1177/1077559506289524
- Ghahramanlou-Holloway, M., Bhar, S., Brown, G., Olsen, C., & Beck, A. T. (2012). Changes in problem-solving appraisal after cognitive therapy for the prevention of suicide. *Psychological Medicine*, 42(06), 1185-1193.
- Giesbrecht, N., Huguette, N., Ogden, L., Kaplan, M. S., McFarland, B. H., Caetano, R., . . . Nolte, K. B. (2015). Acute alcohol use among suicide decedents in 14 US states: impacts of off-premise and on-premise alcohol outlet density. *Addiction*, 110(2), 300-307. doi:10.1111/add.12762
- Godoy Garraza, L., Walrath, C., Goldston, D. B., Reid, H., & McKeon, R. (2015). Effect of the Garrett Lee Smith Memorial Suicide Prevention Program on Suicide Attempts Among Youths. *JAMA Psychiatry*, 72(11), 1143-1149. doi:10.1001/jamapsychiatry.2015.1933

- Goldsmith, S. K., Pellmar, T. C., Kleinman, A. M., & Bunney, W. E. (2002). *Reducing suicide: A national imperative*: National Academies Press.
- Gould, M. S., Cross, W., Pisani, A. R., Munfakh, J. L., & Kleinman, M. (2013). Impact of Applied Suicide Intervention Skills Training on the National Suicide Prevention Lifeline. *Suicide Life Threat Behav*, 43(6), 676-691. doi:10.1111/sltb.12049
- Gould, M. S., Kalafat, J., Harrismunfakh, J. L., & Kleinman, M. (2007). An evaluation of crisis hotline outcomes. Part 2: Suicidal callers. *Suicide Life Threat Behav*, 37(3), 338-352. doi:10.1521/suli.2007.37.3.338
- Grossman, D. C., Mueller, B. A., Riedy, C., Dowd, M. D., Villaveces, A., Prodzinski, J., . . . Harruff, R. (2005). Gun storage practices and risk of youth suicide and unintentional firearm injuries. *JAMA*, 293(6), 707-714. doi:10.1001/jama.293.6.707
- Haddon, W. (1980). Advances in the epidemiology of injuries as a basis for public policy. *Public Health Reports*, 95(5), 411-421.
- Han, B., Crosby, A. E., Ortega, L. A., Parks, S. E., Compton, W. M., & Gfroerer, J. (2016). Suicidal ideation, suicide attempt, and occupations among employed adults aged 18–64years in the United States. *Comprehensive psychiatry*, 66, 176-186.
- Harris, E. C., & Barraclough, B. (1997). Suicide as an outcome for mental disorders. A meta-analysis. *Br J Psychiatry*, 170, 205-228.
- Harris, E. C., & Barraclough, B. (1998). Excess mortality of mental disorder. *Br J Psychiatry*, 173, 11-53.
- Harris, K. M., Carpenter, C., & Bao, Y. (2006). The effects of state parity laws on the use of mental health care. *Med Care*, 44(6), 499-505. doi:10.1097/01.mlr.0000215813.16211.00
- Hassanian-Moghaddam, H., Sarjami, S., Kolahi, A. A., & Carter, G. L. (2011). Postcards in Persia: randomised controlled trial to reduce suicidal behaviours 12 months after hospital-treated self-poisoning. *British Journal of Psychiatry*, 198(4), 309-316.
- Hawton, K. (2007). Restricting access to methods of suicide: Rationale and evaluation of this approach to suicide prevention. *Crisis*, 28. doi:10.1027/0227-5910.28.s1.4
- Heise, L., & Garcia-Moreno, C. (2002). Violence by Intimate Partners. In E. Krug, L. L. Dahlberg, J. A. Mercy, A. B. Zwi, & R. Lozano (Eds.), *World Report on Violence and Health* (pp. 87-121). Geneva, Switzerland: World Health Organization.
- Herman, K. C., Borden, L. A., Reinke, W. M., & Webster-Stratton, C. (2011). The Impact of the Incredible Years Parent, Child, and Teacher Training Programs on Children's Co-Occurring Internalizing Symptoms. *Sch Psychol Q*, 26(3), 189-201. doi:10.1037/a0025228
- Hong, J. S., Kral, M. J., Espelage, D. L., & Allen-Meares, P. (2012). The social ecology of adolescent-initiated parent abuse: a review of the literature. *Child Psychiatry Hum Dev*, 43(3), 431-454. doi:10.1007/s10578-011-0273-y
- Houle, J. N., & Light, M. T. (2014). The home foreclosure crisis and rising suicide rates, 2005 to 2010. *Am J Public Health*, 104(6), 1073-1079. doi:10.2105/AJPH.2013.301774
- Hunkeler, E. M., Katon, W., Tang, L., Williams, J. W., Jr., Kroenke, K., Lin, E. H., . . . Unutzer, J. (2006). Long term outcomes from the IMPACT randomised trial for depressed elderly patients in primary care. *BMJ*, 332(7536), 259-263. doi:10.1136/bmj.38683.710255.BE
- Inagaki, M., Kawashima, Y., Kawanishi, C., Yonemoto, N., Sugimoto, T., Furuno, T., . . . Yamada, M. (2015). Interventions to prevent repeat suicidal behavior in patients admitted to an emergency department for a suicide attempt: a meta-analysis. *J Affect Disord*, 175, 66-78. doi:10.1016/j.jad.2014.12.048
- Isometsa, E. T. (2001). Psychological autopsy studies--a review. *Eur Psychiatry*, 16(7), 379-385.
- Jobes, D. A. (2012). The Collaborative Assessment and Management of Suicidality (CAMS): an evolving evidence-based clinical approach to suicidal risk. *Suicide Life Threat Behav*, 42(6), 640-653. doi:10.1111/j.1943-278X.2012.00119.x
- Johnson, F. W., Gruenewald, P. J., & Remer, L. G. (2009). Suicide and alcohol: do outlets play a role? *Alcohol Clin Exp Res*, 33(12), 2124-2133. doi:10.1111/j.1530-0277.2009.01052.x



- Kaplan, M. S., McFarland, B. H., Huguet, N., Conner, K., Caetano, R., Giesbrecht, N., & Nolte, K. B. (2013). Acute alcohol intoxication and suicide: a gender-stratified analysis of the National Violent Death Reporting System. *Inj Prev*, 19(1), 38-43. doi:10.1136/injuryprev-2012-040317
- Kellam, S. G., Brown, C. H., Poduska, J. M., Ialongo, N. S., Wang, W., Toyinbo, P., . . . Wilcox, H. C. (2008). Effects of a universal classroom behavior management program in first and second grades on young adult behavioral, psychiatric, and social outcomes. *Drug Alcohol Depend*, 95 Suppl 1, S5-S28. doi:10.1016/j.drugalcdep.2008.01.004
- Kessler, R. C., Demler, O., Frank, R. G., Olfson, M., Pincus, H. A., Walters, E. E., . . . Zaslavsky, A. M. (2005). Prevalence and treatment of mental disorders, 1990 to 2003. *N Engl J Med*, 352(24), 2515-2523. doi:10.1056/NEJMSa043266
- Kitchener, B. A., & Jorm, A. F. (2004). Mental health first aid training in a workplace setting: a randomized controlled trial [ISRCTN13249129]. *BMC Psychiatry*, 4, 23. doi:10.1186/1471-244X-4-23
- Kitchener, B. A., & Jorm, A. F. (2006). Mental health first aid training: review of evaluation studies. *Aust N Z J Psychiatry*, 40(1), 6-8. doi:10.1111/j.1440-1614.2006.01735.x
- Kleiman, E. M., Riskind, J. H., Schaefer, K. E., & Weingarden, H. (2012). The moderating role of social support on the relationship between impulsivity and suicide risk. *Crisis*, 33(5), 273-279. doi:10.1027/0227-5910/a000136
- Klevens, J., Simon, T. R., & Chen, J. (2012). Are the perpetrators of violence one and the same? Exploring the co-occurrence of perpetration of physical aggression in the United States. *J Interpers Violence*, 27(10), 1987-2002. doi:10.1177/0886260511431441
- Knox, K. L., Litts, D. A., Talcott, G. W., Feig, J. C., & Caine, E. D. (2003). Risk of suicide and related adverse outcomes after exposure to a suicide prevention programme in the US Air Force: cohort study. *BMJ*, 327(7428), 1376.
- Knox, K. L., Pflanz, S., Talcott, G. W., Campise, R. L., Lavigne, J. E., Bajorska, A., . . . Caine, E. D. (2010). The US Air Force suicide prevention program: implications for public health policy. *Am J Public Health*, 100(12), 2457-2463. doi:10.2105/ajph.2009.159871
- Knox, M. S., Burkhart, K., & Hunter, K. E. (2010). ACT against violence parents raising safe kids program: Effects on maltreatment-related parenting behaviors and beliefs. *Journal of Family Issues*.
- Lang, M. (2013). The impact of mental health insurance laws on state suicide rates. *Health Econ*, 22(1), 73-88. doi:10.1002/hec.1816
- Linehan, M. M., Comtois, K. A., Murray, A. M., Brown, M. Z., Gallop, R. J., Heard, H. L., . . . Lindenboim, N. (2006). Two-year randomized controlled trial and follow-up of dialectical behavior therapy vs therapy by experts for suicidal behaviors and borderline personality disorder. *Arch Gen Psychiatry*, 63(7), 757-766. doi:10.1001/archpsyc.63.7.757
- Losel, F., & Farrington, D. P. (2012). Direct protective and buffering protective factors in the development of youth violence. *Am J Prev Med*, 43(2 Suppl 1), S8-S23. doi:10.1016/j.amepre.2012.04.029
- Luo, F., Florence, C. S., Quispe-Agnoli, M., Ouyang, L., & Crosby, A. E. (2011). Impact of business cycles on US suicide rates, 1928-2007. *Am J Public Health*, 101(6), 1139-1146. doi:10.2105/ajph.2010.300010
- Maimon, D., Browning, C. R., & Brooks-Gunn, J. (2010). Collective efficacy, family attachment, and urban adolescent suicide attempts. *J Health Soc Behav*, 51(3), 307-324. doi:10.1177/0022146510377878
- Mark, T. L., Shern, D. L., Bagalman, J. E., & Cao, Z. (2007). Ranking America's mental health: An analysis of depression across the states. Alexandria, VA: Mental Health America.
- McIntosh, W. L., Spies, E., Stone, D. M., Lokey, C. N., Trudeau, A. R., & Bartholow, B. (2016). Suicide Rates by Occupational Group - 17 States, 2012. *MMWR Morb Mortal Wkly Rep*, 65(25), 641-645. doi:10.15585/mmwr.mm6525a1
- Miller, M., Warren, M., Hemenway, D., & Azrael, D. (2015). Firearms and suicide in US cities. *Inj Prev*, 21(e1), e116-119. doi:10.1136/injuryprev-2013-040969
- Mishara, B. L. (Ed.) (1995). *The Impact of Suicide*. New York: Springer.

- Mishara, B. L., & Martin, N. (2012). Effects of a comprehensive police suicide prevention program. *Crisis: Journal of Crisis Intervention & Suicide*, 33(3), 162-168.
- Mitchell, A. M., Kim, Y., Prigerson, H. G., & Mortimer-Stephens, M. (2004). Complicated grief in survivors of suicide. *Crisis*, 25(1), 12-18. doi:10.1027/0227-5910.25.1.12
- Motto, J. A., & Bostrom, A. G. (2001). A randomized controlled trial of postcrisis suicide prevention. *Psychiatr Serv*, 52(6), 828-833.
- Muennig, P., Cohen, A. K., Palmer, A., & Zhu, W. (2013). The relationship between five different measures of structural social capital, medical examination outcomes, and mortality. *Soc Sci Med*, 85, 18-26. doi:10.1016/j.socscimed.2013.02.007
- National Action Alliance for Suicide Prevention. (2014). Research Prioritization Task Force.(2014). *A prioritized research agenda for suicide prevention: An action plan to save lives*.
- National Action Alliance for Suicide Prevention Workplace Task Force. (2015). *Comprehensive Blueprint for Workplace Suicide Prevention*. Washington, D.C. : Author.
- National Action Alliance for Suicide Prevention: Suicide Attempt Survivors Task Force. (2014). *The Way Forward: Pathways to hope, recovery, and wellness with insights from lived experience*. Washington, D.C. : Author.
- National Action Alliance for Suicide Prevention: Survivors of Suicide Loss Task Force. (2015). *Responding to Grief, Trauma, and Distress After a Suicide: U.S. National Guidelines*. Washington, D.C. : Author.
- Niederkrotenthaler, T., & Sonneck, G. (2007). Assessing the impact of media guidelines for reporting on suicides in Austria: Interrupted time series analysis. *Aust N Z J Psychiatry*, 41. doi:10.1080/00048670701266680
- Olfson, M., Gerhard, T., Huang, C., Crystal, S., & Stroup, T. S. (2015). Premature Mortality Among Adults With Schizophrenia in the United States. *JAMA Psychiatry*, 72(12), 1172-1181. doi:10.1001/jamapsychiatry.2015.1737
- Owens, D. (2002). Fatal and non-fatal repetition of self-harm: Systematic review. *British Journal of Psychiatry*, 181(3), 193-199.
- Pena, J. B., & Caine, E. D. (2006). Screening as an approach for adolescent suicide prevention. *Suicide Life Threat Behav*, 36(6), 614-637. doi:10.1521/suli.2006.36.6.614
- Perron, S., Burrows, S., Fournier, M., Perron, P. A., & Ouellet, F. (2013). Installation of a bridge barrier as a suicide prevention strategy in Montreal, Quebec, Canada. *Am J Public Health*, 103(7), 1235-1239. doi:10.2105/ajph.2012.301089
- Pinchevsky, G. M., & Wright, E. M. (2012). The impact of neighborhoods on intimate partner violence and victimization. *Trauma Violence Abuse*, 13(2), 112-132. doi:10.1177/1524838012445641
- Pirkis, J., Too, L. S., Spittal, M. J., Krysinska, K., Robinson, J., & Cheung, Y. T. D. (2015). Interventions to reduce suicides at suicide hotspots: a systematic review and meta-analysis. *The Lancet Psychiatry*, 2(11), 994-1001. doi:http://dx.doi.org/10.1016/S2215-0366(15)00266-7
- Pitman, A., Osborn, D., King, M., & Erlangsen, A. (2014). Effects of suicide bereavement on mental health and suicide risk. *Lancet Psychiatry*, 1, 86-94.
- Pollock, L. R., & Williams, J. M. (2004). Problem-solving in suicide attempters. *Psychol Med*, 34(1), 163-167.
- Reeves, A., Stuckler, D., McKee, M., Gunnell, D., Chang, S. S., & Basu, S. (2012). Increase in state suicide rates in the USA during economic recession. *Lancet*, 380(9856), 1813-1814. doi:10.1016/S0140-6736(12)61910-2
- Reid, M. J., Webster-Stratton, C., & Hammond, M. (2003). Follow-up of children who received the Incredible Years intervention for oppositional-defiant disorder: Maintenance and prediction of 2-year outcome. *Behavior Therapy*, 34(4), 471-491.
- Resnick, M. D., Ireland, M., & Borowsky, I. (2004). Youth violence perpetration: what protects? What predicts? Findings from the National Longitudinal Study of Adolescent Health. *J Adolesc Health*, 35(5), 424 e421-410. doi:10.1016/j.jadohealth.2004.01.011
- Rowhani-Rahbar, A., Simonetti, J. A., & Rivara, F. P. (2016). Effectiveness of Interventions to Promote Safe Firearm Storage. *Epidemiol Rev*, 38(1), 111-124. doi:10.1093/epirev/mxv006



- Runyan, C. W., Becker, A., Brandspigel, S., Barber, C., Trudeau, A., & Novins, D. (2016). Lethal Means Counseling for Parents of Youth Seeking Emergency Care for Suicidality. *West J Emerg Med*, 17(1), 8-14. doi:10.5811/westjem.2015.11.28590
- Runyan, D., Wattam, C., Ikeda, R., Hassan, F., & Ramiro, L. (2002). Child abuse and neglect by parents and other caregivers. In E. Krug, L. L. Dahlberg, J. A. Mercy, A. B. Zwi, & R. Lozano (Eds.), *World Report on Violence and Health* (pp. 59-86). Geneva, Switzerland: World Health Organization.
- Sampson, R. J., Morenoff, J. D., & Gannon-Rowley, T. (2002). Assessing "Neighborhood Effects": Social Processes and New Directions in Research. *Annual Review of Sociology*, 28, 443-478.
- Schilling, E. A., Aseltine, R. H., Jr., & James, A. (2016). The SOS Suicide Prevention Program: Further Evidence of Efficacy and Effectiveness. *Prev Sci*, 17(2), 157-166. doi:10.1007/s11121-015-0594-3
- Shepard, D. S., Gurewich, D., Lwin, A. K., Reed, G. A., Jr., & Silverman, M. M. (2016). Suicide and Suicidal Attempts in the United States: Costs and Policy Implications. *Suicide Life Threat Behav*, 46(3), 352-362. doi:10.1111/sltb.12225
- Silverman, M. M., & Maris, R. W. (1995). The prevention of suicidal behaviors: An overview. *Suicide and life-threatening behavior*, 25(1), 10-21.
- Simon, O. R., Swann, A. C., Powell, K. E., Potter, L. B., Kresnow, M. J., & O'Carroll, P. W. (2001). Characteristics of impulsive suicide attempts and attempters. *Suicide Life Threat Behav*, 32(1 Suppl), 49-59.
- Spoth, R. L., Gyll, M., & Day, S. X. (2002). Universal family-focused interventions in alcohol-use disorder prevention: cost-effectiveness and cost-benefit analyses of two interventions. *J Stud Alcohol*, 63(2), 219-228.
- Stack, S., & Wasserman, I. (2007). Economic strain and suicide risk: a qualitative analysis. *Suicide and life-threatening behavior*, 37(1), 103-112.
- Substance Abuse and Mental Health Services Administration. (2014). *Report to Congress: Garrett Lee Smith Suicide Prevention Program*. Rockville, MD.
- Sudak, H., Maxim, K., & Carpenter, M. (2008). Suicide and stigma: a review of the literature and personal reflections. *Acad Psychiatry*, 32(2), 136-142. doi:10.1176/appi.ap.32.2.136
- Szumilas, M., & Kutcher, S. (2011). Post-suicide intervention programs: a systematic review. *Can J Public Health*, 102(1), 18-29.
- Townsend, E., Hawton, K., Altman, D. G., Arensman, E., Gunnell, D., Hazell, P., . . . Van Heeringen, K. (2001). The efficacy of problem-solving treatments after deliberate self-harm: meta-analysis of randomized controlled trials with respect to depression, hopelessness and improvement in problems. *Psychological Medicine*, 31(6), 979-988.
- Tyrer, P., Reed, G. M., & Crawford, M. J. (2015). Classification, assessment, prevalence, and effect of personality disorder. *Lancet*, 385(9969), 717-726. doi:10.1016/S0140-6736(14)61995-4
- U.S. Office of the Surgeon General, & National Action Alliance for Suicide Prevention. (2012). *2012 National Strategy for Suicide Prevention: Goals and Objectives for Action*. Washington, D.C.: HHS.
- U.S. Public Health Service. (1999). *The Surgeon General's Call to Action to Prevent Suicide*. Washington, D.C.
- Unutzer, J., Tang, L., Oishi, S., Katon, W., Williams, J. W., Jr., Hunkeler, E., . . . Langston, C. (2006). Reducing suicidal ideation in depressed older primary care patients. *J Am Geriatr Soc*, 54(10), 1550-1556.
- Visser, V. S., Comans, T. A., & Scuffham, P. A. (2014). Evaluation Of The Effectiveness Of A Community-Based Crisis Intervention Program For People Bereaved By Suicide. *Journal of Community Psychology*, 42(1), 19-28. doi:10.1002/jcop.21586
- Walrath, C., Garraza, L. G., Reid, H., Goldston, D. B., & McKeon, R. (2015). Impact of the Garrett Lee Smith youth suicide prevention program on suicide mortality. *Am J Public Health*, 105(5), 986-993. doi:10.2105/AJPH.2014.302496
- Wang, Y. C., Hsieh, L. Y., Wang, M. Y., Chou, C. H., Huang, M. W., & Ko, H. C. (2016). Coping Card Usage can Further Reduce Suicide Reattempt in Suicide Attempter Case Management Within 3-Month Intervention. *Suicide Life Threat Behav*, 46(1), 106-120. doi:10.1111/sltb.12177

- Wasserman, D., Hoven, C. W., Wasserman, C., Wall, M., Eisenberg, R., Hadlaczky, G., . . . Carli, V. (2014). School-based suicide prevention programmes: The SEYLE cluster-randomised, controlled trial. *The Lancet*, 385(9977), 1536-1544. doi:10.1016/S0140-6736(14)61213-7
- Webster-Stratton, C., & Hammond, M. (1997). Treating children with early-onset conduct problems: a comparison of child and parent training interventions. *J Consult Clin Psychol*, 65(1), 93-109.
- Webster-Stratton, C., Reid, M. J., & Hammond, M. (2001). Preventing conduct problems, promoting social competence: a parent and teacher training partnership in head start. *J Clin Child Psychol*, 30(3), 283-302. doi:10.1207/S15374424JCCP3003\_2
- Webster-Stratton, C. H., Reid, M. J., & Beauchaine, T. (2011). Combining parent and child training for young children with ADHD. *Journal of Clinical Child & Adolescent Psychology*, 40(2), 191-203.
- Webster-Stratton, C., Jamila Reid, M., & Stoolmiller, M. (2008). Preventing conduct problems and improving school readiness: evaluation of the incredible years teacher and child training programs in high-risk schools. *Journal of child psychology and psychiatry*, 49(5), 471-488.
- Widome, R., Sieving, R. E., Harpin, S. A., & Hearst, M. O. (2008). Measuring neighborhood connection and the association with violence in young adolescents. *J Adolesc Health*, 43(5), 482-489. doi:10.1016/j.jadohealth.2008.04.013
- Wilcox, H. C., Kellam, S. G., Brown, C. H., Poduska, J. M., Ialongo, N. S., Wang, W., & Anthony, J. C. (2008). The impact of two universal randomized first- and second-grade classroom interventions on young adult suicide ideation and attempts. *Drug Alcohol Depend*, 95 Suppl 1, S60-73.
- Wilson, W. J. (2011). *When work disappears: The world of the new urban poor*: Vintage.
- World Health Organization. (2014). *Suicide Prevention: A Global Imperative*. Geneva, Switzerland: WHO Press.
- Wyman, P. A., Brown, C. H., LoMurray, M., Schmeelk-Cone, K., Petrova, M., Yu, Q., . . . Wang, W. (2010). An outcome evaluation of the Sources of Strength suicide prevention program delivered by adolescent peer leaders in high schools. *Am J Public Health*, 100(9), 1653-1661. doi:
- Yip, P., Caine, E., Yousuf, S., Chang, S.-S., Wu, K., & Chen, Y.-Y. (2012). Means restriction for suicide prevention. *Lancet*, 379. doi:10.1016/s0140-6736(12)60521-2



## Appendix A: Summary of Strategies and Approaches to Prevent Suicide

Strategy	Approach/Program, Practice or Policy	Best Available Evidence			Lead Sectors <sup>1</sup>
		Suicide	Suicide Attempts or Ideation	Other Risk/Protective Factors for Suicide	
Strengthen economic supports	<b>Strengthen household financial security</b>				Government (local, state, Federal)
	<i>Unemployment benefit programs</i>	✓			
	<i>Other income supports</i>	✓			Business/labor
	<b>Housing stabilization policies</b>				Government (local, state, Federal)
	<i>The National Neighborhood Stabilization Program</i>			✓	
Strengthen access to mental health care	<b>Coverage of mental health conditions in health insurance policies</b>				Health care
	<i>Mental Health Parity Laws</i>	✓		✓	Government (state, Federal)
Establish protective environments	<b>Reducing access to lethal means among persons at-risk</b>				Government (local, state)
	<i>Intervening at suicide hot spots</i>	✓			
	<i>Safe storage practices</i>		✓	✓	Public Health
	<b>Organizational policies and culture</b>				Business/Labor
	<i>Together for Life</i>	✓			
	<i>US Air Force Suicide Prevention Program</i>	✓		✓	Government (local, state, Federal)

		Best Available Evidence			
	<b>Community-based policies to reduce excessive alcohol use</b>				Government (local, state)
	<i>Alcohol outlet density</i>	✓		✓	Business/labor
<b>Promote connectedness</b>	<b>Peer norm approaches</b>				Public Health
	<i>Sources of Strength</i>			✓	Education
	<b>Community-engagement activities</b>				Public Health
	<i>Greening vacant urban spaces</i>			✓	Government (local)
<b>Teach coping and problem-solving skills</b>	<b>Social emotional learning</b>				Public Health
	<i>Youth Aware of Mental Health Program</i>		✓		Education
	<i>Signs of Suicide</i>		✓	✓	
	<i>Good Behavior Game</i>		✓	✓	
	<b>Parenting skill and family relationship approaches</b>				Public Health
	<i>The Incredible Years</i>			✓	Education
	<i>Strengthening Families 10-14</i>			✓	
<b>Identify and</b>	<b>Gatekeeper training</b>				Public Health
	<i>Mental Health First Aid</i>			✓	Healthcare
	<b>Screening combined with care management</b>				Healthcare



		Best Available Evidence			
support people at-risk	<i>Henry Ford Perfect Depression Care (Pre-cursor to Zero Suicide)</i>	✓		✓	Social Services
	<b>Crisis Intervention</b>				Public Health
	<i>National Suicide Prevention Lifeline</i>		✓	✓	Social Services
	<i>Applied Suicide Intervention Skills Training</i>		✓	✓	
Intervene to lessen harms and prevent future risk	<b>Treatment for people at risk of suicide</b>				Healthcare
	<i>Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)</i>		✓	✓	Social Services Justice
	<i>Collaborative Assessment and Management of Suicidality (CAMS)</i>		✓	✓	
	<i>Dialectical Behavioral Therapy</i>		✓	✓	
	<i>Attachment-Based Family Therapy</i>		✓		
	<b>Treatment to prevent re-attempts</b>				Healthcare
	<i>ED Brief Intervention with Follow-up Visits</i>	✓			Social Services
	<i>Active follow-up contact approaches</i>	✓	✓		
	<i>CBT for Suicide Prevention</i>				
	<b>Postvention</b>				Healthcare

		Best Available Evidence			
	<i>StandBy Response Service</i>		✓		
	<b>Safe messaging following a suicide</b>				Public Health
	<i>Media Guidelines</i>	✓			Media

<sup>1</sup>This column refers to the lead sectors well positioned to bring leadership and resources to implementation efforts. For each strategy, there are many other sectors such as non-governmental organizations that are instrumental to prevention planning and implementing the specific programmatic activities.



**Preventing Suicide:  
A Technical Package of Policy, Programs, and Practices**

**Prepared by:**

**Deb Stone, ScD, MSW, MPH**

**Kristin Holland, PhD, MPH**

**Brad Bartholow, PhD**

**Alex Crosby, MD, MPH**

**Shane Davis, PhD**

**Natalie Wilkins, PhD**

**Division of Violence Prevention  
National Center for Injury Prevention and Control (NCIPC)  
Centers for Disease Control and Prevention**

**2017**

***Preventing Suicide: A Technical Package of Policies, Programs, and Practices* is a publication of the  
National Center for Injury Prevention and Control of the Centers for Disease Control and  
Prevention.**

Centers for Disease Control and Prevention  
Thomas R. Frieden, MD, MPH, Director

National Center for Injury Prevention and Control  
Debra E. Houry, MD, MPH, Director

Division of Violence Prevention  
James A. Mercy, PhD, Director

***Suggested Citation:*** Stone, D.M., Holland, K.M., Bartholow, B., Crosby, A.E., Davis, S., and Wilkins, N.  
***Preventing Suicide: A Technical Package of Policies, Programs, and Practices.*** Atlanta, GA: National  
Center for Injury Prevention and Control, Centers for Disease Control and Prevention, 2017.



## Contents

Acknowledgements.....	4
External Reviewers.....	5
Overview of Technical Package.....	6
Strengthen Economic Supports.....	14
Strengthen Access and Delivery of Suicide Care.....	17
Create Protective Environments.....	21
Promote Connectedness.....	26
Teach Coping and Problem-Solving Skills.....	28
Identify and Support People At-Risk.....	31
Lessen Harms and Prevent Future Risk.....	37
Sector Involvement.....	39
Monitoring and Evaluation.....	41
Conclusion.....	42
References.....	44
Appendix A.....	50

## Acknowledgements

We would like to thank the following individuals who contributed in specific ways to the development of this technical package. We give special thanks to Linda Dahlberg for her vision, guidance, and support throughout the development of this package. We thank Division, Center, and CDC leadership for their careful review and helpful feedback on earlier iterations of this document. We thank Alida Knuth for her formatting and design expertise. Last but definitely not least, we extend our thanks and gratitude to all the external reviewers for their helpful feedback, support and encouragement for this resource.



## External Reviewers

Casey Castaldi  
Prevention Institute

Carmen Clelland  
Office for State, Tribal, Local and Territorial  
Support, Centers for Disease Control and  
Prevention

Amalia Corby-Edwards  
American Psychological Association

Rachel Davis  
Prevention Institute

Pamela End of Horn  
Indian Health Service Headquarters

Craig Fisher  
American Psychological Association

Keita Franklin  
Department of Defense

Jill M. Harkavy Friedman  
American Foundation for Suicide Prevention

Jarrold Hindman  
Colorado Department of Public Health and  
Environment

Linda Langford  
Education Development Center, Inc.

Richard McKeon  
Substance Abuse and Mental Health Services  
Administration

Doreen S. Marshall  
American Foundation for Suicide Prevention

Christine Moutier  
American Foundation for Suicide Prevention

Jason H. Padgett  
Education Development Center, Inc.

Jerry Reed  
Education Development Center, Inc.

Christine Schuler  
National Institute for Occupational Safety and  
Health, Centers for Disease Control and  
Prevention

Morton Silverman  
Education Development Center, Inc.

Ellyson Stout  
Education Development Center, Inc.

Hope M. Tiesman  
National Institute for Occupational Safety and  
Health, Centers for Disease Control and  
Prevention

Dan Reidenberg  
Suicide Awareness Voices for Education (SAVE)

The experts above are listed with their affiliations at the time this document was reviewed.

## Overview

This technical package represents a select group of strategies based on the best available evidence to help communities and states sharpen their focus on prevention activities with the greatest potential to prevent suicide. These strategies include: strengthening economic supports; strengthening access and delivery of suicide care; creating protective environments; promoting connectedness; teaching coping and problem-solving skills; identifying and supporting people at-risk; and lessening harms and preventing future risk. The strategies represented in this package include those with a focus on preventing suicide from happening in the first place as well as approaches to lessen the immediate and long-term harms of suicidal behavior for individuals, families, communities, and society. The strategies in the technical package support the goals and objectives of the *National Strategy for Suicide Prevention*<sup>1</sup> and the National Action Alliance for Suicide Prevention's priority to strengthen community-based prevention.<sup>2</sup> Commitment, cooperation, and leadership from numerous sectors, including public health, education, justice, health care, social services, business, labor, and government can bring about the successful implementation of this package.

### What is a Technical Package?

A technical package is a compilation of a core set of strategies to achieve and sustain substantial reductions in a specific risk factor or outcome.<sup>3</sup> Technical packages help communities and states prioritize prevention activities based on the best available evidence. This technical package has three components. The first component is the **strategy** or the preventive direction or actions to achieve the goal of preventing suicide. The second component is the **approach**. The approach includes the specific ways to advance the strategy. This can be accomplished through *programs, policies, and practices*. The **evidence** for each of the approaches in preventing suicide or its associated risk factors is included as the third component. This package is intended as a resource to guide and inform prevention decision-making in communities and states.

### Preventing Suicide is a Priority

Suicide, as defined by the Centers for Disease Control and Prevention (CDC), is part of a broader class of behavior called *self-directed violence*. Self-directed violence refers to behavior directed at oneself that deliberately results in injury or the *potential* for injury.<sup>4</sup> Self-directed violence may be *suicidal* or *non-suicidal* in nature. For the purposes of this document, we refer only to behavior where suicide is intended:



- **Suicide** is a death caused by self-directed injurious behavior with any intent to die as a result of the behavior.
- **Suicide attempt** is defined as a *non-fatal* self-directed and potentially injurious behavior with any intent to die as a result of the behavior. A suicide attempt may or may not result in injury.

**Suicide is highly prevalent.** Suicide presents a major challenge to public health in the United States and worldwide. It contributes to premature death, morbidity, lost productivity, and health care costs.<sup>1,5</sup> In 2015 (the most recent year of available death data), suicide was responsible for 44,193 deaths in the U.S., which is approximately one suicide every 12 minutes.<sup>6</sup> In 2015, suicide ranked as the 10th leading cause of death and has been among the top 12 leading causes of death since 1975 in the U.S.<sup>7</sup> Overall suicide rates increased 28% from 2000 to 2015.<sup>6</sup> Suicide is a problem throughout the life span; it is the third leading cause of death for youth 10-14 years of age, the second leading cause of death among people 15–24 and 25-34 years of age; the fourth leading cause among people 35 to 44 years of age, the fifth leading cause among people ages 45-54 and eighth leading cause among people 55-64 years of age.<sup>6</sup>

Suicide rates vary by race/ethnicity, age, and other population characteristics, with the highest rates across the lifespan occurring among non-Hispanic American Indian/Alaska Native (AI/AN) and non-Hispanic White population groups. In 2015, the rates for these groups were 19.9 and 16.9 per 100,000 population, respectively.<sup>6</sup> Other population groups disproportionately impacted by suicide include middle-aged adults (whose rates increased 35% from 2000 to 2015, with steep increases seen among both males (29%) and females (53%) aged 35-64 years<sup>6</sup>; Veterans and other military personnel (whose suicide rate nearly doubled from 2003 to 2008, surpassing the rate of suicide among civilians for the first time in decades)<sup>8,9</sup>; workers in certain occupational groups,<sup>10,11</sup> and sexual minority youth, who experience increased suicidal ideation and behavior compared to their non-sexual minority peers.<sup>12-14</sup>

Suicides reflect only a portion of the problem.<sup>15</sup> Substantially more people are hospitalized as a result of nonfatal suicidal behavior (i.e. suicide attempts) than are fatally injured, and an even greater number are either treated in ambulatory settings (e.g., emergency departments) or not treated at all.<sup>15</sup> For example, during 2014, among adults aged 18 years and older, for every one suicide there were 9 adults treated in hospital emergency departments for self-harm injuries, 27 who reported making a suicide attempt, and over 227 who reported seriously considering suicide.<sup>6,16</sup>

**Suicide is associated with several risk and protective factors.** Suicide, like other human behaviors, has no single determining cause. Instead, suicide occurs in response to multiple biological, psychological, interpersonal, environmental and societal influences that interact with one another, often over time.<sup>1,5</sup> The social ecological model – encompassing multiple levels of focus from the individual, relationship, community, and societal – is a useful framework for viewing and understanding suicide risk and

protective factors identified in the literature.<sup>17</sup> Risk and protective factors for suicide exist at each level. For example, risk factors include:

- **Individual level:** history of depression and other mental illnesses, hopelessness, substance abuse, certain health conditions, previous suicide attempt, violence victimization and perpetration, and genetic and biological determinants
- **Relationship level:** high conflict or violent relationships, sense of isolation and lack of social support, family/loved one's history of suicide, financial and work stress
- **Community level:** inadequate community connectedness, barriers to health care (e.g., lack of access to providers and medications)
- **Societal level:** availability of lethal means of suicide, unsafe media portrayals of suicide, stigma associated with help-seeking and mental illness.<sup>1,5</sup>

It is important to recognize that the vast majority of individuals who are depressed, attempt suicide, or have other risk factors, do *not* die by suicide.<sup>18,19</sup> Furthermore, the relevance of each risk factor can vary by age, race, gender, sexual orientation, residential geography, and socio-cultural and economic status.<sup>1,5</sup>

Protective factors, or those influences that buffer against the risk for suicide, can also be found across the different levels of the social ecological model. Protective factors identified in the literature include: effective coping and problem solving skills, moral objections to suicide, strong and supportive relationships with partners, friends, and family; connectedness to school, community, and other social institutions; availability of quality and ongoing physical and mental health care, and reduced access to lethal means.<sup>1,5</sup> These protective factors can either counter a specific risk factor or buffer against a number of risks associated with suicide.

**Suicide is connected to other forms of violence.** Exposure to violence (e.g., child abuse and neglect, bullying, peer violence, dating violence, sexual violence, and intimate partner violence) is associated with increased risk of depression, post-traumatic stress disorder (PTSD), anxiety, suicide, and suicide attempts.<sup>20-26</sup> Women exposed to partner violence are nearly 5 times more likely to attempt suicide as women not exposed to partner violence.<sup>26</sup> Exposure to adverse experiences in childhood, such as physical, sexual, emotional abuse and neglect, and living in homes with violence, mental health, substance abuse problems and other instability, is also associated with increased risk for suicide and suicide attempts.<sup>22,27</sup> The psychosocial effects of violence in childhood and adolescence can be observed decades later, including severe problems with finances, family, jobs, and stress – factors that can increase the risk for suicide. Suicide and other forms of violence often share the same individual, relationship, community, and societal risk factors suggesting that efforts to prevent interpersonal violence may also prove beneficial in preventing suicide.<sup>28-30</sup> Further, just as risk factors may be shared across suicide and interpersonal violence, so too may protective factors overlap. For example,



connectedness to one's community,<sup>31</sup> school,<sup>32</sup> family,<sup>33</sup> caring adults,<sup>34,35</sup> and pro-social peers<sup>36</sup> can enhance resilience and help reduce risk for suicide and other forms of violence.

**The health and economic consequences of suicide are substantial.** Suicide and suicide attempts have far reaching consequences for individuals, families, and communities.<sup>37-40</sup> In an early study, Crosby and Sacks<sup>41</sup> estimated that 7% of the U.S. adult population, or 13.2 million adults, knew someone in the prior 12 months who had died by suicide. They also estimated that for each suicide, 425 adults were exposed, or knew about the death.<sup>41</sup> In a more recent study, in one state, Cerel et al<sup>42</sup> found that 48% of the population knew at least one person who died by suicide in their lifetime. Research indicates that the impact of knowing someone who died by suicide and/or having lived experience (i.e., personally have attempted suicide, have had suicidal thoughts, or have been impacted by suicidal loss) is much more extensive than injury and death. People with lived experience may suffer long-term health and mental health consequences ranging from anger, guilt, and physical impairment, depending on the means and severity of the attempt.<sup>43</sup> Similarly, survivors of a loved one's suicide may experience ongoing pain and suffering including complicated grief,<sup>44</sup> stigma, depression, anxiety, post-traumatic stress disorder, and increased risk of suicidal ideation and suicide.<sup>45,46</sup> Less discussed but no less important, are the financial and occupational effects on those left behind.<sup>47</sup>

The economic toll of suicide on society is immense as well. According to conservative estimates, in 2013, suicide cost \$50.8 billion in estimated lifetime medical and work-loss costs alone.<sup>47</sup> Adjusting for potential under-reporting of suicide and drawing upon health expenditures per capita, gross domestic product per capita, and variability among states in per capita health care expenditures and income, another study estimated the total lifetime costs associated with nonfatal injuries and deaths caused by self-directed violence to be approximately \$93.5 billion in 2013.<sup>48</sup> The overwhelming burden of these costs were from lost productivity over the life course, with the average cost per suicide being over \$1.3 million.<sup>48</sup> The true economic costs are likely higher, as neither study included monetary figures related to other societal costs such as those associated with the pain and suffering of family members or other impacts.

**Suicide can be prevented.** Like most public health problems, suicide is preventable.<sup>1,5</sup> While progress will continue to be made into the future, evidence for numerous programs, practices, and policies currently exists, and many programs are ready to be implemented now. Just as suicide is not caused by a single factor, research suggests that reductions in suicide will not be prevented by any single strategy or approach.<sup>1,49</sup> Rather, suicide prevention is best achieved by a focus across the individual, relationship, family, community, and societal-levels and across all sectors, private and public.<sup>1,5</sup>

## Assessing the Evidence



This technical package includes programs, practices, and policies with evidence of impact on suicide or risk or protective factors for suicide. To be considered for inclusion in the technical package, the program, practice, or policy selected had to meet at least one of these criteria: a) meta-analyses or systematic reviews showing impact on suicide; b) evidence from at least one rigorous (e.g., randomized controlled trial [RCT] or quasi-experimental design) evaluation study that found significant preventive effects on suicide; c) meta-analyses or systematic reviews showing impact on risk or protective factors for suicide, or d) evidence from at least one rigorous (e.g., RCT or quasi-experimental design) evaluation study that found significant impacts on risk or protective factors for suicide. Finally, consideration was also given to the likelihood of achieving beneficial effects on multiple forms of violence; no evidence of harmful effects on specific outcomes or with particular subgroups; and feasibility of implementation in a U.S. context if the program, policy, or practice has been evaluated in another country.

Within this technical package, some approaches do not yet have research evidence demonstrating impact on rates of suicide but instead are supported by evidence indicating impacts on risk or protective factors for suicide (e.g., help-seeking, stigma reduction, depression, connectedness). In terms of the strength of the evidence, programs that have demonstrated effects on suicidal behavior (e.g., reductions in deaths, attempts) provide a higher-level of evidence, but the evidence base is not that strong in all areas. For instance, there has been less evaluation of community engagement and family programs on suicidal behavior. Thus, approaches in this package that have effects on risk or protective factors reflect the developing nature of the evidence base and the use of the best available evidence at a given time.

It is also important to note that there is often significant heterogeneity among the programs, policies, or practices that fall within one approach or strategy in terms of the nature and quality of the available evidence. Not all programs, policies, or practices that utilize the same approach are equally effective, and even those that are effective may not work across all populations. Tailoring programs and conducting more evaluations may be necessary to address different population groups. The evidence-based programs, practices, or policies included in the package are not intended to be a comprehensive list for each approach, but rather to serve as examples that have been shown to impact suicide or have beneficial effects on risk or protective factors for suicide.

### **Context and Cross-Cutting Themes**

One important feature of the package is the complementary and potentially synergistic impact of the strategies and approaches. The strategies and approaches included in this technical package represent different levels of the social ecology, with efforts intended to impact community and societal levels, as well individual and relationship levels. The strategies and approaches are intended to work in combination and reinforce each other to prevent suicide (see box below). The strategies are arranged in order such that those strategies hypothesized to have the greatest potential for broad public health impact on suicide are included first, followed by those that might impact subsets of the population (e.g., persons who have already made a suicide attempt).



Preventing Suicide	
Strategy	Approach
Strengthen economic supports	<ul style="list-style-type: none"> <li>• Strengthen household financial security</li> <li>• Housing stabilization policies</li> </ul>
Strengthen access and delivery of suicide care	<ul style="list-style-type: none"> <li>• Coverage of mental health conditions in health insurance policies</li> <li>• Reduce provider shortages in underserved areas</li> <li>• Safer suicide care through systems change</li> </ul>
Create protective environments	<ul style="list-style-type: none"> <li>• Reduce access to lethal means among persons at-risk of suicide</li> <li>• Organizational policies and culture</li> <li>• Community-based policies to reduce excessive alcohol use</li> </ul>
Promote connectedness	<ul style="list-style-type: none"> <li>• Peer norm programs</li> <li>• Community engagement activities</li> </ul>
Teach coping and problem-solving skills	<ul style="list-style-type: none"> <li>• Social-emotional learning programs</li> <li>• Parenting skill and family relationship programs</li> </ul>
Identify and support people at-risk	<ul style="list-style-type: none"> <li>• Gatekeeper training</li> <li>• Crisis Intervention</li> <li>• Treatment for people at-risk of suicide</li> <li>• Treatment to prevent re-attempts</li> </ul>
Lessen harms and prevent future risk	<ul style="list-style-type: none"> <li>• Postvention</li> <li>• Safe reporting and messaging about suicide</li> </ul>

It is important to note that these strategies are not mutually exclusive but each has an immediate focus. For instance, social-emotional learning programs, an approach under the *Teach Coping and Problem-Solving Skills* strategy, sometimes include components to change peer norms and the broader environment. The primary focus of these programs, however, is to provide children and youth with skills to resolve problems in relationships, school, and with peers, and to help youth address other negative influences (e.g., substance use) associated with suicide.

The goal of this package is to stress the importance of comprehensive prevention efforts and to provide examples of effective programs addressing each level of the social ecology, with the knowledge that some programs, practices, and policies may impact multiple levels. Further, those that involve multiple sectors and that impact multiple levels of the social ecology are more likely to have a greater impact on the overall burden of suicide.

Suicide ideation, thoughts, attempts, and deaths vary by gender, race/ethnicity, age, occupation, and other important population characteristics.<sup>6,50</sup> Further, certain transition periods are also associated

with higher rates of suicide (e.g., transition from working into retirement, transition from active duty military status to civilian status).<sup>48,51</sup> In fact, suicide risk can change along with dynamic risk factors. For example, individuals' coping skills may change during periods of crisis and heightened stress, limiting their normal ability to effectively solve problems and cope. Research indicates that suicide risk changes as a result of the number and intensity of key risk and protective factors experienced.<sup>52</sup> Ideally, the availability of multiple strategies and approaches tailored to the social, economic, cultural, and environmental context of individuals and communities are desirable as they may increase the likelihood of removing barriers to supportive and effective care and provide opportunities to develop individual and community resilience.<sup>1</sup>

Identifying programs, practices, and policies with evidence of impact on suicide, suicide attempts, or beneficial effects on risk or protective factors for suicide is only the first step. In practice, the effectiveness of the programs, policies and practices identified in this package will be strongly dependent on how well programs are implemented, as well as the partners and communities in which they are implemented. Practitioners in the field may be in the best position to assess the needs and strengths of their communities and work with community members to make decisions about the combination of approaches included here that are best suited to their context.

Data-driven strategic planning processes can help communities with this work.<sup>53-55</sup> These planning processes engage and guide community stakeholders through a prevention planning process designed to address a community's profile of risk and protective factors with evidence-based programs, practices, and policies. These processes can also be used to monitor implementation, track outcomes, and make adjustments as indicated by the data. The readiness of the program for broad dissemination and implementation (e.g., availability of program materials, training and technical assistance) can also influence program effects. Implementation guidance to assist practitioners, organizations and communities will be developed separately.

This package includes strategies where public health agencies are well positioned to bring leadership and resources to implementation efforts. It also includes strategies where public health can serve as an important collaborator (e.g., strategies addressing community and societal level risks), but where leadership and commitment from other sectors such as business, labor or health care is critical to implement a particular policy or program (e.g., workplace policies; treatment to prevent re-attempts). The role of various sectors in the implementation of a strategy or approach in preventing suicide is described further in the section on *Sector Involvement*.

In the sections that follow, the strategies and approaches with the best available evidence for preventing suicide are described.



## Strengthen Economic Supports

### Rationale

Studies from the U.S. examining historical trends indicate that suicide rates increase during economic recessions marked by high unemployment rates, job losses, and economic instability and decrease during economic expansions and periods marked by low unemployment rates, particularly for working-age individuals 25 to 64 years old.<sup>56,57</sup> Economic and financial strain, such as job loss, long periods of unemployment, reduced income, difficulty covering medical, food, and housing expenses, and even the anticipation of such financial stress may increase an individual's risk for suicide or may indirectly increase risk by exacerbating related physical and mental health problems.<sup>58</sup> Buffering these risks can, therefore, potentially protect against suicide. For example, strengthening economic support systems can help people stay in their homes or obtain affordable housing while also paying for necessities such as food and medical care, job training, child care, among other expenses required for daily living. In providing this support, stress and anxiety and the potential for a crisis situation may be reduced, thereby preventing suicide. Although more research is needed to understand how economic factors interact with other factors to increase suicide risk, the available evidence suggests that strengthening economic supports may be one opportunity to buffer suicide risk.

### Approaches

Economic supports for individuals and families can be strengthened by targeting household financial security and ensuring stability in housing during periods of economic stress.

- **Strengthening household financial security** can potentially buffer the risk of suicide by providing individuals with the financial means to lessen the stress and hardship associated with a job loss or other unanticipated financial problems. The provision of unemployment benefits and other forms of temporary assistance, livable wages, medical benefits, and retirement and disability insurance to help cover the cost of necessities or to offset costs in the event of disability, are examples of ways to strengthen household financial security.
- **Housing stabilization policies** aim to keep people in their homes and provide housing options for those in need during times of financial insecurity. This may occur through programs that provide affordable housing such as through government subsidies or through other options available to potential homebuyers such as loan modification programs, move-out planning, or financial counseling services that help minimize the risk or impact of foreclosures and eviction.

### Potential Outcomes

- Reductions in foreclosure rates

- Reductions in eviction rates
- Reductions in emotional distress
- Reductions in rates of suicide

## Evidence

There is evidence suggesting that strengthening household financial security and stabilizing housing can reduce suicide risk.

- **Strengthen household financial security.** The *Federal-State Unemployment Insurance Program* allows states to define the maximum amount and duration of unemployment benefits that workers are entitled to receive after a job loss.<sup>59</sup> An examination of variations in *unemployment benefit programs* across states demonstrated that the impact of unemployment on rates of suicide was offset in those states that provided greater than average unemployment benefits (mean level: \$7,990 per person in U.S. constant dollars). The effects of *unemployment benefit programs* were also consistent by sex and age group.<sup>59</sup> Another U.S. study examining the link between unemployment and suicide rates using monthly suicide data, length of unemployment (less than 5 weeks, 5-14 weeks, 15-26 weeks, and greater than 26 weeks), and job losses found that the duration of unemployment, as opposed to just the loss of job, predicted suicide risk.<sup>60</sup> Together, these results suggest that not only should state unemployment benefit programs be generous in their financial allocations, but also in their duration.

Other measures to strengthen household financial security (e.g., transfer payments related to retirement and disability insurance, unemployment insurance compensation, medical benefits, and other forms of family assistance) have also shown an impact on rates of suicide. A study by Flavin and Radcliff<sup>61</sup> examined the impact of states' per capita spending on transfer payments, medical benefits, and family assistance (Temporary Assistance to Needy Families – TANF) and total state spending on suicide rates between 1990-2000, controlling for a number of suicide risk factors (e.g., residential mobility, divorce rate, unemployment rate) at the state level. As per capita spending on total transfer payments, medical benefits, and family assistance increased there was an associated decrease in state suicide rates. In terms of lives saved, Flavin and Radcliff calculated the cost of reducing a state's suicide rate by a full point for the years studied.<sup>61</sup> At the national level, they estimated 3,000 fewer suicides would occur per year nationwide if every state increased its per capita spending on these types of assistance by \$45 per year.<sup>61</sup> Although this was a correlational study, the results demonstrate the potential benefits of policies that reach particularly vulnerable individuals during periods of great need. More evaluation studies are needed to further understand the outcomes impacted by programs such as these.



- **Housing stabilization policies.** The *Neighborhood Stabilization Program*<sup>62</sup> was designed to help neighborhoods suffering from high rates of foreclosure and abandonment by slowing the deterioration of the neighborhoods and providing affordable housing options for low, moderate, and middle-income homebuyers. This program also offers financial assistance to eligible individuals for the purchase of a new home. Although this program has not been rigorously evaluated for its impact on suicide outcomes, it addresses foreclosure and eviction, which are risk factors for suicide. A longitudinal analysis of annual data on suicides and foreclosures demonstrated that as the proportion of foreclosed properties increased in U.S. states, so did the state suicide rate, particularly among working-aged adults.<sup>63</sup> Another study of data from 16 U.S. states participating in the *National Violent Death Reporting System* found that suicides precipitated by home foreclosures and evictions increased more than 100% from 2005 (before the housing crisis began) to 2010 (after it had peaked).<sup>57</sup> Most of these suicides occurred prior to the actual loss of the decedent's home. These findings suggest that integrating suicide prevention resources, messaging, and referrals into financial, foreclosure, and move-out planning and counseling services may help to prevent suicide.

## Strengthen Access and Delivery of Suicide Care

### Rationale

While most people with mental health problems do not attempt or die by suicide<sup>18,19</sup> and the level of risk conferred by different types of mental illness varies,<sup>64-66</sup> previous research indicates that mental illness is an important risk factor for suicide.<sup>5,67</sup> State-level suicide rates have also been found to be correlated with general mental health measures such as depression.<sup>68,69</sup> Findings from the *National Comorbidity Survey* indicate that relatively few people in the U.S. with mental health disorders receive treatment for those conditions.<sup>70</sup> Lack of access to mental health care is one of the contributing factors related to the underuse of mental health services.<sup>71</sup> Identifying ways to improve access to timely, affordable, and quality mental health and suicide care for people in need is a critical component to prevention.<sup>5</sup> Additionally, research suggests that services provided are maximized when health and behavioral health care systems are set up to effectively and efficiently deliver such care.<sup>72</sup> Apart from treatment benefits, these approaches can also normalize help-seeking behavior and increase the use of such services.

### Approaches

There are a number of approaches that can be used to strengthen access and delivery of suicide care, including:

- **Coverage of mental health conditions in health insurance policies.** Federal and state laws include provisions for equal coverage of mental health services in health insurance plans that is on par with coverage for other health concerns (i.e., mental health parity).<sup>73</sup> Benefits and services covered include such things as the number of visits, co-pays, deductibles, inpatient/outpatient services, prescription drugs, and hospitalizations. If a state has a stronger mental health parity law than the federal parity law, then insurance plans regulated by the state must follow the state parity law. If a state has a weaker parity law than the federal parity law (e.g., includes coverage for some mental health conditions but not others), then the federal parity law will replace the state law. Equal coverage does not necessarily imply good coverage as health insurance plans vary in the extent to which benefits and services are offered to address various health conditions. Rather it helps to ensure that mental health services are covered on par with other health concerns.
- **Reduce provider shortages in underserved areas.** Access to effective and state-of-the-art mental health care is largely dependent upon the training and the size of the mental health care workforce. Over 85 million Americans live in areas with an insufficient number of mental health providers; this shortage is particularly severe among low-income urban and rural communities.<sup>74</sup> There are various ways to increase the number and distribution of practicing mental health providers in underserved areas including offering financial incentives through existing state and



federal programs (e.g., loan repayment programs) and expanding the reach of health services through telephone, video and web-based technologies. Such approaches can increase the likelihood that those in need will be able to access affordable, quality care for mental health problems, which can reduce risk for suicide.

- **Safer suicide care through systems change.** Access to health and behavioral health care services is critical for people at risk of suicide; however this is just one piece of the puzzle. Care should also be delivered efficiently and effectively. More specifically, care should take place within a system that supports suicide prevention and patient safety through strong leadership, workforce training, systematic identification and assessment of suicide risk, implementation of evidence-based treatments (see *Identify and Support People At-Risk*), continuity of care, and continuous quality improvement. Care that is patient-centered and promotes equity for all patients is also of critical importance.<sup>75</sup>

### Potential Outcomes

- Increased use of mental health services
- Lower rates of treatment attrition
- Reductions in depressive symptoms
- Reductions in rates of suicide attempts
- Reductions in rates of suicide

### Evidence

There is evidence suggesting that coverage of mental health conditions in health insurance policies and improving access and the delivery of care can reduce risk factors associated with suicide and may directly impact suicide rates.

- **Coverage of mental health conditions in health insurance policies.** The *National Survey on Drug Use and Health (NSDUH)* is a nationally representative survey of the U.S. population that provides data on substance use, mental health conditions, and service utilization.<sup>50</sup> Using data from this survey, Harris, Carpenter, and Bao<sup>76</sup> found that 12 months after states enacted *mental health parity laws*, self-reported use of mental healthcare services significantly increased. Moreover, subsequent research by Lang<sup>69</sup> examined state mental health laws and suicide rates between 1990 and 2004 and found that mental health parity laws, specifically, were associated with an approximate 5% reduction in suicide rates. This reduction, in the 29 states with parity laws, equated to the prevention of 592 suicides per year.<sup>69</sup>
- **Reduce provider shortages in underserved areas.** One example of a program to improve access to mental health care providers is the *National Health Service Corps (NHSC)*, which offers

financial incentives to attract mental/behavioral health clinicians to underserved areas.<sup>77</sup> Programs such as *NHSC* encourage individuals to work in the mental health profession in locations designated as Health Professional Shortage Areas (HPSAs) in exchange for student loan debt repayment. A 2012 retention survey conducted by the Health Resources and Services Administration (HRSA), found that 61% of mental and behavioral health care providers continued to practice in designated mental health shortage areas after their four year commitment to the *NHSC*.<sup>78</sup> Although this program has not been evaluated for impact on suicide, it addresses access to care, which is a critical component to suicide prevention.

*Telemental Health (TMH)* services refer to the use of telephone, video and web-based technologies for providing psychiatric or psychological care at a distance.<sup>79</sup> *TMH* can be used in a variety of settings (e.g. outpatient clinics, hospitals, military treatment facilities) to treat a wide range of mental health conditions. It can also improve access to care for patients in isolated areas, as well as reduce travel time and expenses, reduce delays in receiving care, and improve satisfaction interacting with the mental health care system. A systematic review of *TMH* services found that services rated as high or good quality were effective in treating mental health conditions such as depression, schizophrenia, substance abuse, and suicidal ideation and suicide.<sup>79</sup> Further, Mohr and colleagues<sup>80</sup> conducted a meta-analysis examining the effect of psychotherapy delivered specifically via telephone and found that it significantly reduced depressive symptoms in comparison to face-to-face psychotherapy. They also found that treatment attrition rates were significantly lower among patients receiving telephone-administered psychotherapy compared to patients receiving face-to-face therapy.<sup>80</sup> Thus, *TMH* may not only offer improved access to mental health care, but it may also ensure continuity of care, and thereby further reduce the risk for suicide.

- **Safer suicide care through systems change.** *Henry Ford Health System*, which is a large health maintenance organization (HMO) in the state of Michigan, pioneered *Perfect Depression Care*,<sup>81</sup> the pre-cursor to what is now called *Zero Suicide*. The overall goal of *Perfect Depression Care* was to eliminate suicide among HMO members. More broadly, the goal of the program was to redesign delivery of depression care to achieve “breakthrough improvement” in quality and safety by focusing on effectiveness, safety, patient centeredness, timeliness, efficiency, and equity among patients. The program screened and assessed each patient for suicide risk and implemented coordinated continuous follow-up care system wide.<sup>81</sup> An examination of the impact of the program found that there was a dramatic and statistically significant decrease in the rate of suicide between the baseline years, 1999 and 2000, prior to the intervention to the intervention years, 2002-2009. During this time period, the suicide rate fell by 82%.<sup>81,82</sup> Further, among HMO members who received mental health specialty services, the suicide rate significantly decreased over time from 1999 to 2010 (110.3 to 47.6 per 100,000 population;  $p < .04$ ) with a mean of 36.2 per 100,000 over the period. Additionally, for those HMO members



who accessed only general medical services as opposed to specialty mental health services, the suicide rate increased from 2.7 to 5.6 per 100,000 ( $p < .01$ ).<sup>82</sup> Similarly, in the state of Michigan, rates of suicide in the general population increased over the period from 9.8 to 12.5 per 100,000 ( $p < .001$ ).<sup>83</sup>

FINAL

## Create Protective Environments

### Rationale

Prevention efforts that focus not only on individual behavior change (e.g., help-seeking, treatment interventions) but on changes to the environment can increase the likelihood of positive behavioral and health outcomes.<sup>84</sup> Creating environments that address risk and protective factors where individuals live, work, and play can help prevent suicide.<sup>1,17</sup> For example, rates of suicide are high among middle-aged adults who comprise 42.6% of the workforce<sup>85</sup>; among certain occupational groups<sup>10,11</sup>; and among people in detention facilities (e.g. jail, prison),<sup>86</sup> to name a few. Thus, settings where these populations work and reside are ideal for implementing programs, practices and policies to buffer against suicide. Changes to organizational culture through the implementation of supportive policies, for instance, can change social norms, encourage help-seeking, and demonstrate that good health and mental health are valued and that stigma and other risk factors for suicide are not.<sup>87,88</sup> Similarly, modifying the characteristics of the physical environment to prevent harmful behavior such as access to lethal means can reduce suicide rates, particularly in times of crisis or transition.<sup>89-94</sup>

### Approaches

The current evidence suggests three potential approaches for creating environments that protect against suicide.

- **Reduce access to lethal means among persons at-risk of suicide.** Means of suicide such as firearms, hanging/suffocation, or jumping from heights provide little opportunity for rescue and, as such, have high case fatality rates (e.g., about 85% of people who use a firearm in a suicide attempt will die from the injury).<sup>95</sup> Research also indicates that: 1) the interval between deciding to act and attempting suicide can be as short as 5 or 10 minutes,<sup>96,97</sup> and 2) people tend *not* to substitute a different method when a highly lethal method is unavailable or difficult to access.<sup>98,99</sup> Therefore, increasing the time interval between deciding to act and the suicide attempt, for example, by making it more difficult to access lethal means, can be lifesaving. The following are examples of approaches reducing access to lethal means for persons at-risk of suicide:
  - *Intervening at Suicide Hotspots.* Suicide hotspots, or places where suicides may take place relatively easily, include tall structures (e.g., bridges, cliffs, balconies, and rooftops), railway tracks, and isolated locations such as parks. Efforts to prevent suicide at these locations include erecting barriers or limiting access to prevent jumping, and installing signs and telephones to encourage individuals who are considering suicide, to seek help.<sup>100</sup>



- *Safe Storage Practices.* Safe storage of medications, firearms, and other household products can reduce the risk for suicide by separating vulnerable individuals from easy access to lethal means. Such practices may include education and counseling around storing firearms locked in a secure place (e.g., in a gun safe or lock box), unloaded and separate from the ammunition; and keeping medicines in a locked cabinet or other secure location away from people who may be at risk or who have made prior attempts.<sup>89,101</sup>
- **Organizational policies and culture** that promote protective environments may be implemented in places of employment, detention facilities, and other secured environments (e.g. residential settings). Such policies and cultural values encourage leadership from the top down and may promote prosocial behavior (e.g., asking for help), skill building, positive social norms, assessment, referral and access to helping services (e.g., mental health, substance abuse treatment, financial counseling), and development of crisis response plans, postvention and other measures to foster a safe physical environment. Such policies and cultural shifts can positively impact organizational climate and morale and help prevent suicide and its related risk factors (e.g. depression, social isolation).<sup>88,102</sup>
- **Community-based policies to reduce excessive alcohol use.** Research studies in the United States have found that greater alcohol availability is positively associated with alcohol-involved suicides.<sup>103-105</sup> Policies to reduce excessive alcohol use broadly include zoning to limit alcohol outlet locations and density, taxes on alcohol, and bans on the sale of alcohol for individuals under the legal drinking age.<sup>105</sup> These policies are important because acute alcohol use has been found to be associated with more than one-third of suicides and approximately 40% of suicide attempts.<sup>106</sup>

### Potential Outcomes

- Increases in safe storage of lethal means
- Reductions in rates of suicide
- Reductions in suicide attempts
- Increases in help-seeking
- Reductions in alcohol-related suicide deaths

### Evidence

The evidence suggests that creating protective environments can reduce suicide and suicide attempts and increase protective behaviors.

- **Reduce access to lethal means among persons at-risk of suicide.** A meta-analysis examining the impact of *suicide hotspot interventions* implemented in combination or in isolation, both in the U.S. and abroad, found associated reduced rates of suicide.<sup>100,107</sup> For example, after erecting a barrier on the Jacques-Cartier bridge in Canada, the suicide rate from jumping from the bridge decreased from about 10 suicide deaths per year to about 3 deaths per year.<sup>108</sup> Moreover, the reduction in suicides by jumping was sustained even when all bridges and nearby jumping sites were considered, suggesting little to no displacement of suicides to other jumping sites.<sup>108</sup> Further evidence for the effectiveness of bridge barriers was demonstrated by a study examining the impact of the *removal* of safety barriers from the Grafton Bridge in Auckland, New Zealand. After removal of the barrier, both the number and rate of suicide increased five-fold.<sup>93,109</sup>

Another form of means reduction involves implementation of *safe storage practices*. In a case-control study of firearm-related events identified from 37 counties in Washington, Oregon, and Missouri, and from 5 trauma centers, researchers found that storing firearms unloaded, separate from ammunition, in a locked place or secured with a safety device was protective of suicide attempts among adolescents.<sup>110</sup> Further, a recent systematic review of clinic and community-based education and counseling interventions suggested that the provision of safety devices significantly increased safe firearm storage practices compared to counseling alone or compared to the provision of economic incentives to acquire safety devices on one's own.<sup>101</sup>

Another program, the *Emergency Department Counseling on Access to Lethal Means (ED CALM)*, trained psychiatric emergency clinicians in a large children's hospital to provide lethal means counseling and safe storage boxes to parents of patients under age 18 receiving care for suicidal behavior. In a pre-post quality improvement project, Runyan et al<sup>89</sup> found that at post-test 76% (of the 55% of parents followed up, n=114) reported that all medications in the home were locked up as compared to fewer than 10% at the time of the initial emergency department visit. Among parents who indicated the presence of guns in the home at pre-test (i.e., 67%), all (100%) reported guns were currently locked up at post-test.<sup>89</sup>

- **Organizational policies and culture.** *Together for Life* is a workplace program of the Montreal Police Force implemented to address suicide among officers. Policy and program components were designed to foster an organizational culture that promoted mutual support and solidarity among all members of the Force. The program included training of supervisors, managers and all units to improve competencies in identifying suicidal risk and to improve use and awareness of existing resources. The program also included an education campaign to improve awareness and help-seeking.<sup>111</sup> Police suicides were tracked over 12 years and compared to rates in the control city of Quebec. The suicide rate in the intervention group decreased significantly by 78.9% to a rate of 6.4 suicides per 100,000 population per year compared to an 11% increase in the control city (29.0 per 100,000).<sup>111</sup>



Another example of this approach is the *United States Air Force Suicide Prevention Program*. The program included 11 policy and education initiatives and was designed to change the culture of the Air Force surrounding suicide. The program uses leaders as role models and agents of change, establishes expectations for behavior related to awareness of suicide risk, develops population skills and knowledge (i.e., education and training), and investigates every suicide (i.e., outcomes measurement). The program represents a fundamental shift from viewing suicide and mental illness solely as medical problems and instead sees them as larger service-wide problems impacting the whole community.<sup>112</sup> Using a time-series design to examine the impact of the program on various violence-related outcomes, researchers found that the program was associated with a 33% relative risk reduction in suicide.<sup>112</sup> The program was also associated with relative risk reductions in related outcomes including moderate and severe family violence (30% and 54%, respectively), homicide (51%), and accidental death (18%).<sup>112</sup> A longitudinal assessment of the program over the period 1981 to 2008 (16 years before the 1997 launch of the program and 11 years post-launch) found significantly lower rates of suicide after the program was launched than before.<sup>87</sup> These effects were sustained over time, except in 2004, which the authors found was associated with less rigorous implementation of program components in that year than in the other years.<sup>87</sup>

Finally, while the evidence is still being built for suicide prevention in correctional facilities, preliminary evidence suggests organizational policies and practices that include routine suicide prevention training for all staff; standardized intake screening and risk assessment; provision of shared information between staff members (especially in transitioning or transferring of inmates); varying levels of observation; safe physical environment; emergency response protocols; notification of suicidal behavior/suicide through the chain of command; and critical incident stress debriefing and death review can potentially reduce suicide.<sup>102</sup> When these policies and practices were implemented across 11 state prisons in Louisiana, suicide rates dropped 46%, from a rate of 23.1 per 100,000 before the intervention to 12.4 per 100,000 the following year.<sup>113</sup> Other similar programs have seen declines in suicide both in the United States and internationally.<sup>114</sup>

- **Community-based policies to reduce excessive alcohol use.** While multiple policies to limit excessive use of alcohol exist, several studies on alcohol outlet density and risk factors for suicide, such as interpersonal violence and social connectedness,<sup>115-118</sup> suggest that measures to reduce alcohol outlet density can potentially reduce alcohol-involved suicides. Additionally, a longitudinal analysis of alcohol outlet density, suicide mortality, and hospitalizations for suicide attempts over 6 years in 581 California zip codes indicated that greater density of bars, specifically, is related to greater suicide and suicide attempts, particularly in rural areas.<sup>119</sup>

## Promote Connectedness

### Rationale

Sociologist, Emile Durkheim theorized in 1897 that weak social bonds, i.e., lack of connectedness, are among the chief causes for suicidality.<sup>120</sup> Connectedness is the degree to which an individual or group of individuals are socially close, interrelated, or share resources with others.<sup>121</sup> Social connections can be formed within and between multiple levels of the social ecology,<sup>17</sup> for instance between individuals (e.g., peers, neighbors, co-workers), families, schools, neighborhoods, workplaces, faith communities, cultural groups, and society as a whole. Related to connectedness, social capital refers to a sense of trust in one's community and neighborhood, social integration, and also the availability and participation in social organizations.<sup>122,123</sup> Many ecological cross-sectional and longitudinal studies have examined the impact of aspects of social capital on depression symptoms, depressive disorder, mental health more generally, and suicide. While the evidence is limited, existing studies suggest a positive association between social capital (as measured by social trust and community/neighborhood engagement), and improved mental health.<sup>124,125</sup> Connectedness and social capital together may protect against suicidal behaviors by decreasing isolation, encouraging adaptive coping behaviors, and by increasing belongingness, personal value, and worth, to help build resilience in the face of adversity. Connectedness can also provide individuals with better access to formal supports and resources, mobilize communities to meet the needs of its members and provide collective primary prevention activities to the community as a whole.<sup>121</sup>

### Approaches

Promoting connectedness among individuals and within communities through modeling peer norms and enhancing community engagement may protect against suicide.

- **Peer norm programs** seek to normalize protective factors for suicide such as help-seeking, reaching out and talking to trusted adults, and promote peer connectedness. By leveraging the leadership qualities and social influence of peers, these approaches can be used to shift group-level beliefs and promote positive social and behavioral change. These approaches typically target youth and are delivered in school settings but can also be implemented in community settings.<sup>126</sup>
- **Community engagement activities.** Community engagement is an aspect of social capital.<sup>127</sup> Community engagement approaches may involve residents participating in a range of activities, including religious activities, community clean-up and greening activities, and physical exercise. These activities provide opportunities for residents to become more involved in the community and to connect with other community members, organizations, and resources, resulting in enhanced overall physical health, reduced stress, and decreased depressive symptoms, thereby reducing risk of suicide.



## Potential Outcomes

- Increases in healthy coping attitudes and behaviors
- Increases in referrals for youth in distress
- Increases in help-seeking behaviors
- Increases in positive perceptions of adult support

## Evidence

Current evidence suggests a number of positive benefits of peer norm and community engagement activities, although more evaluation research is needed to examine whether these improvements in factors that protect against suicidal behavior translate into reduced suicide attempts and deaths.

- **Peer norm programs.** Evaluations show that programs such as *Sources of Strength* can improve school norms and beliefs about suicide that are created and disseminated by student peers. In a randomized controlled trial of *Sources of Strength* conducted with 18 high-schools (6 metropolitan, 12 rural), researchers found that the program improved adaptive norms regarding suicide, connectedness to adults, and school engagement.<sup>36</sup> Peer leaders were also more likely than controls to refer a suicidal friend to an adult. For students, the program resulted in increased perceptions of adult support for suicidal youths, particularly among those with a history of suicidal ideation, and the acceptability of help-seeking behaviors. Finally, trained peer leaders also reported a greater decrease in maladaptive coping attitudes compared with untrained leaders.<sup>36</sup>
- **Community engagement activities.** A vacant lot greening initiative was undertaken in Philadelphia between 1999 and 2008. Local residents and community members worked together to green 4,436 lots (or 7.8 million square feet) in 4 areas of the city. Researchers found significant reductions in community residents' self-reported level of stress, which is a risk factor for suicide, and engagement in more physical exercise, a protective factor for suicide, than residents in control vacant lot areas. There is some evidence for other cross-cutting benefits, including reductions in firearm assaults and vandalism.<sup>128,129</sup>

## Teach Coping and Problem-Solving Skills

### Rationale

Building life skills prepares individuals to successfully tackle every day challenges and adapt to stress and adversity. Life skills encompasses many concepts, but most often include coping and problem-solving skills, emotional regulation, conflict resolution, and critical thinking. Life skills are important in shielding individuals from suicidal behaviors.<sup>126</sup> Suicide prevention programs that focus on life and social skills training are drawn from social cognitive theories,<sup>130</sup> surmising that suicidal behavior is attributed to either direct learning and modeling or environmental and individual (e.g. hopelessness) characteristics. The inability to employ adequate strategies to cope with immediate stressors or identify and find solutions for problems has been characterized among suicide attempters.<sup>131</sup> Teaching and providing youth with the skills to tackle every day challenges and stressors is, therefore, an important developmental component to suicide prevention.

### Approaches

Social-emotional learning programs and parenting skill and family relationship programs are two approaches for teaching coping and problem-solving skills.

- **Social-emotional learning programs** focus on developing and strengthening communication and problem-solving skills, emotion regulation, conflict resolution, help seeking and coping skills. These approaches address a range of risk and protective factors for suicidal behavior. They provide children and youth with skills to resolve problems in relationships, school, and with peers, and help youth to address other negative influences (e.g., substance use) associated with suicide.<sup>126</sup> These approaches are typically delivered to all students in a particular grade or school, although some programs also focus on groups of students considered to be at high risk for suicide. Opportunities to practice and reinforce skills are an important part of programs that work.<sup>132</sup>
- **Parenting skill and family relationship programs** provide caregivers with support and are designed to strengthen parenting skills, enhance positive parent-child interactions, and improve children's behavioral and emotional skills and abilities.<sup>132</sup> Programs are typically designed for parents or caregivers with children in a specific age range and can be self-directed or delivered to individual families or groups of families. Some programs have sessions primarily with parents or caregivers while others include sessions for parents or caregivers, youth, and the family. Specific program content typically varies by the age of the child but often has consistent themes of child development, parent-child communication and relationships, and youth's interpersonal and problem-solving skills.



## Potential Outcomes

- Reductions in suicide ideation
- Reductions in suicide attempts
- Reductions in suicide risk behaviors (i.e., depression, anxiety, conduct problems, substance abuse)
- Improvements in help-seeking behavior
- Improvements in social competence and emotional regulation skills
- Improvements in problem-solving and conflict management skills

## Evidence

Several social-emotional learning and parenting and family relationship programs have been shown in rigorous evaluations to improve resilience and reduce problem behavior and risk factors for various behaviors, including ones closely related to suicide, such as depression, internalizing behaviors, and substance abuse.<sup>133</sup>

- **Social-emotional learning programs.** The *Youth Aware of Mental Health Program (YAM)* is a program developed for teenagers aged 14-16 that uses interactive dialogue and role-playing to teach adolescents about the risk and protective factors associated with suicide (including knowledge about depression and anxiety) and enhances their problem-solving skills for dealing with adverse life events, stress, school and other problems.<sup>134</sup> In a cluster-randomized controlled trial conducted across 10 European Union countries and 168 schools, students in schools randomized to *YAM* were significantly less likely to attempt suicide and have severe suicidal ideation at the 12-month follow-up compared to students in control schools which received educational materials and care as usual. Overall, the relative risk of youth suicide attempts among the *YAM* group was reduced by over 50% demonstrating that out of 1000 students, five attempted suicide in the *YAM* group compared to 11 in the control group. Additionally, related to severe suicide ideation, in the *YAM* group, relative risk fell by 49.6%.<sup>134</sup>

Another example is the *Good Behavior Game (GBG)*, which is a classroom-based program for elementary school children aged 6-10. The program uses a team-based behavior management strategy that promotes good behavior by setting clear expectations for good behavior and consequences for maladaptive behavior. The goal of the *GBG* program is to create an integrated classroom social system that is supportive of all children being able to learn with little aggressive or disruptive behavior.<sup>135</sup> Two cohorts of youths participated in the program in 1985-86 and 1986-87 school years when they were in the first and second grades. A number of proximal and distal outcomes were assessed among the two cohorts over time. With respect to distal suicide-related outcomes, an outcome evaluation of the *GBG* indicated that individuals in the first cohort who were assigned to participate in *GBG* when

they were in the first grade reported half the adjusted odds of suicidal ideation and suicide attempts when assessed approximately 15 years later, between the ages of 19 to 21, compared to peers who had been in a standard classroom setting. The beneficial effect of the program was consistent for suicidal ideation regardless of whether baseline covariates were included.<sup>135</sup> The *GBG* effect on attempts was less robust in some adjusted models including caregiver mental health. In the second cohort of *GBG* students, neither suicidal ideation nor suicide attempts were significantly different between *GBG* and the control interventions.<sup>135</sup> The researchers believed this may have been due to a lack of implementation fidelity, including less mentoring and monitoring of teachers. *GBG* was also found to be associated with reduced risk of later substance abuse and other suicide risk factors among the first cohort of students. Results for the second cohort were generally smaller but in the desired direction.<sup>136</sup>

- **Parenting skill and family relationship programs.** Parenting and family skills training approaches have shown promising impacts in preventing key risk factors associated with suicide. For example, the *Incredible Years (IY)* is a comprehensive group training program for parents, teachers and children designed to reduce conduct and substance abuse problems, two important suicide risk factors in youth by improving protective factors such as responsive and positive parent-teacher-child interactions and relationships, emotion self-regulation and social competence (all protective factors for suicide).<sup>132</sup> The program includes 9-20 sessions offered in community-based settings (e.g., religious, recreation centers, mental health treatment centers, and hospitals). Several studies have demonstrated the effect of the *IY* program on reducing internalizing symptoms, such as anxiety and depression, and child conduct problems.<sup>137,138</sup> The program is also associated with improved problem-solving and conflict management; these skills were maintained at 1-year follow-up.<sup>139-141</sup> Additionally, the program demonstrated greater benefits in mother-rated child internalizing symptoms, compared to the waitlisted control group, when parent, child, and teacher components were included.<sup>132</sup>

Additionally, *Strengthening Families 10–14* is a program that involves sessions for parents, youth, and families with the goal of improving parents' skills for disciplining, managing emotions and conflict, and communicating with their children; promoting youths' interpersonal and problem-solving skills; and creating family activities to build cohesion and positive parent-child interactions. The premise of the program is that developing these skills for both parents and children will reduce internalizing behavior and adolescent substance abuse, two important risk factors for suicide.<sup>142</sup> *Strengthening Families* has been shown to significantly decrease externalizing behaviors, such as aggression, alcohol use, and drug use



among youth participants, as well as reduce depression, alcohol use, and drug use among participating families.<sup>142</sup>

FINAL

## Identify and Support People At-Risk

### Rationale

In order to decrease suicide, care of, and attention to, vulnerable populations is necessary, as these groups tend to experience suicidal behavior at higher than average rates. Such vulnerable populations include, but are not limited to, individuals with lower socio-economic status or who are living with a mental health problem; people who have previously attempted suicide; Veterans and active duty military personnel; individuals who are institutionalized, have been victims of violence, or are homeless; individuals of sexual minority status; and members of certain racial and ethnic minority groups.<sup>8,9,12,13,143</sup> Supporting people at-risk requires proactive case finding and effective response, crisis intervention, and evidence-based treatment. Finding optimal ways of identifying at-risk individuals, customizing services to make them more accessible (e.g., Internet-based services when appropriate) and engaging people in evidence-based care (e.g., through such measures as collaborative treatment), remain key challenges.<sup>81,144,145</sup> Simply improving or expanding services does not guarantee that those services will be used by people most in need, nor will it necessarily increase the number of people who follow recommended referrals or treatment. For example, some people living in disadvantaged communities may face social and economic issues that can adversely affect their ability to access supportive services.<sup>70</sup>

### Approaches

The following approaches focus on identifying and supporting people at increased risk of suicide.

- **Gatekeeper training** is designed to train teachers, coaches, clergy, emergency responders, primary and urgent care providers, and others in the community to identify people who may be at risk of suicide and to respond effectively, including facilitating treatment seeking and support services. Gatekeeper training may be implemented in a variety of settings to identify and support people at risk.<sup>146</sup>
- **Crisis intervention.** These approaches provide support and referral services, typically by connecting a person in crisis (or a friend or family member of someone at-risk) to trained volunteers or professional staff via telephone hotline, online chat, text messaging, or in-person. Crisis intervention approaches are intended to impact key risk factors for suicide, including feelings of depression, hopelessness, and subsequent mental health care utilization.<sup>147</sup> Similar to means reduction, crisis interventions can put space or time between an individual who may be considering suicide and harmful behavior.
- **Treatment for people at-risk of suicide** can include various forms of psychotherapy delivered by licensed providers to help individuals with mental health problems and other suicide risk factors with problem-solving and emotion regulation. Treatment usually takes place in a one-on-one or



group format between patients and clinicians and can vary in duration from several weeks to ongoing therapy, as needed. Treatment that employs collaborative (i.e., between patient and therapist or care manager) and/or integrated care (e.g., linkage between primary care and behavioral health care) can help engage and motivate patients, thereby increasing retention in therapy and decreasing suicide risk.<sup>148-150</sup>

- **Treatment to prevent re-attempts.** These approaches typically include follow-up contact and use diverse modalities (e.g., home visits, mail, telephone, e-mail) to engage recent suicide attempt survivors in continued treatment to prevent re-attempts.<sup>151</sup> Treatment may focus on improved coping skills, mindfulness, and other emotional regulation skills, and may include case management home visits to increase adherence to treatment and continuity of care; and one-on-one interpersonal therapy and/or group therapy. Approaches that engage and connect attempters to peers and providers are especially important because many attempters do not present to aftercare; 12%-25% reattempt within a year, and 3%-9% of attempt survivors die by suicide within 1 to 5 years of their initial attempt.<sup>151</sup>

### Potential Outcomes

- Reductions in suicidal ideation
- Reductions in suicide attempts
- Reductions in suicide rates
- Reductions in depression and feelings of hopelessness
- Reductions in reattempts
- Improvements in coping skills
- Increases in treatment engagement and compliance with medications

### Evidence

The current evidence suggests that identifying people at risk of suicide and the continued provision of treatment and support for these individuals can positively impact suicide and its associated risk factors.

- **Gatekeeper training.** *Applied Suicide Intervention Skills Training (ASIST)* is a widely implemented training program that helps hotline counselors, emergency workers, and other gatekeepers to identify and connect with suicidal individuals, understand their reasoning for living and dying, and assist with safely connecting those in need to available resources. In a study employing a randomized controlled trial, Gould, Cross, Pisani, Munfakh, & Kleinman<sup>152</sup> evaluated the training across the *National Suicide Prevention Lifeline* network of hotlines over the period 2008-2009. Using data from 1,410 suicidal individuals who called 17 Lifeline centers, the researchers found that callers who spoke with ASIST-trained counselors were significantly more likely to feel less

depressed, less suicidal, less overwhelmed, and more hopeful by the end of their call, compared to callers who spoke to non-*ASIST* trained counselors. Counselors trained in *ASIST* were also more skilled at keeping callers on the phone longer and establishing a connection with them. However, training in *ASIST* did not result in more comprehensive suicide risk assessments than usual care training.<sup>152</sup>

Gatekeeper training has also been a primary component of the *Garret Lee Smith (GLS) Suicide Prevention Program*, which has been funded in 50 states and 50 tribes. A multi-site evaluation assessed the impact of community gatekeeper training on suicide attempts and deaths by comparing the change in suicide rates and nonfatal suicidal behavior among young people aged 10-24 in counties implementing *GLS* trainings, with the trajectory observed in similar counties that did not implement these trainings. Counties that implemented *GLS* trainings had significantly lower youth suicide rates one year following the training implementation.<sup>153</sup> This finding equates to a decrease of 1 suicide death per 100,000 among youth ages 10 to 24, or the prevention of approximately 237 deaths in the age group, between 2007 and 2010. Counties implementing *GLS* program activities also had significantly lower suicide attempt rates among youth ages 16 to 23 in the year following implementation of the *GLS* program than did similar counties that did not implement *GLS* activities (4.9 fewer attempts per 1000 youths).<sup>154</sup> More than 79,000 suicide attempts may have been prevented during the period examined.

- **Crisis intervention.** Suicide prevention hotlines are one way to provide crisis intervention. In an evaluation of the effectiveness of the *National Suicide Prevention Lifeline* to prevent suicide, 1,085 suicidal individuals who called the hotline completed a standard risk assessment for suicide, and 380 of those completed a follow-up assessment between 1 and 52 days (mean=13.5 days) after the initial assessment. Researchers found that over half of the initial sample were seriously considering suicide when they called, and they had a plan for their suicide. Researchers also found that among follow-up participants, there was a significant decrease in psychological pain, hopelessness, and intent to die between initiation of the call (time 1) to follow-up (time 3).<sup>155</sup> Between time 2 (end of the call) to time 3, the effect remained for psychological pain and hopelessness, but was not significant for intent to die, suggesting that greater effort at outreach during and following the call is needed for the callers with high levels of suicide intent.<sup>155</sup>
- **Treatment for people at-risk of suicide.** The *Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)* program aims to prevent suicide among older primary care patients by reducing suicide ideation and depression. *IMPACT* facilitates the development of a therapeutic alliance, a personalized treatment plan that includes patient preferences, as well as proactive follow-up (biweekly during an acute phase and monthly during continuation phase) by a depression care manager.<sup>156</sup> The program has been shown to significantly improve quality of life,



and to reduce functional impairment, depression and suicidal ideation over 24-months of follow-up<sup>156,157</sup> relative to patients who received care as usual.

*Collaborative Assessment and Management of Suicidality (CAMS)*, is a therapeutic approach for suicide-specific assessment and treatment. The program's flexible approach can be used across treatment settings and clinician theoretical orientations and involves the clinician and patient working together in an interactive assessment process to develop patient-specific treatment plans. Sessions are collaborative and involve constant patient input about what is and is not working with the ultimate goal of enhancing the therapeutic alliance and increasing treatment motivation in the suicidal patient. *CAMS* has been tested and supported in 6 correlational studies,<sup>144</sup> in a variety of inpatient and outpatient settings, and in one RCT with several additional RCTs under way. A feasibility trial with a community-based sample of suicidal outpatients randomly assigned to *CAMS* or enhanced care as usual (intake with a psychiatrist or psychiatric nurse practitioner followed by 1-11 visits with a case manager and medication as needed) found better treatment retention among the *CAMS* group and significant improvements in suicidal ideation, overall symptom distress, and feelings of hopelessness at the 12 month follow-up.<sup>158</sup>

Other examples include *Dialectical Behavioral Therapy (DBT)* and *Attachment-Based Family Therapy (ABFT)*. *DBT* is a multicomponent therapy for individuals at high risk for suicide and who may struggle with impulsivity and emotional regulation issues. The components of *DBT* include individual therapy, group skills training, between-session telephone coaching and a therapist consultation team. In a randomized controlled trial of women with recent suicidal or self-injurious behavior, those receiving *DBT* were half as likely to make a suicide attempt at two-year follow-up than women receiving community treatment (23% vs 46%), required less hospitalization for suicide ideation, and had lower medical risk across all suicide attempts and self-injurious acts combined.<sup>159</sup>

*ABFT* is a program for adolescents aged 12-18 and is designed to treat clinically diagnosed major depressive disorder, eliminate suicidal ideation, and reduce dispositional anxiety.<sup>160</sup> A randomized controlled trial of *ABFT* found that suicidal adolescents assigned to *ABFT* experienced significantly greater improvement in suicidal ideation over 24 weeks of follow-up than did adolescents assigned to enhanced usual care. Additionally, a significantly higher percentage of *ABFT* participants reported no suicidal ideation in the week prior to assessment at 12 weeks than did adolescents receiving enhanced usual care (69.2% vs. 34.6%) and at 24 weeks (82.1% vs. 46.2%).<sup>160</sup>

The Veterans Affairs *Translating Initiatives for Depression into Effective Solutions* project (*TIDES*) uses a depression care liaison to link primary care and mental health services. The depression care liaison assesses and educates patients and follows-up with both patients and providers

between primary care visits to optimize treatment. This collaborative care increases the efficiency of providing mental health services by bringing mental health care to the primary care setting, where most patients are first detected and subsequently treated for many mental health conditions. An evaluation of *TIDES* found significant decreases in depression severity scores among 70% of primary care patients.<sup>161</sup> *TIDES* also demonstrated 85% and 95% compliance with medication and follow-up visits, respectively.<sup>161</sup>

- **Treatment to prevent re-attempts.** Several strategies that aim to prevent re-attempts have demonstrated impact on reducing suicide deaths. For example, *Emergency Department Brief Intervention with Follow-up Visits* is a program that involves a one-hour discharge information session that addresses suicidal ideation and attempts, distress, risk and protective factors, alternatives to self-harm, and referral options, combined with nine follow-up contacts over 18 months (at 1, 2, 4, 7, 11 weeks and 4, 6, 12, 18 months). Follow-up contacts are either conducted by phone or through home visits according to a specific timeline for up to 18 months. A randomized controlled trial that enrolled suicide attempters from eight hospital emergency departments in five countries (Brazil, India, Sri Lanka, Iran, and China) found that a brief intervention combined with nine follow-up visits over 18 months was associated with significantly fewer deaths from suicide relative to a treatment-as-usual group (0.2% versus 2.2%, respectively).<sup>162</sup>

Another example of treatment to prevent re-attempts involves *active follow-up contact approaches* such as postcards, letters, and telephone calls intended to increase a patient's sense of connectedness with health care providers and decrease isolation.<sup>151</sup> These approaches include expression of care and support and typically invite patients to reconnect with their provider. Contacts are made periodically (e.g., monthly or every few months in the first 12 months post-discharge with some programs continuing contact for two or more years). In a meta-analysis conducted by Inagaki et al<sup>151</sup> interventions to prevent repeat suicide attempts in patients admitted to an emergency department for suicide attempt were found to reduce reattempts by approximately 17% for up to 12 months post-discharge; however, the effects of these approaches beyond 12 months on reattempts has not yet been demonstrated.<sup>151</sup> Also, because the number of trials and associated sample sizes included in this meta-analysis were small, it was not possible to determine the effect of active contact and follow-up approaches on death by suicide.

In a randomized controlled trial of the post-crisis suicide prevention long-term follow-up contact approach, Motto, Bostrom<sup>163</sup> found that patients who refused ongoing care but who were randomized to be contacted by letter four times per year had a lower rate of suicide over two years of follow-up than did patients in the control group who received no further contact. Other



studies have also shown post-crisis letters and coping cards to be protective against suicide ideation and attempts.<sup>164,165</sup>

Finally, *Cognitive Behavior Therapy for Suicide Prevention (CBT-SP)* is an example of a therapeutic approach to prevent re-attempts. It uses a risk-reduction, relapse prevention approach that includes an analysis of proximal risk factors and stressors (e.g., relationship problems, school or work-related difficulties) leading up to and following the suicidal event; safety plan development; skill building; and psychoeducation. *CBT-SP* also has family skill modules focused on family support and communication patterns as well as improving the family's problem solving skills. A randomized controlled trial of *CBT-SP* found that 10-session outpatient cognitive therapy designed to prevent repeat suicide attempts resulted in a 50% reduction in the likelihood of a suicide reattempt among adults who had been admitted to an emergency department for a suicide attempt relative to treatment as usual.<sup>166</sup>

## Lessen Harms and Prevent Future Risk

### Rationale

Millions of people are bereaved by suicide every year in the United States and throughout the world.<sup>5</sup> Risk of suicide and suicide risk factors has been shown to increase among people who have lost a friend/peer, family member, co-worker, or other close contact to suicide.<sup>167</sup> Care and attention to the bereaved is therefore of high importance. Despite often good intentions, media and others responding to suicide may add to this risk. For example, research suggests that exposure to sensationalized or otherwise uninformed reporting on suicide may heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to what is known as suicide contagion.<sup>168,169</sup>

### Approaches

Some approaches that can be used to lessen harms and reduce future risk of suicide include postvention and safe reporting and messaging following a suicide.

- **Postvention** approaches are implemented *after* a suicide has taken place and may include debriefing sessions, counseling, and/or bereavement support groups for surviving friends and family members/loved ones. These programs have not typically been evaluated for their impact on suicide or suicidal behavior but may reduce survivors' guilt, feelings of depression, and complicated grief.<sup>170</sup>
- **Safe reporting and messaging about suicide.** The manner in which information on a recent suicide is communicated to the public (e.g., school assemblies, mass media, social media) can heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to suicide contagion. Reports that are inclusive of suicide prevention messages, stories of hope and resilience, risk and protective factors, and links to helping resources (e.g., hotline), and that avoid sensationalizing events or reducing suicide to one cause, can help reduce the likelihood of suicide contagion.<sup>171</sup>

### Potential Outcomes

- Reductions in suicidal ideation
- Reductions in suicide attempts
- Reductions in rates of suicide
- Reductions in psychological distress
- Improvements in reporting following suicide
- Reductions in contagion effects related to suicide



## Evidence

Current evidence suggests that postvention and safe reporting and messaging can impact risk and protective factors for suicide.

- **Postvention.** One example of a postvention program with evidence of impact on risk and protective factors for suicide is the *StandBy Response Service (StandBy)*. *StandBy* provides clients with face-to-face outreach and telephone support through a professional crisis response team. Site coordinators develop customized case management plans, referring clients to other existing community services matched to their needs.<sup>172</sup> In a study by Visser, Comans, and Scuffham,<sup>172</sup> *StandBy* clients were significantly less likely to be at high risk for suicidality (suicide ideation and attempts) and had less psychological distress than a suicide bereaved comparison group who had not had contact with the *StandBy* program (48% and 64% respectively). Additionally, research suggests that active postvention approaches in which outreach to suicide survivors occurs at the scene of a suicide is associated with intake into treatment sooner, greater attendance at support group meetings, and attendance at more meetings compared to passive postvention (versus passive approaches where survivors self-refer for services).<sup>173</sup>
- **Safe reporting and messaging about suicide.** One way to ensure safe reporting and messaging about suicide is to encourage news media adhere to *Recommendations for Reporting on Suicide* (<http://www.reportingonsuicide.org>). The most compelling evidence supporting these recommendations for reporting comes from Austria. After a sharp increase in suicides on the Viennese subway, media guidelines were introduced and an interrupted time series design was used to evaluate the national impact of the guidelines on subsequent suicides. Changes in the quality and quantity of media reporting resulted in a nationwide significant reduction of 81 suicides annually.<sup>169</sup> Finally, research suggests that not only does reporting on suicide in a negative way (e.g., reporting on suicide myths and repetition) have harmful effects on suicide, but reporting on positive coping skills in the face of adversity can also demonstrate protective effects against suicide.<sup>174</sup> Reports of individual suicidal ideation not accompanied by reports of suicide or suicide attempts, along with reports describing a “mastery” of a crisis situation where adversities were overcome, was associated with significant decreases in suicide rates in the time period immediately following such reports.<sup>174</sup>



## Sector Involvement

Public health can play an important and unique role in addressing suicide. Public health agencies, which typically place prevention at the forefront of efforts and work to create broad population-level impact, can bring critical leadership and resources to bear on this problem. For example, these agencies can serve as a convener, bringing together partners and stakeholders to plan, prioritize, and coordinate suicide prevention efforts. Public health agencies are also well positioned to collect and disseminate data, implement preventive measures, evaluate programs, and track progress. Although public health can play a leadership role in preventing suicide, the strategies and approaches outlined in this technical package cannot be accomplished by the public health sector alone. As noted in the *National Strategy for Suicide Prevention*,<sup>1</sup> the integration and coordination of prevention activities across sectors and settings is critical for expanding the reach and impact of suicide prevention efforts.

Other sectors vital to implementing this package include, but are not limited to, education, government (local, state, and federal), social services, health services, business, labor, justice, housing, media, and organizations that comprise the civil society sector such as faith-based organizations, youth-serving organizations, foundations, and other non-governmental organizations. Collectively, these sectors can make a difference in preventing suicide by impacting the various contexts and underlying risks that contribute to suicide.

The strategies and approaches described in this technical package are summarized in Appendix A along with the relevant sectors that are well positioned to lead implementation efforts. For example, business and labor, the health sector (including insurers, providers, and health systems), and government entities are in the best position to implement programs and policies that *Strengthen Economic Supports* and *Strengthen Access and Delivery of Suicide Care*. These types of supports go beyond individual behavior change and require commitment and support from those sectors that can directly address some of the underlying risks and the environmental contexts that increase the risk for suicide. Public health entities can play an important role by gathering and synthesizing information to inform policy, raise awareness, and evaluate the effectiveness of various policies. Moreover, partnerships with non-governmental and community organizations can be instrumental in increasing awareness of and garnering support for policies affecting individuals and families.

The public health sector has been at the forefront of many community-based prevention efforts, working collaboratively with schools and community-based organizations, to change social norms and positively impact health behavior. Public health is well suited to take on a similar leadership role in *Promoting Connectedness* through peer norm and community engagement activities and supporting the development, evaluation, and adoption of effective programs that *Teach Coping and Problem-Solving Skills* to prevent suicide from happening in the first place. These programs are often delivered in school and community settings, making education and non-governmental organizations vital partners in prevention.



Businesses, workplaces, and local and state government entities, on the other hand, are in the best position to establish policies and support practices that *Create Protective Environments* where people live, work, and play. Public health entities can serve in an important role by gathering and synthesizing information, working with other governmental agencies (e.g., criminal justice, defense) and agencies within the executive branch of their state or local government in support of policy and other approaches, and evaluating the effectiveness of measures taken. In a similar fashion, public health entities can partner with schools, workplaces, and community organizations to implement and evaluate prevention programs, policies and practices geared toward creating safe, healthy, and supportive environments.

Finally, this technical package includes a number of interventions delivered in hospital, primary care, behavioral health care, and community settings designed to *Identify and Support People At-Risk*. The intensity and activities for many of these interventions require the expertise of professionals who are licensed and trained to deliver critical intervention support. The health, social services, and justice sectors can work collaboratively to support individuals at high-risk for suicide and their families. These activities also require coordination of supports across various service providers and community organizations.

Regardless of strategy, action by many sectors will be necessary for the successful implementation of this package. In this regard, all sectors can play an important and influential role in preventing suicide from happening in the first place and lessening the immediate and long-term harms of suicidal behavior by helping those in times of crisis get the services and support they need.

## Monitoring and Evaluation

Monitoring and evaluation are necessary components of the public health approach to prevention. It is important to have timely and reliable data to monitor the extent of the problem and to evaluate the impact of prevention efforts. Data are also necessary for prevention planning and implementation.

Gathering ongoing and systematic data is important for prevention efforts. However, it is also important to gather data that are uniform and consistent across systems. Consistent data allow public health and other entities to better gauge the scope of the problem, identify high-risk groups, and monitor the effects of prevention programs and policies. Currently, it is common for different sectors, agencies, and organizations to employ varying definitions of suicidal ideation, behavior, and death that can make it difficult to consistently monitor specific outcomes across sectors and over time. For example, the manner in which deaths are classified can change from one jurisdiction to another, and can change based on local medical and/or medico-legal standards.<sup>4</sup> CDC's uniform definitions and recommended data elements for self-directed violence provide a useful framework to help ensure that data are collected in a consistent manner across surveillance systems.<sup>4</sup>

Surveillance systems exist at the federal, state, and local levels. It is important to assess the availability of surveillance data and data systems across these levels to identify and address gaps in the systems. CDC's *National Vital Statistics System (NVSS)*<sup>7</sup> and the *National Violent Death Reporting System (NVDRS)*<sup>175</sup> are examples of surveillance systems that provide data on deaths from suicide. NVSS is a nationwide surveillance system that collects demographic, geographic, and cause-of-death data from death certificates.<sup>7</sup> NVDRS is a state-based surveillance system (currently in 40 states, the District of Columbia, and Puerto Rico) that combines data from death certificates, law enforcement reports, and coroner or medical examiner reports to provide detailed information on the circumstances of violent deaths, including suicide, which can assist communities in guiding prevention approaches.<sup>175</sup> Data from state and local Child Death Review teams<sup>176</sup> and Suicide Death Review Teams (which are in a few states) offer another source to identify deaths and obtain insight into the gaps in services, systems, and modifiable risk factors for suicide.

The *National Electronic Injury Surveillance System-All Injury Program (NEISS-AIP)* provides nationally representative data about all types and causes of nonfatal injuries treated in U.S. hospital emergency departments, and can be used to assess national rates of, and trends in, self-harm injuries by cause (e.g., falls, poisoning, etc.), age, race/ethnicity, sex, disposition (where the injured person goes when released from the Emergency Department).<sup>6</sup>

In addition to information on deaths and nonfatal injuries, there are also surveillance systems that provide national, state, and some local estimates of suicidal behavior. The *Youth Risk Behavior Surveillance System (YRBSS)* collects information from a nationally representative sample of 9-12 grade students and is a key resource in monitoring health-risk behaviors among youth, including whether youth



have seriously considered attempting suicide, attempted suicide, made a plan, or required treatment by a doctor or nurse for a suicide attempt that resulted in an injury, poisoning, or overdose.<sup>177</sup> The YRBSS data are obtained from a national school-based survey conducted by CDC as well as from state, territorial, tribal, and large urban school district surveys conducted by education and health agencies.<sup>177</sup> The *National Survey on Drug Use and Health (NSDUH)*<sup>50</sup> is an annual survey of the civilian, non-institutionalized population aged 12 years and older. *NSDUH* provides both national and state-level estimates of substance use (alcohol, tobacco, illicit drugs, and non-medical use of prescription drugs); mental health (past year mental illness, co-occurring illnesses); and service utilization, along with suicide ideation, suicide plans, and suicide attempts. *NSDUH* is a key resource to track trends in suicide-related risk factors in the population and to help identify groups at increased risk.<sup>50</sup>

It is also important at all levels (local, state, and federal) to address gaps in responses, track progress of prevention efforts and evaluate the impact of those efforts, including the impact of this technical package. Evaluation data, produced through program implementation and monitoring, is essential to provide information on what does and does not work to reduce rates of suicide and its associated risk and protective factors. Theories of change and logic models that identify short, intermediate, and long-term outcomes are an important part of program evaluation.

The evidence-base for suicide prevention has advanced greatly over the last few decades. However, additional research is needed to understand the impact of programs, policies, and practices on suicide (and suicide attempts, at a minimum), as opposed to merely examining their effectiveness on risk factors. More research is also needed to examine the effectiveness of primary prevention strategies (before risk occurs) and community-level strategies to prevent suicide at the population level. It will be important for researchers to test the effectiveness of combinations of the strategies and approaches included in this package. Most existing evaluations focus on approaches implemented in isolation, but there is potential to understand the synergistic effects within a comprehensive prevention approach. Lastly, there are also many potential opportunities to build and strengthen partnerships across program areas (e.g., violence prevention, substance abuse prevention) to evaluate the impact of different approaches on multiple outcomes.

## Conclusion

Suicide is a serious public health problem whose rates have been on the rise for more than a decade and whose costs stretch well into the billions of dollars each year. While suicide is a rare outcome statistically, its human impact has a ripple effect that is far-reaching. Each of us likely interacts with suicide survivors, those with lived experience, and those with thoughts of suicide on a daily basis – at home, at work, and in our communities. Suicide and suicide attempts are public health issues of societal concern. There are a number of barriers that have impeded progress, including, for example, stigma related to help-seeking, mental illness, being a survivor and fear related to asking someone about suicidal thoughts. Fortunately,

like many public health problems, suicide is preventable,<sup>1,5</sup> and more is being done to prevent suicide than ever before, as evidenced by the work of the National Action Alliance for Suicide Prevention,<sup>39,40,75,88</sup> the release of the first world report on suicide,<sup>5</sup> and more timely surveillance data, to name just a few examples.

In an effort to continue pushing the field and society further towards prevention, this technical package includes strategies and approaches that ideally would be used in a comprehensive, multi-level and multi-sectoral way. It includes strategies and approaches to prevent suicide from occurring in the first place, as well as strategies focused on lessening the immediate and long-term harms of suicidal behavior. It includes strategies that range from a focus on the whole population regardless of risk to strategies designed to support people at highest risk. Importantly, this technical package extends the bounds of the typical prevention strategies to consider approaches that go beyond individual behavior change to better address risk factors impacting communities and populations more broadly (e.g., economic policies to strengthen housing and financial security).

While the evidence base continues to emerge, the collection of programs, policies, and practices laid out here are available for implementation now. In keeping with good public health practice, the intent is that monitoring and evaluation will play a key role in that implementation. Moreover, as new evidence becomes available, this technical package can be refined to reflect the current state of the science.

In closing, and in keeping with a message of resilience as spoken by those with lived experience, ‘hope, help, and healing is possible.’



## References

1. U.S. Office of the Surgeon General, National Action Alliance for Suicide Prevention. 2012 National Strategy for Suicide Prevention: Goals and Objectives for Action. Washington, D.C.: HHS; 2012.
2. National Action Alliance for Suicide Prevention. Action Alliance Priorities. 2017; <http://actionallianceforsuicideprevention.org/priorities>.
3. Frieden TR. Six components necessary for effective public health program implementation. *Am J Public Health*. 2014;104(1):17-22.
4. Crosby AE, Ortega L, Melanson C. Self-directed Violence Surveillance: Uniform Definitions and Recommended Data Elements, Version 1.0. Atlanta, GA: Centers for Disease Control and Prevention, National Center for Injury Prevention and Control; 2011.
5. World Health Organization. Suicide Prevention: A Global Imperative. Geneva, Switzerland: WHO Press; 2014.
6. Centers for Disease Control and Prevention. Web-Based Injury Statistics Query and Reporting System (WISQARS). Atlanta, GA: National Center for Injury Prevention and Control. Available online: <http://www.cdc.gov/injury/wisqars/index.html>.
7. Centers for Disease Control and Prevention, National Center for Health Statistics. National Vital Statistics System. <https://www.cdc.gov/nchs/nvss/deaths.htm>.
8. Bachynski KE, Canham-Chervak M, Black SA, Dada EO, Millikan AM, Jones BH. Mental health risk factors for suicides in the US Army, 2007–8. *Inj Prev*. 2012;18(6):405-412.
9. Lineberry TW, O'Connor SS. Suicide in the US Army. *Mayo Clinic Proceedings*. 2012;87(9):871-878.
10. McIntosh WL, Spies E, Stone DM, Lokey CN, Trudeau AR, Bartholow B. Suicide Rates by Occupational Group - 17 States, 2012. *MMWR Morb Mortal Wkly Rep*. 2016;65(25):641-645.
11. Han B, Crosby AE, Ortega LA, Parks SE, Compton WM, Gfroerer J. Suicidal ideation, suicide attempt, and occupations among employed adults aged 18–64 years in the United States. *Compr Psychiatry*. 2016;66:176-186.
12. Kann L, McManus T, Harris WA, et al. Youth Risk Behavior Surveillance - United States, 2015. *MMWR CDC Surveill Summ*. 2016;65(6):1-174.
13. Russell ST, Joyner K. Adolescent sexual orientation and suicide risk: Evidence from a national study. *Am J Public Health*. 2001;91(8):1276-1281.
14. Stone DM, Luo F, Ouyang L, Lippy C, Hertz MF, Crosby AE. Sexual orientation and suicide ideation, plans, attempts, and medically serious attempts: evidence from local Youth Risk Behavior Surveys, 2001-2009. *Am J Public Health*. 2014;104(2):262-271.
15. Crosby AE, Han B, Ortega LA, Parks SE, Gfroerer J. Suicidal thoughts and behaviors among adults aged ≥18 years--United States, 2008-2009. *MMWR CDC Surveill Summ*. 2011;60(13):1-22.
16. Lipari R, Piscopo K, Kroutil LA, Kilmer Miller G. Suicidal thoughts and behavior among adults: Results from the 2014 National Survey on Drug Use and Health. *NSDUH Data Review 2015*; <https://www.samhsa.gov/data/sites/default/files/NSDUH-FRR2-2014/NSDUH-FRR2-2014.pdf>.
17. Dahlberg LL, Krug EG. Violence-a global public health problem. In: Krug E, Dahlberg LL, Mercy JA, Zwi AB, Lozano R, eds. *World Report on Violence and Health*. Geneva, Switzerland: World Health Organization; 2002:1-21.
18. Owens D. Fatal and non-fatal repetition of self-harm: Systematic review. *Br J Psychiatry*. 2002;181(3):193-199.
19. Olfson M, Gerhard T, Huang C, Crystal S, Stroup TS. Premature Mortality Among Adults With Schizophrenia in the United States. *JAMA Psychiatry*. 2015;72(12):1172-1181.
20. Bossarte RM, Karras E, Lu N, et al. Associations between the Department of Veterans Affairs' suicide prevention campaign and calls to related crisis lines. *Public Health Rep (Washington, D.C.: 1974)*. 2014;129(6):516-525.

21. Chapman DP, Whitfield CL, Felitti VJ, Dube SR, Edwards VJ, Anda RF. Adverse childhood experiences and the risk of depressive disorders in adulthood. *J Affect Disord.* 2004;82(2):217-225.
22. Dube SR, Anda RF, Felitti VJ, Chapman DP, Williamson DF, Giles WH. Childhood abuse, household dysfunction, and the risk of attempted suicide throughout the life span: findings from the Adverse Childhood Experiences Study. *JAMA.* 2001;286(24):3089-3096.
23. Felitti VJ, Anda RF, Nordenberg D, et al. Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: The Adverse Childhood Experiences (ACE) Study. *Am J Prev Med.* 1998;14(4):245-258.
24. Klomek AB, Sourander A, Gould M. The association of suicide and bullying in childhood to young adulthood: a review of cross-sectional and longitudinal research findings. *Can J Psychiatry.* 2010;55(5):282-288.
25. Leeb RT, Lewis T, Zolotor AJ. A review of physical and mental health consequences of child abuse and neglect and implications for practice. *American Journal of Lifestyle Medicine.* 2011;5(5):454-468.
26. World Health Organization. Global and Regional Estimates of Violence Against Women: Prevalence and Health Effects of Intimate Partner Violence and Non-Partner Sexual Violence. Geneva: World Health Organization; 2013.
27. Bellis MA, Hughes K, Leckenby N, et al. Adverse childhood experiences and associations with health-harming behaviours in young adults: surveys in eight eastern European countries. *Bull World Health Organ.* 2014;92(9):641-655.
28. Haegerich TM, Dahlberg LL. Violence as a public health risk. *American Journal of Lifestyle Medicine.* 2011;5(5):392-406.
29. Wilkins N, Tsao B, Hertz M, Davis R, Klevens J. Connecting the dots: An overview of the links among multiple forms of violence. Atlanta, GA: National Center for Injury Prevention and Control, Centers for Disease Control and Prevention; 2014.
30. Hamby S, Grych J. The web of violence: exploring connections among different forms of interpersonal violence and abuse. *Briefs in Sociology.* New York, NY: Springer; 2013.
31. Kleiman EM, Riskind JH, Schaefer KE, Weingarden H. The moderating role of social support on the relationship between impulsivity and suicide risk. *Crisis.* 2012;33(5):273-279.
32. Carter M, McGee R, Taylor B, Williams S. Health outcomes in adolescence: associations with family, friends and school engagement. *J Adolesc.* 2007;30(1):51-62.
33. Maimon D, Browning CR, Brooks-Gunn J. Collective efficacy, family attachment, and urban adolescent suicide attempts. *J Health Soc Behav.* 2010;51(3):307-324.
34. Capaldi DM, Knoble NB, Shortt JW, Kim HK. A Systematic Review of Risk Factors for Intimate Partner Violence. *Partner Abuse.* 2012;3(2):231-280.
35. Losel F, Farrington DP. Direct protective and buffering protective factors in the development of youth violence. *Am J Prev Med.* 2012;43(2 Suppl 1):S8-S23.
36. Wyman PA, Brown CH, LoMurray M, et al. An outcome evaluation of the Sources of Strength suicide prevention program delivered by adolescent peer leaders in high schools. *Am J Public Health.* 2010;100(9):1653-1661.
37. Dunne EJ, McIntosh JL, Dunne-Maxim K, eds. *Suicide and its aftermath: Understanding and counseling the survivors.* New York: Norton; 1987.
38. Mishara BL. *The Impact of Suicide.* New York: Springer; 1995.
39. National Action Alliance for Suicide Prevention: Suicide Attempt Survivors Task Force. *The Way Forward: Pathways to hope, recovery, and wellness with insights from lived experience.* Washington, D.C. : Author; 2014.
40. National Action Alliance for Suicide Prevention: Survivors of Suicide Loss Task Force. *Responding to Grief, Trauma, and Distress After a Suicide: U.S. National Guidelines.* Washington, D.C. : Author; 2015.



41. Crosby AE, Sacks JJ. Exposure to suicide: incidence and association with suicidal ideation and behavior: United States, 1994. *Suicide Life Threat Behav.* 2002;32(3):321-328.
42. Cerel J, Maple M, De Venne A, Moore M, Flaherty C, Brown M. Exposure to Suicide in the Community: Prevalence and Correlates in One US State. *Public Health Rep (Washington, D.C.: 1974).* 2016;131(1):100-107.
43. Chapman AL, Dixon-Gordon KL. Emotional antecedents and consequences of deliberate self-harm and suicide attempts. *Suicide Life Threat Behav.* 2007;37(5):543-552.
44. Mitchell AM, Kim Y, Prigerson HG, Mortimer-Stephens M. Complicated grief in survivors of suicide. *Crisis.* 2004;25(1):12-18.
45. Sudak H, Maxim K, Carpenter M. Suicide and stigma: a review of the literature and personal reflections. *Acad Psychiatry.* 2008;32(2):136-142.
46. Cerel J, McIntosh JL, Neimeyer RA, Maple M, Marshall D. The Continuum of "Survivorship": Definitional Issues in the Aftermath of Suicide. *Suicide Life Threat Behav.* 2014;44(6):591-600.
47. Florence C, Simon T, Haegerich T, Luo F, Zhou C. Estimated lifetime medical and work-loss costs of fatal injuries-United States, 2013. *MMWR Morb Mortal Wkly Rep.* 2015;64(38):1074-1077.
48. Shepard DS, Gurewich D, Lwin AK, Reed GA, Jr., Silverman MM. Suicide and Suicidal Attempts in the United States: Costs and Policy Implications. *Suicide Life Threat Behav.* 2016;46(3):352-362.
49. Silverman MM, Maris RW. The prevention of suicidal behaviors: An overview. *Suicide Life Threat Behav.* 1995;25(1):10-21.
50. Substance Abuse and Mental Health Services Administration, Center for Behavioral Health Statistics and Quality. National Survey on Drug Use and Health. 2016; [https://nsduhwebesn.rti.org/respweb/project\\_description.html](https://nsduhwebesn.rti.org/respweb/project_description.html).
51. Desai RA, Dausey DJ, Rosenheck RA. Mental health service delivery and suicide risk: the role of individual patient and facility factors. *Am J Psychiatry.* 2005;162(2):311-318.
52. Turecki G. Epigenetics and suicidal behavior research pathways. *Am J Prev Med.* 2014;47(3):S144-S151.
53. Edwards RW, Jumper-Thurman P, Plested BA, Oetting ER, Swanson L. Community readiness: Research to practice. *Journal of Community Psychology.* 2000;28(3):291-307.
54. Hawkins JD, Catalano RF, Kuklinski MR. Communities that care. *Encyclopedia of Criminology and Criminal Justice*: Springer; 2014:393-408.
55. Plested BA, Edwards RW, Jumper-Thurman P. Community readiness: A handbook for successful change. Fort Collins, CO: Tri-Ethnic Center for Prevention Research. 2006.
56. Luo F, Florence CS, Quispe-Agnoli M, Ouyang L, Crosby AE. Impact of business cycles on US suicide rates, 1928-2007. *Am J Public Health.* 2011;101(6):1139-1146.
57. Fowler KA, Gladden RM, Vagi KJ, Barnes J, Frazier L. Increase in suicides associated with home eviction and foreclosure during the US housing crisis: findings from 16 National Violent Death Reporting System States, 2005-2010. *Am J Public Health.* 2015;105(2):311-316.
58. Stack S, Wasserman I. Economic strain and suicide risk: a qualitative analysis. *Suicide Life Threat Behav.* 2007;37(1):103-112.
59. Cylus J, Glymour MM, Avendano M. Do generous unemployment benefit programs reduce suicide rates? A state fixed-effect analysis covering 1968-2008. *Am J Epidemiol.* 2014;180(1):45-52.
60. Classen TJ, Dunn RA. The effect of job loss and unemployment duration on suicide risk in the United States: a new look using mass-layoffs and unemployment duration. *Health Econ.* 2012;21(3):338-350.
61. Flavin P, Radcliff B. Public policies and suicide rates in the American states. *Social Indicators Research.* 2009;90(2):195-209.
62. U.S. Department of Housing and Urban Development. Neighborhood Stabilization Program. <https://www.hudexchange.info/programs/nsp/>, 2017.
63. Houle JN, Light MT. The home foreclosure crisis and rising suicide rates, 2005 to 2010. *Am J Public Health.* 2014;104(6):1073-1079.

64. Arsenault-Lapierre G, Kim C, Turecki G. Psychiatric diagnoses in 3275 suicides: a meta-analysis. *BMC Psychiatry*. 2004;4:37.
65. Harris EC, Barraclough B. Suicide as an outcome for mental disorders. A meta-analysis. *Br J Psychiatry*. 1997;170:205-228.
66. Tyrer P, Reed GM, Crawford MJ. Classification, assessment, prevalence, and effect of personality disorder. *Lancet*. 2015;385(9969):717-726.
67. Harris EC, Barraclough B. Excess mortality of mental disorder. *Br J Psychiatry*. 1998;173:11-53.
68. Mark TL, Shern DL, Bagalman JE, Cao Z. Ranking America's mental health: An analysis of depression across the states. Alexandria, VA: Mental Health America. 2007.
69. Lang M. The impact of mental health insurance laws on state suicide rates. *Health Econ*. 2013;22(1):73-88.
70. Wang PS, Demler O, Kessler RC. Adequacy of treatment for serious mental illness in the United States. *Am J Public Health*. 2002;92(1):92-98.
71. Cunningham PJ. Beyond parity: primary care physicians' perspectives on access to mental health care. *Health Aff (Millwood)*. 2009;28(3):w490-501.
72. Coffey CE. Building a system of perfect depression care in behavioral health. *Jt Comm J Qual Patient Saf*. 2007;33(4):193-199.
73. The Paul Wellstone and Pete Domenici Mental Health Parity and Addiction Equity Act of 2008 (MHPEA), HR 1424, 110<sup>th</sup> Congress. 2008.
74. U.S. Department of Health and Human Services Health Resources and Services Administrations. Designated Health Professional Shortage Areas Statistics, As of November 4, 2016. 2016.
75. National Action Alliance for Suicide Prevention: Clinical Workforce Preparedness Task Force. *Suicide prevention and the clinical workforce: Guidelines for training*. Washington, D.C.: Author; 2014.
76. Harris KM, Carpenter C, Bao Y. The effects of state parity laws on the use of mental health care. *Med Care*. 2006;44(6):499-505.
77. Health Resources & Services Administration. National Health Service Corps. 2017; <https://www.nhsc.hrsa.gov/>.
78. U.S. Department of Health and Human Services Health Resources and Services Administrations. National Health Service Corp Clinician Retention: A Story of Dedication and Commitment. 2016.
79. Hailey D, Roine R, Ohinmaa A. The effectiveness of telemental health applications: a review. *The Can J Psychiatry*. 2008;53(11):769-778.
80. Mohr DC, Vella L, Hart S, Heckman T, Simon G. The effect of telephone-administered psychotherapy on symptoms of depression and attrition: A meta-analysis. *Clinical Psychology: Science and Practice*. 2008;15(3):243-253.
81. Coffey CE. Pursuing perfect depression care. *Psychiatr Serv*. 2006;57(10):1524-1526.
82. Coffey CE, Coffey MJ, Ahmedani BK. An update on perfect depression care. *Psychiatr Serv*. 2013;64(4):396.
83. Coffey M, Coffey C, Ahmedani BK. Suicide in a health maintenance organization population. *JAMA Psychiatry*. 2015;72(3):294-296.
84. Haddon W. Advances in the epidemiology of injuries as a basis for public policy. *Public Health Rep*. 1980;95(5):411-421.
85. Toosi M. Labor force projections to 2024: The labor force is growing, but slowly. Washington, D.C.: Bureau of Labor Statistics; *Monthly Labor Review*. 2015:1-33.
86. Noonan ME. Mortality in State Prisons, 2001-2014 *Bureau of Justice Statistical Tables*. 2016;250150(December).
87. Knox KL, Pflanz S, Talcott GW, et al. The US Air Force suicide prevention program: implications for public health policy. *Am J Public Health*. 2010;100(12):2457-2463.



88. National Action Alliance for Suicide Prevention Workplace Task Force. *Comprehensive Blueprint for Workplace Suicide Prevention*. Washington, D.C. : Author; 2015.
89. Runyan CW, Becker A, Brandspigel S, Barber C, Trudeau A, Novins D. Lethal Means Counseling for Parents of Youth Seeking Emergency Care for Suicidality. *West J Emerg Med*. 2016;17(1):8-14.
90. Miller M, Warren M, Hemenway D, Azrael D. Firearms and suicide in US cities. *Inj Prev*. 2015;21(e1):e116-119.
91. Crosby AE, Espitia-Hardeman V, Ortega L, Lozano B. Alcohol and suicide. *Alcohol: Science, Policy and Public Health*. 2013:190-193.
92. Kaplan MS, McFarland BH, Huguet N, et al. Acute alcohol intoxication and suicide: a gender-stratified analysis of the National Violent Death Reporting System. *Inj Prev*. 2013;19(1):38-43.
93. Beautrais AL, Gibb SJ, Fergusson DM, Horwood LJ, Larkin GL. Removing bridge barriers stimulates suicides: An unfortunate natural experiment. *Aust NZ J Psychiat*. 2009;43(6):495-497.
94. Stokes ML, McCoy KP, Abram KM, Byck GR, Teplin LA. Suicidal Ideation and Behavior in Youth in the Juvenile Justice System: A Review of the Literature. *Journal of Correctional Health Care*. 2015;21(3):222-242.
95. Elnour AA, Harrison J. Lethality of suicide methods. *Inj Prev*. 2008;14(1):39-45.
96. Simon OR, Swann AC, Powell KE, Potter LB, Kresnow MJ, O'Carroll PW. Characteristics of impulsive suicide attempts and attempters. *Suicide Life Threat Behav*. 2001;32(1 Suppl):49-59.
97. Deisenhammer EA, Ing CM, Strauss R, Kemmler G, Hinterhuber H, Weiss EM. The duration of the suicidal process: how much time is left for intervention between consideration and accomplishment of a suicide attempt? *J Clin Psychiatry*. 2009;70(1):19-24.
98. Hawton K. Restricting access to methods of suicide: Rationale and evaluation of this approach to suicide prevention. *Crisis*. 2007;28(S1):4-9.
99. Yip P, Caine E, Yousuf S, Chang S-S, Wu K, Chen Y-Y. Means restriction for suicide prevention. *Lancet*. 2012;379(9834):2393-2399.
100. Cox GR, Owens C, Robinson J, et al. Interventions to reduce suicides at suicide hotspots: a systematic review. *BMC Public Health*. 2013;13(1):1-12.
101. Rowhani-Rahbar A, Simonetti JA, Rivara FP. Effectiveness of Interventions to Promote Safe Firearm Storage. *Epidemiol Rev*. 2016;38(1):111-124.
102. Hayes LM. Suicide prevention in correctional facilities: reflections and next steps. *Int J Law Psychiatry*. 2013;36(3-4):188-194.
103. Giesbrecht N, Huguet N, Ogden L, et al. Acute alcohol use among suicide decedents in 14 US states: impacts of off-premise and on-premise alcohol outlet density. *Addiction*. 2015;110(2):300-307.
104. Escobedo LG, Ortiz M. The relationship between liquor outlet density and injury and violence in New Mexico. *Accid Anal Prev*. 2002;34(5):689-694.
105. Xuan Z, Naimi TS, Kaplan MS, et al. Alcohol Policies and Suicide: A Review of the Literature. *Alcohol Clin Exp Res*. 2016;40(10):2043-2055.
106. Cherpitel CJ, Borges GLG, Wilcox HC. Acute alcohol use and suicidal behavior: A review of the literature. *Alcoholism: Clinical and Experimental Research*. 2004;28(5 SUPPL.):18S-28S.
107. Pirkis J, Too LS, Spittal MJ, Kryszinska K, Robinson J, Cheung YTD. Interventions to reduce suicides at suicide hotspots: A systematic review and meta-analysis. *Lancet Psychiatry*. 2015;2(11):994-1001.
108. Perron S, Burrows S, Fournier M, Perron PA, Ouellet F. Installation of a bridge barrier as a suicide prevention strategy in Montreal, Quebec, Canada. *Am J Public Health*. 2013;103(7):1235-1239.
109. Beautrais AL. Effectiveness of barriers at suicide jumping sites: A case study. *Aust NZ J Psychiat*. 2001;35(5):557-562.
110. Grossman DC, Mueller BA, Riedy C, et al. Gun storage practices and risk of youth suicide and unintentional firearm injuries. *JAMA*. 2005;293(6):707-714.

111. Mishara BL, Martin N. Effects of a comprehensive police suicide prevention program. *Crisis*. 2012;33(3):162-168.
112. Knox KL, Litts DA, Talcott GW, Feig JC, Caine ED. Risk of suicide and related adverse outcomes after exposure to a suicide prevention programme in the US Air Force: cohort study. *BMJ*. 2003;327(7428):1376.
113. Hayes LM. Prison Suicide: An Overview and a Guide to Prevention. *The Prison Journal*. 1995;75(4):431-456.
114. Barker E, Kölves K, De Leo D. Management of Suicidal and Self-Harming Behaviors in Prisons: Systematic Literature Review of Evidence-Based Activities. *Archives of Suicide Research*. 2014;18(3):227-240.
115. Rush BR, Gliksman L, Brook R. Alcohol availability, alcohol consumption and alcohol-related damage. I. The distribution of consumption model. *J Stud Alcohol*. 1986;47(1):1-10.
116. Gruenewald PJ, Remer L. Changes in outlet densities affect violence rates. *Alcohol Clin Exp Res*. 2006;30(7):1184-1193.
117. Lipton R, Gruenewald P. The spatial dynamics of violence and alcohol outlets. *J Stud Alcohol*. 2002;63(2):187-195.
118. Lippy C, DeGue S. Exploring alcohol policy approaches to prevent sexual violence perpetration. *Trauma, Violence, & Abuse*. 2016;17(1):26-42.
119. Johnson FW, Gruenewald PJ, Remer LG. Suicide and alcohol: do outlets play a role? *Alcohol Clin Exp Res*. 2009;33(12):2124-2133.
120. Durkheim E. Suicide: A study in sociology (JA Spaulding & G. Simpson, trans.). *Glencoe, IL: Free Press. (Original work published 1897)*. 1897/1951.
121. Centers for Disease Control and Prevention. Strategic direction for the prevention of suicidal behavior: Promoting individual, family, and community connectedness to prevent suicidal behavior. 2009; Available at: [http://www.cdc.gov/ViolencePrevention/pdf/Suicide\\_Strategic\\_Direction\\_Full\\_version-a.pdf](http://www.cdc.gov/ViolencePrevention/pdf/Suicide_Strategic_Direction_Full_version-a.pdf).
122. Muennig P, Cohen AK, Palmer A, Zhu W. The relationship between five different measures of structural social capital, medical examination outcomes, and mortality. *Soc Sci Med*. 2013;85:18-26.
123. Beyer KM, Layde PM, Hamberger LK, Laud PW. Does neighborhood environment differentiate intimate partner femicides from other femicides? *Violence Against Women*. 2015;21(1):49-64.
124. Whitley R, McKenzie K. Social capital and psychiatry: review of the literature. *Harv Rev Psychiatry*. 2005;13(2):71-84.
125. De Silva MJ, McKenzie K, Harpham T, Huttly SR. Social capital and mental illness: a systematic review. *J Epidemiol Community Health*. 2005;59(8):619-627.
126. Wyman PA. Developmental approach to prevent adolescent suicides: research pathways to effective upstream preventive interventions. *Am J Prev Med*. 2014;47(3 Suppl 2):S251-256.
127. Centers for Disease Control and Prevention. Principles of community engagement. *CDC/ATSDR Committee on Community Engagement*. 1997.
128. Branas CC, Cheney RA, MacDonald JM, Tam VW, Jackson TD, Ten Have TR. A difference-in-differences analysis of health, safety, and greening vacant urban space. *Am J Epidemiol*. 2011;174(11):1296-1306.
129. Branas CC, Kondo MC, Murphy SM, South EC, Polsky D, MacDonald JM. Urban blight remediation as a cost-beneficial solution to firearm violence. *Am J Public Health*. 2016;106(12):2158-2164.
130. Bandura A. *Social foundations of thought and action: A social cognitive theory*. Prentice-Hall, Inc; 1986.
131. Pollock LR, Williams JM. Problem-solving in suicide attempters. *Psychol Med*. 2004;34(1):163-167.
132. Herman KC, Borden LA, Reinke WM, Webster-Stratton C. The Impact of the Incredible Years Parent, Child, and Teacher Training Programs on Children's Co-Occurring Internalizing Symptoms. *Sch Psychol Q*. 2011;26(3):189-201.
133. Knox MS, Burkhart K, Hunter KE. ACT against violence parents raising safe kids program: Effects on maltreatment-related parenting behaviors and beliefs. *Journal of Family Issues*. 2010.



134. Wasserman D, Hoven CW, Wasserman C, et al. School-based suicide prevention programmes: The SEYLE cluster-randomised, controlled trial. *Lancet*. 2014;385(9977):1536-1544.
135. Wilcox HC, Kellam SG, Brown CH, et al. The impact of two universal randomized first- and second-grade classroom interventions on young adult suicide ideation and attempts. *Drug Alcohol Depend*. 2008;95 Suppl 1:S60-73.
136. Kellam SG, Brown CH, Poduska JM, et al. Effects of a universal classroom behavior management program in first and second grades on young adult behavioral, psychiatric, and social outcomes. *Drug Alcohol Depend*. 2008;95 Suppl 1:S5-S28.
137. Webster-Stratton C, Jamila Reid M, Stoolmiller M. Preventing conduct problems and improving school readiness: evaluation of the incredible years teacher and child training programs in high-risk schools. *Journal of Child Psychology and Psychiatry*. 2008;49(5):471-488.
138. Webster-Stratton CH, Reid MJ, Beauchaine T. Combining parent and child training for young children with ADHD. *Journal of Clinical Child & Adolescent Psychology*. 2011;40(2):191-203.
139. Reid MJ, Webster-Stratton C, Hammond M. Follow-up of children who received the Incredible Years intervention for oppositional-defiant disorder: Maintenance and prediction of 2-year outcome. *Behavior Therapy*. 2003;34(4):471-491.
140. Webster-Stratton C, Hammond M. Treating children with early-onset conduct problems: a comparison of child and parent training interventions. *J Consult Clin Psychol*. 1997;65(1):93-109.
141. Webster-Stratton C, Reid MJ, Hammond M. Preventing conduct problems, promoting social competence: a parent and teacher training partnership in head start. *J Clin Child Psychol*. 2001;30(3):283-302.
142. Spoth RL, Gyll M, Day SX. Universal family-focused interventions in alcohol-use disorder prevention: cost-effectiveness and cost-benefit analyses of two interventions. *J Stud Alcohol*. 2002;63(2):219-228.
143. Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999-2014. *NCHS Data Brief*. Hyattsville, MD: National Center for Health Statistics; 2016.
144. Jobes DA. The Collaborative Assessment and Management of Suicidality (CAMS): an evolving evidence-based clinical approach to suicidal risk. *Suicide Life Threat Behav*. 2012;42(6):640-653.
145. Wilcox HC, Wyman PA. Suicide Prevention Strategies for Improving Population Health. *Child Adolesc Psychiatr Clin N Am*. 2016;25:219-233.
146. Isaac M, Elias B, Katz LY, et al. Gatekeeper training as a preventative intervention for suicide: a systematic review. *Can J Psychiatry*. 2009;54(4):260-268.
147. Gould MS, Munfakh JL, Kleinman M, Lake AM. National suicide prevention lifeline: enhancing mental health care for suicidal individuals and other people in crisis. *Suicide Life Threat Behav*. 2012;42(1):22-35.
148. Gilbody S, Bower P, Fletcher J, Richards D, Sutton AJ. Collaborative care for depression: a cumulative meta-analysis and review of longer-term outcomes. *Arch Int Med*. 2006;166(21):2314-2321.
149. Archer J, Bower P, Gilbody S, et al. Collaborative care for depression and anxiety problems. *Cochrane Database of Systematic Reviews*. 2012;10(Art No CD006525).
150. Bruce ML, Ten Have TR, Reynolds III CF, et al. Reducing suicidal ideation and depressive symptoms in depressed older primary care patients: a randomized controlled trial. *JAMA*. 2004;291(9):1081-1091.
151. Inagaki M, Kawashima Y, Kawanishi C, et al. Interventions to prevent repeat suicidal behavior in patients admitted to an emergency department for a suicide attempt: a meta-analysis. *J Affect Disord*. 2015;175:66-78.
152. Gould MS, Cross W, Pisani AR, Munfakh JL, Kleinman M. Impact of Applied Suicide Intervention Skills Training on the National Suicide Prevention Lifeline. *Suicide Life Threat Behav*. 2013;43(6):676-691.
153. Walrath C, Garraza LG, Reid H, Goldston DB, McKeon R. Impact of the Garrett Lee Smith youth suicide prevention program on suicide mortality. *Am J Public Health*. 2015;105(5):986-993.

154. Godoy Garraza L, Walrath C, Goldston DB, Reid H, McKeon R. Effect of the Garrett Lee Smith Memorial Suicide Prevention Program on Suicide Attempts Among Youths. *JAMA Psychiatry*. 2015;72(11):1143-1149.
155. Gould MS, Kalafat J, Harrismunfakh JL, Kleinman M. An evaluation of crisis hotline outcomes. Part 2: Suicidal callers. *Suicide Life Threat Behav*. 2007;37(3):338-352.
156. Hunkeler EM, Katon W, Tang L, et al. Long term outcomes from the IMPACT randomised trial for depressed elderly patients in primary care. *BMJ*. 2006;332(7536):259-263.
157. Unutzer J, Tang L, Oishi S, et al. Reducing suicidal ideation in depressed older primary care patients. *J Am Geriatr Soc*. 2006;54(10):1550-1556.
158. Comtois KA, Jobes DA, S. O'Connor S, et al. Collaborative assessment and management of suicidality (CAMS): feasibility trial for next-day appointment services. *Depress Anxiety*. 2011;28(11):963-972.
159. Linehan MM, Comtois KA, Murray AM, et al. Two-year randomized controlled trial and follow-up of dialectical behavior therapy vs therapy by experts for suicidal behaviors and borderline personality disorder. *Arch Gen Psychiatry*. 2006;63(7):757-766.
160. Diamond GS, Wintersteen MB, Brown GK, et al. Attachment-based family therapy for adolescents with suicidal ideation: a randomized controlled trial. *J Am Acad Child Adolesc Psychiatry*. 2010;49(2):122-131.
161. Rubenstein LV, Chaney EF, Ober S, et al. Using evidence-based quality improvement methods for translating depression collaborative care research into practice. *Families, Systems, & Health*. 2010;28(2):91-113.
162. Fleischmann A, Bertolote JM, Wasserman D, et al. Effectiveness of brief intervention and contact for suicide attempters: a randomized controlled trial in five countries. *Bull World Health Organ*. 2008;86(9):703-709.
163. Motto JA, Bostrom AG. A randomized controlled trial of postcrisis suicide prevention. *Psychiatr Serv*. 2001;52(6):828-833.
164. Hassanian-Moghaddam H, Sarjami S, Kolahi AA, Carter GL. Postcards in Persia: randomised controlled trial to reduce suicidal behaviours 12 months after hospital-treated self-poisoning. *Br J Psychiatry*. 2011;198(4):309-316.
165. Wang YC, Hsieh LY, Wang MY, Chou CH, Huang MW, Ko HC. Coping Card Usage can Further Reduce Suicide Reattempt in Suicide Attempter Case Management Within 3-Month Intervention. *Suicide Life Threat Behav*. 2016;46(1):106-120.
166. Brown GK, Ten Have T, Henriques GR, Xie SX, Hollander JE, Beck AT. Cognitive therapy for the prevention of suicide attempts: a randomized controlled trial. *JAMA*. 2005;294(5):563-570.
167. Pitman A, Osborn D, King M, Erlangsen A. Effects of suicide bereavement on mental health and suicide risk. *Lancet Psychiatry*. 2014;1:86-94.
168. Etzersdorfer E, Sonneck G. Preventing suicide by influencing mass-media reporting: The Viennese experience, 1980–1996. *Arch Suicide Res*. 1998;4(1):67-74.
169. Niederkrotenthaler T, Sonneck G. Assessing the impact of media guidelines for reporting on suicides in Austria: Interrupted time series analysis. *Aust N Z J Psychiatry*. 2007;41(5):419-428.
170. Szumilas M, Kutcher S. Post-suicide intervention programs: A systematic review. *Can J Public Health*. 2011;102(1):18-29.
171. Bohanna I, Wang X. Media guidelines for the responsible reporting of suicide: a review of effectiveness. *Crisis*. 2012;33(4):190-198.
172. Visser VS, Comans TA, Scuffham PA. Evaluation Of The Effectiveness Of A Community-Based Crisis Intervention Program For People Bereaved By Suicide. *Journal of Community Psychology*. 2014;42(1):19-28.
173. Cerel J, Campbell FR. Suicide survivors seeking mental health services: a preliminary examination of the role of an active postvention model. *Suicide Life Threat Behav*. 2008;38(1):30-34.



174. Niederkrotenthaler T, Voracek M, Herberth A, et al. Media and suicide. Papageno v Werther effect. *BMJ*. 2010;341:c5841.
175. Centers for Disease Control and Prevention. National Violent Death Reporting System. Atlanta, GA: Centers for Disease Control and Prevention, National Center for Injury Prevention and Control; 2017. Available online: <https://www.cdc.gov/injury/wisqars/nvdrs.html>.
176. The National Center for the Review & Prevention of Child Deaths. U.S. Child Death Review Programs. <https://www.childdeathreview.org/cdr-programs/u-s-cdr-programs/>.
177. Centers for Disease Control and Prevention, Brener ND, Kann L, et al. Methodology of the Youth Risk Behavior Surveillance System--2013. *MMWR Recomm Rep*. 2013;62(RR-1):1-20.

FINAL

## Appendix A: Summary of Strategies and Approaches to Prevent Suicide

Strategy	Approach/Program, Practice or Policy	Best Available Evidence			Lead Sectors <sup>1</sup>
		Suicide	Suicide Attempts or Ideation	Other Risk/Protective Factors for Suicide	
Strengthen economic supports	<b>Strengthen household financial security</b>				Government (local, state, Federal)
	<i>Unemployment benefit programs</i>	✓		✓	Business/labor
	<i>Other income supports</i>	✓			
	<b>Housing stabilization policies</b>				Government (local, state, Federal)
	<i>Neighborhood Stabilization Program</i>			✓	
Strengthen access and delivery of suicide care	<b>Coverage of mental health conditions in health insurance policies</b>				Government (local, state, Federal)
	<i>Mental Health Parity Laws</i>	✓		✓	
	<b>Reduce provider shortages in underserved areas</b>				
	<i>National Health Service Corps (NHSC)</i>			✓	Healthcare
	<i>Telemental Health (TMH)</i>			✓	Social services
	<b>Safer suicide care through systems change</b>				
	<i>Henry Ford Perfect Depression Care (Precursor to Zero Suicide)</i>	✓		✓	
Create protective environments	<b>Reduce access to lethal means among persons at-risk</b>				Government (local, state)
	<i>Intervening at suicide hot spots</i>	✓			
	<i>Safe storage practices</i>		✓	✓	Public Health
	<i>Emergency Department Counseling on Access to Lethal Means (ED CALM)</i>			✓	Healthcare



		Best Available Evidence			
	Organizational policies and culture				
	Together for Life	✓			Business/Labor
	US Air Force Suicide Prevention Program	✓		✓	Justice
	Correctional suicide prevention	✓			Government (local, state, Federal)
	Community-based policies to reduce excessive alcohol use				Government (local, state)
	Alcohol outlet density	✓		✓	Business/labor
Promote connectedness	Peer norm programs				Public Health
	Sources of Strength			✓	Education
	Community engagement activities				Public Health
	Greening vacant urban spaces			✓	Government (local)
Teach coping and problem-solving skills	Social-emotional learning programs				
	Youth Aware of Mental Health Program		✓	✓	Public Health
	Good Behavior Game		✓	✓	Education
	Parenting skill and family relationship approaches				
	The Incredible Years			✓	Public Health
					Education

		Best Available Evidence			
	<i>Strengthening Families 10–14</i>			✓	
Identify and support people at-risk	<b>Gatekeeper training</b>				Public Health
	<i>Applied Suicide Intervention Skills Training</i>			✓	Healthcare
	<i>Garret Lee Smith Federal Grant Program</i>	✓	✓		
	<b>Crisis Intervention</b>				Public Health
	<i>National Suicide Prevention Lifeline</i>		✓	✓	Social Services
	<b>Treatment for people at risk of suicide</b>				
	<i>Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)</i>		✓	✓	
	<i>Collaborative Assessment and Management of Suicidality (CAMS)</i>		✓	✓	Healthcare
	<i>Dialectical Behavioral Therapy (DBT)</i>		✓	✓	Social Services
	<i>Attachment-Based Family Therapy (ABFT)</i>		✓		Justice
	<i>Translating Initiatives for Depression into Effective Solutions project (TIDES)</i>			✓	
	<b>Treatment to prevent re-attempts</b>				
	<i>ED Brief Intervention with Follow-up Visits</i>	✓			Healthcare
	<i>Active follow-up contact approaches</i>	✓	✓		Social services
	<i>CBT for Suicide Prevention</i>		✓		



		Best Available Evidence			
Lessen harms and prevent future risk	<b>Postvention</b>				Healthcare
	<i>StandBy Response Service</i>		✓	✓	
	<b>Safe reporting and message about suicide</b>				Public Health
	<i>Media Guidelines</i>	✓			Media

<sup>1</sup>This column refers to the lead sectors well positioned to bring leadership and resources to implementation efforts. For each strategy, there are many other sectors such as non-governmental organizations that are instrumental to prevention planning and implementing specific activities.

**Preventing Suicide:  
A Technical Package of Policy, Programs, and Practices**

**Prepared by:**

**Deb Stone, ScD, MSW, MPH  
Kristin Holland, PhD, MPH  
Brad Bartholow, PhD  
Alex Crosby, MD, MPH  
Shane Davis, PhD  
Natalie Wilkins, PhD**

**Division of Violence Prevention  
National Center for Injury Prevention and Control (NCIPC)  
Centers for Disease Control and Prevention**

**2017**



***Preventing Suicide: A Technical Package of Policies, Programs, and Practices* is a publication of the  
National Center for Injury Prevention and Control of the Centers for Disease Control and  
Prevention.**

Centers for Disease Control and Prevention  
Thomas R. Frieden, MD, MPH, Director

National Center for Injury Prevention and Control  
Debra E. Houry, MD, MPH, Director

Division of Violence Prevention  
James A. Mercy, PhD, Director

***Suggested Citation:*** Stone, D.M., Holland, K.M., Bartholow, B., Crosby, A.E., Davis, S., and Wilkins, N.  
***Preventing Suicide: A Technical Package of Policies, Programs, and Practices.*** Atlanta, GA: National  
Center for Injury Prevention and Control, Centers for Disease Control and Prevention, 2017.

## Contents

Acknowledgements.....	4
External Reviewers.....	5
Overview of Technical Package.....	6
Strengthen Economic Supports.....	14
Strengthen Access and Delivery of Suicide Care.....	17
Create Protective Environments.....	21
Promote Connectedness.....	26
Teach Coping and Problem-Solving Skills.....	28
Identify and Support People At-Risk.....	31
Lessen Harms and Prevent Future Risk.....	37
Sector Involvement.....	39
Monitoring and Evaluation.....	41
Conclusion.....	42
References.....	44
Appendix A.....	50



## Acknowledgements

We would like to thank the following individuals who contributed in specific ways to the development of this technical package. We give special thanks to Linda Dahlberg for her vision, guidance, and support throughout the development of this package. We thank Division, Center, and CDC leadership for their careful review and helpful feedback on earlier iterations of this document. We thank Alida Knuth for her formatting and design expertise. Last but definitely not least, we extend our thanks and gratitude to all the external reviewers for their helpful feedback, support and encouragement for this resource.

## External Reviewers

Casey Castaldi  
Prevention Institute

Carmen Clelland  
Office for State, Tribal, Local and Territorial  
Support, Centers for Disease Control and  
Prevention

Amalia Corby-Edwards  
American Psychological Association

Rachel Davis  
Prevention Institute

Pamela End of Horn  
Indian Health Service Headquarters

Craig Fisher  
American Psychological Association

Keita Franklin  
Department of Defense

Jill M. Harkavy Friedman  
American Foundation for Suicide Prevention

Jarrold Hindman  
Colorado Department of Public Health and  
Environment

Linda Langford  
Education Development Center, Inc.

Richard McKeon  
Substance Abuse and Mental Health Services  
Administration

Doreen S. Marshall  
American Foundation for Suicide Prevention

Christine Moutier  
American Foundation for Suicide Prevention

Jason H. Padgett  
Education Development Center, Inc.

Jerry Reed  
Education Development Center, Inc.

Christine Schuler  
National Institute for Occupational Safety and  
Health, Centers for Disease Control and  
Prevention

Morton Silverman  
Education Development Center, Inc.

Ellyson Stout  
Education Development Center, Inc.

Hope M. Tiesman  
National Institute for Occupational Safety and  
Health, Centers for Disease Control and  
Prevention

Dan Reidenberg  
Suicide Awareness Voices for Education (SAVE)

The experts above are listed with their affiliations at the time this document was reviewed.



## Overview

This technical package represents a select group of strategies based on the best available evidence to help communities and states sharpen their focus on prevention activities with the greatest potential to prevent suicide. These strategies include: strengthening economic supports; strengthening access and delivery of suicide care; creating protective environments; promoting connectedness; teaching coping and problem-solving skills; identifying and supporting people at-risk; and lessening harms and preventing future risk. The strategies represented in this package include those with a focus on preventing suicide from happening in the first place as well as approaches to lessen the immediate and long-term harms of suicidal behavior for individuals, families, communities, and society. The strategies in the technical package support the goals and objectives of the *National Strategy for Suicide Prevention*<sup>1</sup> and the National Action Alliance for Suicide Prevention's priority to strengthen community-based prevention.<sup>2</sup> Commitment, cooperation, and leadership from numerous sectors, including public health, education, justice, health care, social services, business, labor, and government can bring about the successful implementation of this package.

### What is a Technical Package?

A technical package is a compilation of a core set of strategies to achieve and sustain substantial reductions in a specific risk factor or outcome.<sup>3</sup> Technical packages help communities and states prioritize prevention activities based on the best available evidence. This technical package has three components. The first component is the **strategy** or the preventive direction or actions to achieve the goal of preventing suicide. The second component is the **approach**. The approach includes the specific ways to advance the strategy. This can be accomplished through *programs, policies, and practices*. The approaches included come primarily from studies based in the United States. The **evidence** for each of the approaches in preventing suicide or its associated risk factors is included as the third component. This package is intended as a resource to guide and inform prevention decision-making in communities and states.

### Preventing Suicide is a Priority

Suicide, as defined by the Centers for Disease Control and Prevention (CDC), is part of a broader class of behavior called *self-directed violence*. Self-directed violence refers to behavior directed at oneself that deliberately results in injury or the *potential* for injury.<sup>4</sup> Self-directed violence may be *suicidal* or *non-suicidal* in nature. For the purposes of this document, we refer only to behavior where suicide is intended:

- **Suicide** is a death caused by self-directed injurious behavior with any intent to die as a result of the behavior.
- **Suicide attempt** is defined as a *non-fatal* self-directed and potentially injurious behavior with any intent to die as a result of the behavior. A suicide attempt may or may not result in injury.

**Suicide is highly prevalent.** Suicide presents a major challenge to public health in the United States and worldwide. It contributes to premature death, morbidity, lost productivity, and health care costs.<sup>1,5</sup> In 2015 (the most recent year of available death data), suicide was responsible for 44,193 deaths in the U.S., which is approximately one suicide every 12 minutes.<sup>6</sup> In 2015, suicide ranked as the 10th leading cause of death and has been among the top 12 leading causes of death since 1975 in the U.S.<sup>7</sup> Overall suicide rates increased 28% from 2000 to 2015.<sup>6</sup> Suicide is a problem throughout the life span; it is the third leading cause of death for youth 10-14, the second leading cause of death among people 15–24 and 25-34 years; the fourth leading cause among people 35 to 44, the fifth leading cause among people 45-54 and eighth leading cause among people 55-64.<sup>6</sup>

Suicide rates vary by race/ethnicity, age, and other population characteristics, with the highest rates across the lifespan occurring among non-Hispanic American Indian/Alaska Native (AI/AN) and non-Hispanic White population groups. In 2015, the rates for these groups were 19.9 and 16.9 per 100,000 population, respectively.<sup>6</sup> Other population groups disproportionately impacted by suicide include middle-aged adults (whose rates increased 33% from 2000 to 2015, with steep increases seen among both males (27.8%) and females (51.1%) aged 35-64 years<sup>6</sup>; Veterans and other military personnel (whose suicide rate nearly doubled from 2003 to 2008, surpassing the rate of suicide among civilians for the first time in decades)<sup>8,9</sup>; workers in certain occupational groups,<sup>10,11</sup> and sexual minority youth, who experience increased suicidal ideation and behavior compared to their non-sexual minority peers.<sup>12-14</sup>

Suicides reflect only a portion of the problem.<sup>15</sup> Substantially more people are hospitalized as a result of nonfatal suicidal behavior (i.e. suicide attempts) than are fatally injured, and an even greater number are either treated in ambulatory settings (e.g., emergency departments) or not treated at all.<sup>15</sup> For example, during 2014, among adults aged 18 years and older, for every one suicide there were 9 adults treated in hospital emergency departments for self-harm injuries, 27 who reported making a suicide attempt, and over 227 who reported seriously considering suicide.<sup>6,16</sup>

**Suicide is associated with several risk and protective factors.** Suicide, like other human behaviors, has no single determining cause. Instead, suicide occurs in response to multiple biological, psychological, interpersonal, environmental and societal influences that interact with one another, often over time.<sup>1,5</sup> The social-ecological model – encompassing multiple levels of focus from the individual, relationship, community, and societal – is a useful framework for viewing and understanding suicide risk factors identified in the literature.<sup>17</sup> Risk and protective factors for suicide exist at each level. For example, risk factors include:



- **Individual level:** history of depression and other mental illnesses, hopelessness, substance abuse, certain health conditions, previous suicide attempt, violence victimization and perpetration, and genetic and biological determinants
- **Relationship level:** high conflict or violent relationships, sense of isolation and lack of social support, family/loved one's history of suicide, financial and work stress
- **Community level:** inadequate community connectedness, barriers to health care (e.g., lack of access to providers and medications)
- **Societal level:** availability of lethal means of suicide, unsafe media portrayals of suicide, stigma associated with help-seeking and mental illness.<sup>1,5</sup>

It is important to recognize that the vast majority of individuals who are depressed, attempt suicide, or have other risk factors, do *not* die by suicide.<sup>18,19</sup> Furthermore, the relevance of each risk factor can vary by age, race, gender, sexual orientation, residential geography, and socio-cultural and economic status.<sup>1,5</sup>

Protective factors, or those influences that buffer against the risk for suicide, can also be found across the different levels of the social-ecological model. Protective factors identified in the literature include: effective coping and problem solving skills, moral objections to suicide, strong and supportive relationships with partners, friends, and family; connectedness to school, community, and other social institutions; availability of quality and ongoing physical and mental health care, and reduced access to lethal means.<sup>1,5</sup> These protective factors can either counter a specific risk factor or buffer against a number of risks associated with suicide.

**Suicide is connected to other forms of violence.** Exposure to violence (e.g., child abuse and neglect, bullying, peer violence, dating violence, sexual violence, and intimate partner violence) is associated with increased risk of depression, post-traumatic stress disorder (PTSD), anxiety, suicide, and suicide attempts.<sup>20-26</sup> Women exposed to partner violence are nearly 5 times more likely to attempt suicide as women not exposed to partner violence.<sup>26</sup> Exposure to adverse experiences in childhood, such as physical, sexual, emotional abuse and neglect, and living in homes with violence, mental health, substance abuse problems and other instability, is also associated with increased risk for suicide and suicide attempts.<sup>22,27</sup> The psychosocial effects of violence in childhood and adolescence can be observed decades later, including severe problems with finances, family, jobs, and stress – factors that can increase the risk for suicide. Suicide and other forms of violence often share the same individual, relationship, community, and societal risk factors suggesting that efforts to prevent interpersonal violence may also prove beneficial in preventing suicide.<sup>28-30</sup> Further, just as risk factors may be shared across suicide and interpersonal violence, so too may protective factors overlap. For example, connectedness to one's community,<sup>31</sup> school,<sup>32</sup> family,<sup>33</sup> caring adults,<sup>34,35</sup> and pro-social peers<sup>36</sup> can enhance resilience and help reduce risk for suicide and other forms of violence.

**The health and economic consequences of suicide are substantial.** Suicide and suicide attempts have far reaching consequences for individuals, families, and communities.<sup>37-40</sup> In an early study, Crosby and Sacks<sup>41</sup> estimated that 7% of the U.S. adult population, or 13.2 million adults, knew someone in the prior 12 months who had died by suicide. They also estimated that for each suicide, 425 adults were exposed, or knew about the death.<sup>41</sup> In a more recent study, in one state, Cerel et al<sup>42</sup> found that 48% of the population knew at least one person who died by suicide in their lifetime. Research indicates that the impact of knowing someone who died by suicide and/or having lived experience (i.e., personally have attempted suicide, have had suicidal thoughts, or have been impacted by suicidal loss) is much more extensive than injury and death. People with lived experience may suffer long-term health and mental health consequences ranging from anger, guilt, and physical impairment, depending on the means and severity of the attempt.<sup>43</sup> Similarly, survivors of a loved one's suicide may experience ongoing pain and suffering including complicated grief,<sup>44</sup> stigma, depression, anxiety, post-traumatic stress disorder, and increased risk of suicidal ideation and suicide.<sup>45,46</sup> Less discussed but no less important, are the financial and occupational effects on those left behind.<sup>47</sup>

The economic toll of suicide on society is immense as well. According to conservative estimates, in 2013, suicide cost \$50.8 billion in estimated lifetime medical and work-loss costs alone.<sup>47</sup> Adjusting for potential under-reporting of suicide and drawing upon health expenditures per capita, gross domestic product per capita, and variability among states in per capita health care expenditures and income, another study estimated the total lifetime costs associated with nonfatal injuries and deaths caused by self-directed violence to be approximately \$93.5 billion in 2013.<sup>48</sup> The overwhelming burden of these costs were from lost productivity over the life course, with the average cost per suicide being over \$1.3 million.<sup>48</sup> The true economic costs are likely higher, as neither study included monetary figures related to other societal costs such as those associated with the pain and suffering of family members or other impacts.

**Suicide can be prevented.** Like most public health problems, suicide is preventable.<sup>1,5</sup> While progress will continue to be made into the future, evidence for numerous programs, practices, and policies currently exists, and many programs are ready to be implemented now. Just as suicide is not caused by a single factor, research suggests that reductions in suicide will not be prevented by any single strategy or approach.<sup>1,49</sup> Rather, suicide prevention is best achieved by a focus across the individual, relationship, family, community, and societal-levels and across all sectors, private and public.<sup>1,5</sup>

## Assessing the Evidence

This technical package includes programs, practices, and policies with evidence of impact on suicide or risk or protective factors for suicide. To be considered for inclusion in the technical package, the program, practice, or policy selected had to meet at least one of these criteria: a) meta-analyses or



systematic reviews showing impact on suicide; b) evidence from at least one rigorous (e.g., randomized controlled trial [RCT] or quasi-experimental design) evaluation study that found significant preventive effects on suicide; c) meta-analyses or systematic reviews showing impact on risk or protective factors for suicide, or d) evidence from at least one rigorous (e.g., RCT or quasi-experimental design) evaluation study that found significant impacts on risk or protective factors for suicide. Finally, consideration was also given to the likelihood of achieving beneficial effects on multiple forms of violence; no evidence of harmful effects on specific outcomes or with particular subgroups; and feasibility of implementation in a U.S. context if the program, policy, or practice has been evaluated in another country.

Within this technical package, some approaches do not yet have research evidence demonstrating impact on rates of suicide but instead are supported by evidence indicating impacts on risk or protective factors for suicide (e.g., help-seeking, stigma reduction, depression, connectedness). In terms of the strength of the evidence, programs that have demonstrated effects on suicidal behavior (e.g., reductions in deaths, attempts) provide a higher-level of evidence, but the evidence base is not that strong in all areas. For instance, there has been less evaluation of community engagement and family programs on suicidal behavior. Thus, approaches in this package that have effects on risk or protective factors reflect the developing nature of the evidence base and the use of the best available evidence at a given time.

It is also important to note that there is often significant heterogeneity among the programs, policies, or practices that fall within one approach or strategy in terms of the nature and quality of the available evidence. Not all programs, policies, or practices that utilize the same approach are equally effective, and even those that are effective may not work across all populations. Tailoring programs and conducting more evaluations may be necessary to address different population groups. The evidence-based programs, practices, or policies included in the package are not intended to be a comprehensive list for each approach, but rather to serve as examples that have been shown to impact suicide or have beneficial effects on risk or protective factors for suicide.

### **Context and Cross-Cutting Themes**

One important feature of the package is the complementary and potentially synergistic impact of the strategies and approaches. The strategies and approaches included in this technical package represent different levels of the social ecology, with efforts intended to impact community and societal levels, as well individual and relationship levels. The strategies and approaches are intended to work in combination and reinforce each other to prevent suicide (see box below). The strategies are arranged in order such that those strategies hypothesized to have the greatest potential for broad public health impact on suicide are included first, followed by those that might impact subsets of the populations (e.g., persons who have already made a suicide attempt).



Preventing Suicide	
Strategy	Approach
Strengthen economic supports	<ul style="list-style-type: none"> <li>• Strengthen household financial security</li> <li>• Housing stabilization policies</li> </ul>
Strengthen access and delivery of suicide care	<ul style="list-style-type: none"> <li>• Coverage of mental health conditions in health insurance policies</li> <li>• Reduce provider shortages in underserved areas</li> <li>• Safer suicide care through systems change</li> </ul>
Create protective environments	<ul style="list-style-type: none"> <li>• Reduce access to lethal means among persons at-risk of suicide</li> <li>• Organizational policies and culture</li> <li>• Community-based policies to reduce excessive alcohol use</li> </ul>
Promote connectedness	<ul style="list-style-type: none"> <li>• Peer norm programs</li> <li>• Community engagement activities</li> </ul>
Teach coping and problem-solving skills	<ul style="list-style-type: none"> <li>• Social-emotional learning programs</li> <li>• Parenting skill and family relationship programs</li> </ul>
Identify and support people at-risk	<ul style="list-style-type: none"> <li>• Gatekeeper training</li> <li>• Crisis Intervention</li> <li>• Treatment for people at-risk of suicide</li> <li>• Treatment to prevent re-attempts</li> </ul>
Lessen harms and prevent future risk	<ul style="list-style-type: none"> <li>• Postvention</li> <li>• Safe reporting and messaging about suicide</li> </ul>

It is important to note that these strategies are not mutually exclusive but each has an immediate focus. For instance, social emotional learning programs, an approach under the *Teach Coping and Problem-Solving Skills* strategy, sometimes include components to change peer norms and the broader environment. The primary focus of these programs, however, is to provide children and youth with skills to resolve problems in relationships, school, and with peers, and to help youth address other negative influences (e.g., substance use) associated with suicide.

The goal of this package is to stress the importance of comprehensive prevention efforts and to provide examples of effective programs addressing each level of the social ecology, with the knowledge that some programs, practices, and policies may impact multiple levels. Further, those that involve multiple sectors and that impact multiple levels of the social ecology are more likely to have a greater impact on the overall burden of suicide.

Suicide ideation, thoughts, attempts, and deaths vary by gender, race/ethnicity, age, occupation, and other important population characteristics.<sup>6,50</sup> Further, certain transition periods are also associated with higher rates of suicide (e.g., transition from working into retirement, transition from active duty military status to civilian status).<sup>48,51</sup> In fact, suicide risk can change along with dynamic risk factors. For example, individuals' coping skills may change during periods of crisis and heightened stress, limiting



their normal ability to effectively solve problems and cope. Research indicates that suicide risk changes as a result of the number and intensity of key risk and protective factors experienced.<sup>52</sup> Ideally, the availability of multiple strategies and approaches tailored to the social, economic, cultural, and environmental context of individuals and communities are desirable as they may increase the likelihood of removing barriers to supportive and effective care and provide opportunities to develop individual and community resilience.<sup>1</sup>

Identifying programs, practices, and policies with evidence of impact on suicide, suicide attempts, or beneficial effects on risk or protective factors for suicide is only the first step. In practice, the effectiveness of the programs, policies and practices identified in this package will be strongly dependent on how well programs are implemented, as well as the partners and communities in which they are implemented. Practitioners in the field may be in the best position to assess the needs and strengths of their communities and work with community members to make decisions about the combination of approaches included here that are best suited to their context.

Data-driven strategic planning processes can help communities with this work.<sup>53-55</sup> These planning processes engage and guide community stakeholders through a prevention planning process designed to address a community's profile of risk and protective factors with evidence-based programs, practices, and policies. These processes can also be used to monitor implementation, track outcomes, and make adjustments as indicated by the data. The readiness of the program for broad dissemination and implementation (e.g., availability of program materials, training and technical assistance) can also influence program effects. Implementation guidance to assist practitioners, organizations and communities will be developed separately.

This package includes strategies where public health agencies are well positioned to bring leadership and resources to implementation efforts. It also includes strategies where public health can serve as an important collaborator (e.g., strategies addressing community and societal level risks), but where leadership and commitment from other sectors such as business, labor or health care is critical to implement a particular policy or program (e.g., workplace policies; treatment to prevent re-attempts). The role of various sectors in the implementation of a strategy or approach in preventing suicide is described further in the section on *Sector Involvement*.

In the sections that follow, the strategies and approaches with the best available evidence for preventing suicide are described.

## Strengthen Economic Supports

### Rationale

Studies from the U.S. examining historical trends indicate that suicide rates increase during economic recessions marked by high unemployment rates, job losses, and economic instability and decrease during economic expansions and periods marked by low unemployment rates, particularly for working-age individuals 25 to 64 years old.<sup>56,57</sup> Economic and financial strain, such as job loss, long periods of unemployment, reduced income, difficulty covering medical, food, and housing expenses, and even the anticipation of such financial stress may increase an individual's risk for suicide or may indirectly increase risk by exacerbating related physical and mental health problems.<sup>58</sup> Buffering these risks can, therefore, potentially protect against suicide. For example, strengthening economic support systems can help people stay in their homes or obtain affordable housing while also paying for necessities such as food and medical care, job training, child care, among other expenses required for daily living. In providing this support, stress and anxiety and the potential for a crisis situation may be reduced, thereby preventing suicide. Although more research is needed to understand how economic factors interact with other factors to increase suicide risk, the available evidence suggests that strengthening economic supports may be one opportunity to buffer suicide risk.

### Approaches

Economic supports for individuals and families can be strengthened by targeting household financial security and ensuring stability in housing during periods of economic stress.

- **Strengthening household financial security** can potentially buffer the risk of suicide by providing individuals with the financial means to lessen the stress and hardship associated with a job loss or other unanticipated financial problems. The provision of unemployment benefits and other forms of temporary assistance, livable wages, medical benefits, and retirement and disability insurance to help cover the cost of necessities or to offset costs in the event of disability, are examples of ways to strengthen household financial security.
- **Housing stabilization policies** aim to keep people in their homes and provide housing options for those in need during times of financial insecurity. This may occur through programs that provide affordable housing such as through government subsidies or through other options available to potential homebuyers such as loan modification programs, move-out planning, or financial counseling services that help minimize the risk or impact of foreclosures and eviction.

### Potential Outcomes

- Reductions in foreclosure rates



- Reductions in eviction rates
- Reductions in emotional distress
- Reductions in suicide

## Evidence

There is evidence suggesting that strengthening household financial security and stabilizing housing can reduce suicide risk.

- **Strengthen household financial security.** The *Federal-State Unemployment Insurance Program* allows states to define the maximum amount and duration of unemployment benefits that workers are entitled to receive after a job loss.<sup>59</sup> An examination of variations in *unemployment benefit programs* across states demonstrated that the impact of unemployment on rates of suicide was offset in those states that provided greater than average unemployment benefits (mean level: \$7,990 per person in U.S. constant dollars). The effects of *unemployment benefit programs* were also consistent by sex and age group.<sup>59</sup> Another U.S. study examining the link between unemployment and suicide rates using monthly suicide data, length of unemployment (less than 5 weeks, 5-14 weeks, 15-26 weeks, and greater than 26 weeks), and job losses found that the duration of unemployment, as opposed to just the loss of job, predicted suicide risk.<sup>60</sup> Together, these results suggest that not only should state unemployment benefit programs be generous in their financial allocations, but also in their duration.

Other measures to strengthen household financial security (e.g., transfer payments related to retirement and disability insurance, unemployment insurance compensation, medical benefits, and other forms of family assistance) have also shown an impact on rates of suicide. A study by Flavin and Radcliff<sup>61</sup> examined the impact of states' per capita spending on transfer payments, medical benefits, and family assistance (Temporary Assistance to Needy Families – TANF) and total state spending on suicide rates between 1990-2000, controlling for a number of suicide risk factors (e.g., residential mobility, divorce rate, unemployment rate) at the state level. As per capita spending on total transfer payments, medical benefits, and family assistance increased there was an associated decrease in state suicide rates. In terms of lives saved, Flavin and Radcliff calculated the cost of reducing a state's suicide rate by a full point for the years studied.<sup>61</sup> At the national level, they estimated 3,000 fewer suicides would occur per year nationwide if every state increased its per capita spending on these types of assistance by \$45 per year.<sup>61</sup> Although this was a correlational study, the results demonstrate the potential benefits of policies that reach particularly vulnerable individuals during periods of great need. More evaluation studies are needed to further understand the outcomes impacted by programs such as these.

- **Housing stabilization policies.** The *Neighborhood Stabilization Program*<sup>62</sup> was designed to help neighborhoods suffering from high rates of foreclosure and abandonment by slowing the deterioration of the neighborhoods and providing affordable housing options for low, moderate, and middle-income homebuyers. This program also offers financial assistance to eligible individuals for the purchase of a new home. Although this program has not been rigorously evaluated for its impact on suicide outcomes, it addresses foreclosure and eviction, which are risk factors for suicide. A longitudinal analysis of annual data on suicides and foreclosures demonstrated that as the proportion of foreclosed properties increased in U.S. states, so did the state suicide rate, particularly among working-aged adults.<sup>63</sup> Another study of data from 16 U.S. states participating in the *National Violent Death Reporting System* found that suicides precipitated by home foreclosures and evictions increased more than 100% from 2005 (before the housing crisis began) to 2010 (after it had peaked).<sup>57</sup> Most of these suicides occurred prior to the actual loss of the decedent's home. These findings suggest that integrating suicide prevention resources, messaging, and referrals into financial, foreclosure, and move-out planning and counseling services may help to prevent suicide.



## Strengthen Access and Delivery of Suicide Care

### Rationale

While most people with mental health problems do not attempt or die by suicide<sup>18,19</sup> and the level of risk conferred by different types of mental illness varies,<sup>64-66</sup> previous research indicates that mental illness is an important risk factor for suicide.<sup>5,67</sup> State-level suicide rates have also been found to be correlated with general mental health measures such as depression.<sup>68,69</sup> Findings from the *National Comorbidity Survey* indicate that relatively few people in the U.S. with mental health disorders receive treatment for those conditions.<sup>70</sup> Lack of access to mental health care is one of the contributing factors related to the underuse of mental health services.<sup>71</sup> Identifying ways to improve access to timely, affordable, and quality mental health and suicide care for people in need is a critical component to prevention.<sup>5</sup> Additionally, research suggests that services provided are maximized when health and behavioral health care systems are set up to effectively and efficiently deliver such care.<sup>72</sup> Apart from treatment benefits, these approaches can also normalize help-seeking behavior and increase the use of such services.

### Approaches

There are a number of approaches that can be used to strengthen access and delivery of suicide care, including:

- **Coverage of mental health conditions in health insurance policies.** Federal and state laws include provisions for equal coverage of mental health services in health insurance plans that is on par with coverage for other health concerns (i.e., mental health parity).<sup>73</sup> Benefits and services covered include such things as the number of visits, co-pays, deductibles, inpatient/outpatient services, prescription drugs, and hospitalizations. If a state has a stronger mental health parity law than the federal parity law, then insurance plans regulated by the state must follow the state parity law. If a state has a weaker parity law than the federal parity law (e.g., includes coverage for some mental health conditions but not others), then the federal parity law will replace the state law. Equal coverage does not necessarily imply good coverage as health insurance plans vary in the extent to which benefits and services are offered to address various health conditions. Rather it helps to ensure that mental health services are covered on par with other health concerns.
- **Reduce provider shortages in underserved areas.** Access to effective and state-of-the-art mental health care is largely dependent upon the training and the size of the mental health care workforce. Over 85 million Americans live in areas with an insufficient number of mental health providers; this shortage is particularly severe among low-income urban and rural communities.<sup>74</sup> There are various ways to increase the number and distribution of practicing mental health providers in underserved areas including offering financial incentives through existing state and



federal programs (e.g., loan repayment programs) and expanding the reach of health services through telephone, video and web-based technologies. Such approaches can increase the likelihood that those in need will be able to access affordable, quality care for mental health problems, which can reduce risk for suicide.

- **Safer suicide care through systems change.** Access to health and behavioral health care services is critical for people at risk of suicide; however this is just one piece of the puzzle. Care should also be *delivered* efficiently and effectively. More specifically, care should take place within a system that supports suicide prevention and patient safety through strong leadership, workforce training, systematic identification and assessment of suicide risk, implementation of evidence-based treatments (see *Identify and Support People At-Risk*), continuity of care, and continuous quality improvement. Care that is patient-centered and promotes equity for all patients is also of critical importance.<sup>75</sup>

### Potential Outcomes

- Increases in access to mental health services
- Increase in utilization of mental health services
- Reductions in symptoms of mental illnesses and suicidality
- Reductions in rates of suicide attempts
- Reductions in rates of suicide

### Evidence

There is evidence suggesting that coverage of mental health conditions in health insurance policies and improving access and the delivery of care can reduce risk factors associated with suicide and may directly impact suicide rates.

- **Coverage of mental health conditions in health insurance policies.** The *National Survey on Drug Use and Health (NSDUH)* is a nationally representative survey of the U.S. population that provides data on substance use, mental health conditions, and service utilization.<sup>50</sup> Using data from this survey, Harris, Carpenter, and Bao<sup>76</sup> found that 12 months after states enacted *mental health parity laws*, self-reported use of mental healthcare services significantly increased. Moreover, subsequent research by Lang<sup>69</sup> examined state mental health laws and suicide rates between 1990 and 2004 and found that mental health parity laws, specifically, were associated with an approximate 5% reduction in suicide rates. This reduction, in the 29 states with parity laws, equated to the prevention of 592 suicides per year.<sup>69</sup>
- **Reduce provider shortages in underserved areas.** One example of a program to improve access to mental health care providers is the *National Health Service Corps (NHSC)*, which offers



financial incentives to attract mental/behavioral health clinicians to underserved areas.<sup>77</sup> Programs such as *NHSC* encourage individuals to work in the mental health profession in locations designated as Health Professional Shortage Areas (HPSAs) in exchange for student loan debt repayment. A 2012 retention survey conducted by the Health Resources and Services Administration (HRSA), found that 61% of mental and behavioral health care providers continued to practice in designated mental health shortage areas after their four year commitment to the *NHSC*.<sup>78</sup> Although this program has not been evaluated for impact on suicide, it addresses access to care, which is a critical component to suicide prevention.

*Telemental health (TMH)* services refer to the use of telephone, video and web-based technologies for providing psychiatric or psychological care at a distance.<sup>79</sup> *TMH* can be used in a variety of settings (e.g. outpatient clinics, hospitals, military treatment facilities) to treat a wide range of mental health conditions. It can also improve access to care for patients in isolated areas, as well as reduce travel time and expenses, reduce delays in receiving care, and improve satisfaction interacting with the mental health care system. A systematic review of *TMH* services found that services rated as high or good quality were effective in treating mental health conditions such as depression, schizophrenia, substance abuse, and suicidal ideation and suicide.<sup>79</sup> Further, Mohr and colleagues<sup>80</sup> conducted a meta-analysis examining the effect of psychotherapy delivered specifically via telephone and found that it significantly reduced depressive symptoms in comparison to face-to-face psychotherapy. They also found that treatment attrition rates were significantly lower among patients receiving telephone-administered psychotherapy compared to patients receiving face-to-face therapy.<sup>80</sup> Thus, *TMH* may not only offer improved access to mental health care, but it may also ensure continuity of care, and thereby further reduce the risk for suicide.

- **Safer suicide care through systems change.** *Henry Ford Health System*, which is a large health maintenance organization (HMO) in the state of Michigan, pioneered *Perfect Depression Care*,<sup>81</sup> the pre-cursor to what is now called *Zero Suicide*. The overall goal of *Perfect Depression Care* was to eliminate suicide among HMO members. More broadly, the goal of the program was to redesign delivery of depression care to achieve “breakthrough improvement” in quality and safety by focusing on effectiveness, safety, patient centeredness, timeliness, efficiency, and equity among patients. The program screened and assessed each patient for suicide risk and implemented coordinated continuous follow-up care system wide.<sup>81</sup> An examination of the impact of the program found that there was a dramatic and statistically significant decrease in the rate of suicide between the baseline years, 1999 and 2000, prior to the intervention to the intervention years, 2002-2009. During this time period, the suicide rate fell by 82%.<sup>81,82</sup> Further, among HMO members who received mental health specialty services, the suicide rate significantly decreased over time from 1999 to 2010 (110.3 to 47.6 per 100,000 population;  $p < .04$ ) with a mean of 36.2 per 100,000 over the period. Additionally, for those HMO members

who accessed only general medical services as opposed to specialty mental health services, the suicide rate increased from 2.7 to 5.6 per 100,000 ( $p < .01$ ).<sup>82</sup> Similarly, in the state of Michigan, rates of suicide in the general population increased over the period from 9.8 to 12.5 per 100,000 ( $p < .001$ ).<sup>83</sup>

FINAL



## Create Protective Environments

### Rationale

Prevention efforts that focus not only on individual behavior change (e.g., help-seeking, treatment interventions) but on changes to the environment can increase the likelihood of positive behavioral and health outcomes.<sup>84</sup> Creating environments that address risk and protective factors where individuals live, work, and play can help prevent suicide.<sup>1,17</sup> For example, rates of suicide are high among middle-aged adults who comprise 42.6% of the workforce<sup>85</sup>; among certain occupational groups<sup>10,11</sup>; and among people in detention facilities (e.g. jail, prison),<sup>86</sup> to name a few. Thus, settings where these populations work and reside are ideal for implementing programs, practices and policies to buffer against suicide. Changes to organizational culture through the implementation of supportive policies, for instance, can change social norms, encourage help-seeking, and demonstrate that good health and mental health are valued and that stigma and other risk factors for suicide are not.<sup>87,88</sup> Similarly, modifying the characteristics of the physical environment to prevent harmful behavior such as access to lethal means can reduce suicide rates, particularly in times of crisis or transition.<sup>89-94</sup>

### Approaches

The current evidence suggests three potential approaches for creating environments that protect against suicide.

- **Reduce access to lethal means among persons at-risk of suicide.** Means of suicide such as firearms, hanging/suffocation, or jumping from heights provide little opportunity for rescue and, as such, have high case fatality rates (e.g., about 85% of people who use a firearm in a suicide attempt will die from the injury).<sup>95</sup> Research also indicates that: 1) the interval between deciding to act and attempting suicide can be as short as 5 or 10 minutes,<sup>96,97</sup> and 2) people tend *not* to substitute a different method when a highly lethal method is unavailable or difficult to access.<sup>98,99</sup> Therefore, increasing the time interval between deciding to act and the suicide attempt, for example, by making it more difficult to access lethal means, can be lifesaving. The following are examples of approaches reducing access to lethal means for persons at-risk of suicide:
  - *Intervening at Suicide Hotspots.* Suicide hotspots, or places where suicides may take place relatively easily, include tall structures (e.g., bridges, cliffs, balconies, and rooftops), railway tracks, and isolated locations such as parks. Efforts to prevent suicide at these locations include erecting barriers or limiting access to prevent jumping, and installing signs and telephones to encourage individuals who are considering suicide, to seek help.<sup>100</sup>

- *Safe Storage Practices.* Safe storage of medications, firearms, and other household products can reduce the risk for suicide by separating vulnerable individuals from easy access to lethal means. Such practices may include education and counseling around storing firearms--locked in a secure place (e.g., in a gun safe or lock box), unloaded and separate from the ammunition--and keeping medicines in a locked cabinet or other secure location away from people who may be at risk or who have made prior attempts.<sup>89,101</sup>
- **Organizational policies and culture** that promote protective environments may be implemented in places of employment, detention facilities, and other secured environments (e.g. residential settings). Such policies and cultural values encourage leadership from the top down and may promote prosocial behavior (e.g., asking for help), skill building, positive social norms, assessment, referral and access to helping services (e.g. mental health, substance abuse treatment, financial counseling), and development of crisis response plans, postvention and other measures to foster a safe physical environment. Such policies and cultural shifts can positively impact organizational climate and morale and help prevent suicide and its related risk factors (e.g. depression, social isolation).<sup>88,102</sup>
- **Community-based policies to reduce excessive alcohol use.** Research studies in the United States have found that greater alcohol availability is positively associated with alcohol-involved suicides.<sup>103-105</sup> Policies to reduce excessive alcohol use broadly include zoning to limit alcohol outlet locations and density, taxes on alcohol, and bans on the sale of alcohol for individuals under the legal drinking age.<sup>105</sup> These policies are important because acute alcohol use has been found to be associated with more than one-third of suicides and approximately 40% of suicide attempts.<sup>106</sup>

### Potential Outcomes

- Increases in safe storage of lethal means
- Reductions in rates of suicide
- Reductions in suicide attempts
- Reductions in suicide deaths
- Increases in help-seeking
- Reductions in alcohol-related suicide deaths



## Evidence

The evidence suggests that creating protective environments can reduce suicide and suicide attempts and increase protective behaviors.

- **Reduce access to lethal means among persons at-risk of suicide.** A meta-analysis examining the impact of *suicide hotspot interventions* implemented in combination or in isolation, both in the U.S. and abroad, found associated reduced rates of suicide.<sup>100,107</sup> For example, after erecting a barrier on the Jacques-Cartier bridge in Canada, the suicide rate from jumping from the bridge decreased from about 10 suicide deaths per year to about 3 deaths per year.<sup>108</sup> Moreover, the reduction in suicides by jumping was sustained even when all bridges and nearby jumping sites were considered, suggesting little to no displacement of suicides to other jumping sites.<sup>108</sup> Further evidence for the effectiveness of bridge barriers was demonstrated by a study examining the impact of the *removal* of safety barriers from the Grafton Bridge in Auckland, New Zealand. After removal of the barrier, both the number and rate of suicide increased five-fold.<sup>93,109</sup>

Another form of means reduction involves implementation of *safe storage practices*. In a case-control study of firearm-related events identified from 37 counties in Washington, Oregon, and Missouri, and from 5 trauma centers, researchers found that storing firearms unloaded, separate from ammunition, in a locked place or secured with a safety device was protective of suicide attempts among adolescents.<sup>110</sup> Further, a recent systematic review of clinic and community-based education and counseling interventions suggested that the provision of safety devices significantly increased safe firearm storage practices compared to counseling alone or compared to the provision of economic incentives to acquire safety devices on one's own.<sup>101</sup>

Another program, the *Emergency Department Counseling on Access to Lethal Means (ED CALM)*, trained psychiatric emergency clinicians in a large children's hospital to provide lethal means counseling and safe storage boxes to parents of patients under age 18 receiving care for suicidal behavior. In a pre-post quality improvement project, Runyan et al<sup>89</sup> found that at post-test 76% (of the 55% of parents followed up, n=114) reported that all medications in the home were locked up as compared to fewer than 10% at the time of the initial emergency department visit. Among parents who indicated the presence of guns in the home at pre-test (i.e. 67%), all (100%) reported guns were currently locked up at post-test.<sup>89</sup>

- **Organizational policies and culture.** *Together for Life* is a workplace program of the Montreal Police Force implemented to address suicide among officers. Policy and program components were designed to foster an organizational culture that promoted mutual support and solidarity among all members of the Force. The program included training of supervisors, managers and all units to improve competencies in identifying suicidal risk and to improve use and awareness

of existing resources. The program also included an education campaign to improve awareness and help-seeking.<sup>111</sup> Police suicides were tracked over 12 years and compared to rates in the control city of Quebec. The suicide rate in the intervention group decreased significantly by 78.9% to a rate of 6.4 suicides per 100,000 population per year compared to an 11% increase in the control city 29.0 per 100,000;<sup>111</sup>

Another example of this approach is the *United States Air Force Suicide Prevention Program*. The program included 11 policy and education initiatives and was designed to change the culture of the Air Force surrounding suicide. The program uses leaders as role models and agents of change, establishes expectations for behavior related to awareness of suicide risk, develops population skills and knowledge (i.e., education and training), and investigates every suicide (i.e., outcomes measurement). The program represents a fundamental shift from viewing suicide and mental illness solely as medical problem and instead sees them as larger service-wide problems impacting the whole community.<sup>112</sup> Using a time-series design to examine the impact of the program on various violence-related outcomes, researchers found that the program was associated with a 33% relative risk reduction in suicide.<sup>112</sup> The program was also associated with relative risk reductions in related outcomes including moderate and severe family violence (30% and 54%, respectively), homicide (51%), and accidental death (18%).<sup>112</sup> A longitudinal assessment of the program over the period 1981 to 2008 (16 years before the 1997 launch of the program and 11 years post-launch) found significantly lower rates of suicide after the program was launched than before.<sup>87</sup> These effects were sustained over time, except in 2004, which the authors found was associated with less rigorous implementation of program components in that year than in the other years.<sup>87</sup>

Finally, while the evidence is still being built for suicide prevention in correctional facilities, preliminary evidence suggests organizational policies and practices that include routine suicide prevention training for all staff, standardized intake screening and risk assessment, provision of shared information between staff members, especially in transitioning or transferring of inmates, varying levels of observation, safe physical environment, emergency response protocols, notification of suicidal behavior/suicide through the chain of command, and critical incident stress debriefing and death review can potentially reduce suicide.<sup>102</sup> When these policies and practices were implemented across 11 state prisons in Louisiana, suicide rates dropped 46%, from a rate of 23.1 per 100,000 before the intervention to 12.4 per 100,000 the following year.<sup>113</sup> Other similar programs have seen declines in suicide both in the United States and internationally.<sup>114</sup>

- **Community-based policies to reduce excessive alcohol use.** While multiple policies to limit excessive use of alcohol exist, several studies on alcohol outlet density and risk factors for suicide, such as interpersonal violence and social connectedness,<sup>115-118</sup> suggest that measures to



reduce alcohol outlet density can potentially reduce alcohol-involved suicides. Additionally, a longitudinal analysis of alcohol outlet density, suicide mortality, and hospitalizations for suicide attempts over 6 years in 581 California zip codes indicated that greater density of bars, specifically, is related to greater suicide and suicide attempts, particularly in rural areas.<sup>119</sup>

FINAL

## Promote Connectedness

### Rationale

Sociologist, Emile Durkheim theorized in 1897 that weak social bonds, i.e. lack of connectedness, are among the chief causes for suicidality.<sup>120</sup> Connectedness is the degree to which an individual or group of individuals are socially close, interrelated, or share resources with others.<sup>121</sup> Social connections can be formed within and between multiple levels of the social ecology,<sup>17</sup> for instance between individuals (e.g. peers, neighbors, co-workers), families, schools, neighborhoods, workplaces, faith communities, cultural groups, and society as a whole. Related to connectedness, social capital refers to a sense of trust in one's community and neighborhood, social integration, and also the availability and participation in social organizations.<sup>122,123</sup> Many ecological cross-sectional and longitudinal studies have examined the impact of aspects of social capital on depression symptoms, depressive disorder, mental health more generally, and suicide. While the evidence is limited, existing studies suggest a positive association between social capital (as measured by social trust and community/neighborhood engagement), and improved mental health.<sup>124,125</sup> Connectedness and social capital together may protect against suicidal behaviors by decreasing isolation, encouraging adaptive coping behaviors, and by increasing belongingness, personal value, and worth, to help build resilience in the face of adversity. Connectedness can also provide individuals with better access to formal supports and resources, mobilize communities to meet the needs of its members and provide collective primary prevention activities to the community as a whole.<sup>121</sup>

### Approaches

Promoting connectedness among individuals and within communities through modeling peer norms and enhancing community engagement may protect against suicide.

- **Peer norm programs** seek to normalize protective factors for suicide such as help-seeking, reaching out and talking to trusted adults, and promote peer connectedness. By leveraging the leadership qualities and social influence of peers, these approaches can be used to shift group-level beliefs and promote positive social and behavioral change. These approaches typically target youth and are delivered in school settings but can also be implemented in community settings.<sup>126</sup>
- **Community engagement activities.** Community engagement is an aspect of social capital.<sup>127</sup> Community engagement approaches may involve residents participating in a range of activities, including religious activities, community clean-up and greening activities, and physical exercise. These activities provide opportunities for residents to become more involved in the community and to connect with other community members, organizations, and resources, resulting in enhanced overall physical health, reduced stress, and decreased depressive symptoms, thereby reducing risk of suicide.



## Potential Outcomes

- Reductions in maladaptive coping attitudes and behaviors
- Increases in healthy coping attitudes and behaviors
- Increases in referrals for youth in distressed
- Increases help-seeking behaviors
- Increases in positive perceptions of adult support

## Evidence

Current evidence suggests a number of positive benefits of peer norm and community engagement activities, although more evaluation research is needed to examine whether these improvements in factors that protect against suicidal behavior translate into reduced suicide attempts and deaths.

- **Peer norm programs.** Evaluations show that programs such as *Sources of Strength* can improve school norms and beliefs about suicide that are created and disseminated by student peers. In a randomized controlled trial of *Sources of Strength* conducted with 18 high-schools (6 metropolitan, 12 rural), researchers found that the program improved adaptive norms regarding suicide, connectedness to adults, and school engagement.<sup>36</sup> Peer leaders were also more likely than controls to refer a suicidal friend to an adult. For students, the program resulted in increased perceptions of adult support for suicidal youths, particularly among those with a history of suicidal ideation, and the acceptability of help-seeking behaviors. Finally, trained peer leaders also reported a greater decrease in maladaptive coping attitudes compared with untrained leaders.<sup>36</sup>
- **Community engagement activities.** A vacant lot greening initiative was undertaken in Philadelphia between 1999 and 2008. Local residents and community members worked together to green 4,436 lots (or 7.8 million square feet) in 4 areas of the city. Researchers found significant reductions in community residents' self-reported level of stress, which is a risk factor for suicide, and engagement in more physical exercise, a protective factor for suicide, than residents in control vacant lot areas. There is some evidence for other cross-cutting benefits, including reductions in firearm assaults and vandalism.<sup>128,129</sup>

## Teach Coping and Problem-Solving Skills

### Rationale

Building life skills prepares individuals to successfully tackle every day challenges and adapt to stress and adversity. Life skills encompasses many concepts, but most often include coping and problem-solving skills, emotional regulation, conflict resolution, and critical thinking. Life skills are important in shielding individuals from suicidal behaviors.<sup>126</sup> Suicide prevention programs that focus on life and social skills training are drawn from social cognitive theories,<sup>130</sup> surmising that suicidal behavior is attributed to either direct learning and modeling or environmental and individual (e.g. hopelessness) characteristics. The inability to employ adequate strategies to cope with immediate stressors or identify and find solutions for problems has been characterized among suicide attempters.<sup>131</sup> Teaching and providing youth with the skills to tackle every day challenges and stressors is, therefore, an important developmental component to suicide prevention.

### Approaches

Social emotional learning programs and parenting skill and family relationship programs are two approaches for teaching coping and problem-solving skills.

- **Social-emotional learning programs** focus on developing and strengthening communication and problem-solving skills, emotion regulation, conflict resolution, help seeking and coping skills. These approaches address a range of risk and protective factors for suicidal behavior. They provide children and youth with skills to resolve problems in relationships, school, and with peers, and help youth to address other negative influences (e.g., substance use) associated with suicide.<sup>126</sup> These approaches are typically delivered to all students in a particular grade or school, although some programs also focus on groups of students considered to be at high risk for suicide. Opportunities to practice and reinforce skills are an important part of programs that work.<sup>132</sup>
- **Parenting skill and family relationship programs** provide caregivers with support and are designed to strengthen parenting skills, enhance positive parent-child interactions, and improve children's behavioral and emotional skills and abilities.<sup>132</sup> Programs are typically designed for parents or caregivers with children in a specific age range and can be self-directed or delivered to individual families or groups of families. Some programs have sessions primarily with parents or caregivers while others include sessions for parents or caregivers, youth, and the family. Specific program content typically varies by the age of the child but often has consistent themes of child development, parent-child communication and relationships, and youth's interpersonal and problem-solving skills.



## Potential Outcomes

- Reductions in suicide attempts and suicide ideation
- Reductions in suicide risk behaviors (i.e., depression, anxiety, conduct problems, substance abuse)
- Improvements in help-seeking behavior
- Improvements in social competence and emotional regulation skills
- Improvements in problem-solving and conflict management skills

## Evidence

Several social emotional learning and parenting and family relationship programs have been shown in rigorous evaluations to improve resilience and reduce problem behavior and risk factors for various behaviors, including ones closely related to suicide, such as depression, internalizing behaviors, and substance abuse.<sup>133</sup>

- **Social-emotional learning programs.** The *Youth Aware of Mental Health Program (YAM)* is a program developed for teenagers aged 14-16 that uses interactive dialogue and role-playing to teach adolescents about the risk and protective factors associated with suicide (including knowledge about depression and anxiety) and enhances their problem-solving skills for dealing with adverse life events, stress, school and other problems.<sup>134</sup> In a cluster-randomized controlled trial conducted across 10 European Union countries and 168 schools, students in schools randomized to *YAM* were significantly less likely to attempt suicide and have severe suicidal ideation at the 12-month follow-up compared to students in control schools which received educational materials and care as usual. Overall, the relative risk of youth suicide attempts among the *YAM* group was reduced by over 50% demonstrating that out of 1000 students, five attempted suicide in the *YAM* group compared to 11 in the control group. Additionally, related to severe suicide ideation, in the *YAM* group, relative risk fell by 49.6%.<sup>134</sup>

Another example is the *Good Behavior Game (GBG)*, which is a classroom-based program for elementary school children aged 6-10. The program uses a team-based behavior management strategy that promotes good behavior by setting clear expectations for good behavior and consequences for maladaptive behavior. The goal of the *GBG* program is to create an integrated classroom social system that is supportive of all children being able to learn with little aggressive or disruptive behavior.<sup>135</sup> Two cohorts of youths participated in the program in 1985-86 and 1986-87 school years when they were in the first and second grades. A number of proximal and distal outcomes were assessed among the two cohorts over time. With respect to distal suicide-related outcomes, an outcome evaluation of the *GBG* indicated that individuals in the first cohort who were assigned to participate in *GBG* when they were in the first grade reported half the adjusted odds of suicidal ideation and

suicide attempts when assessed approximately 15 years later, between the ages of 19 to 21, compared to peers who had been in a standard classroom setting. The beneficial effect of the program was consistent for suicidal ideation regardless of whether baseline covariates were included.<sup>135</sup> The *GBG* effect on attempts was less robust in some adjusted models including caregiver mental health. In the second cohort of *GBG* students, neither suicidal ideation nor suicide attempts were significantly different between *GBG* and the control interventions.<sup>135</sup> The researchers believed this may have been due to a lack of implementation fidelity, including less mentoring and monitoring of teachers. *GBG* was also found to be associated with reduced risk of later substance abuse and other suicide risk factors among the first cohort of students. Results for the second cohort were generally smaller but in the desired direction.<sup>136</sup>

- **Parenting skill and family relationship programs.** Parenting and family skills training approaches have shown promising impacts in preventing key risk factors associated with suicide. For example, the *Incredible Years (IY)* is a comprehensive group training program for parents, teachers and children designed to reduce conduct and substance abuse problems, two important suicide risk factors in youth by improving protective factors such as responsive and positive parent-teacher-child interactions and relationships, emotion self-regulation and social competence (all protective factors for suicide).<sup>132</sup> The program includes 9-20 sessions offered in community-based settings (e.g., religious, recreation centers, mental health treatment centers, and hospitals). Several studies have demonstrated the effect of the *IY* program on reducing internalizing symptoms, such as anxiety and depression, and child conduct problems.<sup>137,138</sup> The program is also associated with improved problem-solving and conflict management; these skills were maintained at 1-year follow-up.<sup>139-141</sup> Additionally, the program demonstrated greater benefits in mother-rated child internalizing symptoms, compared to the waitlisted control group, when parent, child, and teacher components were included.<sup>132</sup>

Additionally, *Strengthening Families: For Parents and Youth 10-14* is a program that involves sessions for parents, youth, and families with the goal of improving parents' skills for disciplining, managing emotions and conflict, and communicating with their children; promoting youths' interpersonal and problem-solving skills; and creating family activities to build cohesion and positive parent-child interactions. The premise of the program is that developing these skills for both parents and children will reduce internalizing behavior and adolescent substance abuse, two important risk factors for suicide.<sup>142</sup> *Strengthening Families* has been shown to significantly decrease externalizing behaviors, such as aggression, alcohol use, and drug use among youth participants, as well as reduce depression, alcohol use, and drug use among participating families.<sup>142</sup>



## Identify and Support People At-Risk

### Rationale

In order to decrease suicide, care of, and attention to, vulnerable populations is necessary, as these groups tend to experience suicidal behavior at higher than average rates. Such vulnerable populations include, but are not limited to, individuals with lower socio-economic status or who are living with a mental health problem; people who have previously attempted suicide; Veterans and active duty military personnel; individuals who are institutionalized, have been victims of violence, or are homeless; individuals of sexual minority status; and members of certain racial and ethnic minority groups.<sup>8,9,12,13,143</sup> Supporting people at-risk requires proactive case finding and effective response, crisis intervention, and evidence-based treatment. Finding optimal ways of identifying at-risk individuals, customizing services to make them more accessible (e.g., Internet-based services when appropriate) and engaging people in evidence-based care (e.g. through such measures as collaborative treatment), remain key challenges.<sup>81,144,145</sup> Simply improving or expanding services does not guarantee that those services will be used by people most in need, nor will it necessarily increase the number of people who follow recommended referrals or treatment. For example, some people living in disadvantaged communities may face social and economic issues that can adversely affect their ability to access supportive services.<sup>70</sup>

### Approaches

The following approaches focus on identifying and supporting people at increased risk of suicide.

- **Gatekeeper training** is designed to train teachers, coaches, clergy, emergency responders, primary and urgent care providers, and others in the community to identify people who may be at risk of suicide and to respond effectively, including facilitating treatment seeking and support services. Gatekeeper training may be implemented in a variety of settings to identify and support people at risk.<sup>146</sup>
- **Crisis intervention.** These approaches provide support and referral services, typically by connecting a person in crisis (or a friend or family member of someone at-risk) to trained volunteers or professional staff via telephone hotline, online chat, text messaging, or in-person. Crisis intervention approaches are intended to impact key risk factors for suicide, including feelings of depression, hopelessness, and subsequent mental health care utilization.<sup>147</sup> Similar to means reduction, crisis interventions can put space or time between an individual who may be considering suicide and harmful behavior.
- **Treatment for people at-risk of suicide** can include various forms of psychotherapy delivered by licensed providers to help individuals with mental health problems and other suicide risk factors with problem-solving and emotion regulation. Treatment usually takes place in a one-on-one or

group format between patients and clinicians and can vary in duration from several weeks to ongoing therapy, as needed. Treatment that employs collaborative (i.e., between patient and therapist or care manager) and/or integrated care (e.g., linkage between primary care and behavioral health care) can help engage and motivate patients, thereby increasing retention in therapy and decreasing suicide risk.<sup>148-150</sup>

- **Treatment to prevent re-attempts.** These approaches typically include follow-up contact and use diverse modalities (e.g., home visits, mail, telephone, e-mail) to engage recent suicide attempt survivors in continued treatment to prevent re-attempts.<sup>151</sup> Treatment may focus on improved coping skills, mindfulness, and other emotional regulation skills, and may include case management home visits to increase adherence to treatment and continuity of care; and one-on-one interpersonal therapy and/or group therapy. Approaches that engage and connect attempters to peers and providers are especially important because many attempters do not present to aftercare; 12%-25% reattempt within a year, and 3%-9% of attempt survivors die by suicide within 1 to 5 years of their initial attempt.<sup>151</sup>

### Potential Outcomes

- Reductions in suicide attempts
- Reductions in suicide rates
- Reductions in suicide deaths
- Reductions in symptoms of mental illnesses
- Reductions in suicidal ideation
- Reductions in mental health-related sequelae
- Reductions in re-attempts
- Increases in connectedness
- Improvements in coping skills
- Increases in identification of individuals at-risk for suicidal behavior
- Increases in treatment engagement and compliance by at-risk individuals
- Increases in community members trained to identify at-risk individuals
- Increases in referrals for health care

### Evidence

The current evidence suggests that identifying people at risk of suicide and the continued provision of treatment and support for these individuals can positively impact suicide and its associated risk factors.

- **Gatekeeper training.** *Applied Suicide Intervention Skills Training (ASIST)* is a widely implemented training program that helps hotline counselors, emergency workers, and other gatekeepers to



identify and connect with suicidal individuals, understand their reasoning for living and dying, and assist with safely connecting those in need to available resources. In a study employing a randomized controlled trial, Gould, Cross, Pisani, Munfakh, & Kleinman<sup>152</sup> evaluated the training across the *National Suicide Prevention Lifeline* network of hotlines over the period 2008-2009. Using data from 1,410 suicidal individuals who called 17 Lifeline centers, the researchers found that callers who spoke with *ASIST*-trained counselors were significantly more likely to feel less depressed, less suicidal, less overwhelmed, and more hopeful by the end of their call, compared to callers who spoke to non-*ASIST* trained counselors. Counselors trained in *ASIST* were also more skilled at keeping callers on the phone longer and establishing a connection with them. However, training in *ASIST* did not result in more comprehensive suicide risk assessments than usual care training.<sup>152</sup>

Gatekeeper training has also been a primary component of the *Garret Lee Smith (GLS) Suicide Prevention Program*, which has been funded in 50 states and 50 tribes. A multi-site evaluation assessed the impact of community gatekeeper training on suicide attempts and deaths by comparing the change in suicide rates and nonfatal suicidal behavior among young people aged 10-24 in counties implementing *GLS* trainings, with the trajectory observed in similar counties that did not implement these trainings. Counties that implemented *GLS* trainings had significantly lower youth suicide rates one year following the training implementation.<sup>153</sup> This finding equates to a decrease of 1 suicide death per 100,000 among youth ages 10 to 24, or the prevention of approximately 237 deaths in the age group, between 2007 and 2010. Counties implementing *GLS* program activities also had significantly lower suicide attempt rates among youth ages 16 to 23 in the year following implementation of the *GLS* program than did similar counties that did not implement *GLS* activities (4.9 fewer attempts per 1000 youths).<sup>154</sup> More than 79,000 suicide attempts may have been prevented during the period examined.

- **Crisis intervention.** Suicide prevention hotlines are one way to provide crisis intervention. In an evaluation of the effectiveness of the *National Suicide Prevention Lifeline* to prevent suicide, 1,085 suicidal individuals who called the hotline completed a standard risk assessment for suicide, and 380 of those completed a follow-up assessment between 1 and 52 days (mean=13.5 days) after the initial assessment. Researchers found that over half of the initial sample were seriously considering suicide when they called, and they had a plan for their suicide. Researchers also found that among follow-up participants, there was a significant decrease in psychological pain, hopelessness, and intent to die between initiation of the call (time 1) to follow-up (time 3).<sup>155</sup> Between time 2 (end of the call) to time 3, the effect remained for psychological pain and hopelessness, but was not significant for intent to die, suggesting that greater effort at outreach during and following the call is needed for the callers with high levels of suicide intent.<sup>155</sup>

- **Treatment for people at-risk of suicide.** The *Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)* program aims to prevent suicide among older primary care patients by reducing suicide ideation and depression. *IMPACT* facilitates the development of a therapeutic alliance, a personalized treatment plan that includes patient preferences, as well as proactive follow-up (biweekly during an acute phase and monthly during continuation phase) by a depression care manager.<sup>156</sup> The program has been shown to significantly improve quality of life, and to reduce functional impairment, depression and suicidal ideation over 24-months of follow-up<sup>156,157</sup> relative to patients who received care as usual.

*Collaborative Assessment and Management of Suicidality (CAMS)*, is a therapeutic approach for suicide-specific assessment and treatment. The program's flexible approach can be used across treatment settings and clinician theoretical orientations and involves the clinician and patient working together in an interactive assessment process to develop patient-specific treatment plans. Sessions are collaborative and involve constant patient input about what is and is not working with the ultimate goal of enhancing the therapeutic alliance and increasing treatment motivation in the suicidal patient. *CAMS* has been tested and supported in 6 correlational studies,<sup>144</sup> in a variety of inpatient and outpatient settings, and in one RCT with several additional RCTs under way. A feasibility trial with a community-based sample of suicidal outpatients randomly assigned to *CAMS* or enhanced care as usual (intake with a psychiatrist or psychiatric nurse practitioner followed by 1-11 visits with a case manager and medication as needed) found better treatment retention among the *CAMS* group and significant improvements in suicidal ideation, overall symptom distress, and feelings of hopelessness at the 12 month follow-up.<sup>158</sup>

Other examples include *Dialectical Behavioral Therapy (DBT)* and *Attachment-Based Family Therapy (ABFT)*. *DBT* is a multicomponent therapy for individuals at high risk for suicide and who may struggle with impulsivity and emotional regulation issues. The components of *DBT* include individual therapy, group skills training, between-session telephone coaching and a therapist consultation team. In a randomized controlled trial of women with recent suicidal or self-injurious behavior, those receiving *DBT* were half as likely to make a suicide attempt at two-year follow-up than women receiving community treatment (23% vs 46%), required less hospitalization for suicide ideation, and had lower medical risk across all suicide attempts and self-injurious acts combined.<sup>159</sup>

*ABFT* is a program for adolescents aged 12-18 and is designed to treat clinically diagnosed major depressive disorder, eliminate suicidal ideation, and reduce dispositional anxiety.<sup>160</sup> A randomized controlled trial of *ABFT* found that suicidal adolescents assigned to *ABFT* experienced significantly greater improvement in suicidal ideation over 24 weeks of follow-up than did adolescents assigned to enhanced usual care. Additionally, a significantly higher percentage of *ABFT* participants reported no suicidal ideation in the week prior to assessment at 12 weeks than



did adolescents receiving enhanced usual care (69.2% vs. 34.6%) and at 24 weeks (82.1% vs. 46.2%).<sup>160</sup>

The Veterans Affairs *Translating Initiatives for Depression into Effective Solutions* project (*TIDES*) uses a depression care liaison to link primary care and mental health services. The depression care liaison assesses and educates patients and follows up with both patients and providers between primary care visits to optimize treatment. This collaborative care increases the efficiency of providing mental health services by bringing mental health care to the primary care setting, where most patients are first detected and subsequently treated for many mental health conditions. An evaluation of *TIDES* found significant decreases in depression severity scores among 70% of primary care patients.<sup>161</sup> *TIDES* also demonstrated 85% and 95% compliance with medication and follow-up visits, respectively.<sup>161</sup>

- **Treatment to prevent re-attempts.** Several strategies that aim to prevent re-attempts have demonstrated impact on reducing suicide deaths. For example, *Emergency Department Brief Intervention with Follow-up Visits* is a program that involves a one-hour discharge information session that addresses suicidal ideation and attempts, distress, risk and protective factors, alternatives to self-harm, and referral options, combined with nine follow-up contacts over 18 months (at 1, 2, 4, 7, 11 weeks and 4, 6, 12, 18 months). Follow-up contacts are either conducted by phone or through home visits according to a specific timeline for up to 18 months. A randomized controlled trial that enrolled suicide attempters from eight hospital emergency departments in five countries (Brazil, India, Sri Lanka, Iran, and China) found that a brief intervention combined with nine follow-up visits over 18 months was associated with significantly fewer deaths from suicide relative to a treatment-as-usual group (0.2% versus 2.2%, respectively).<sup>162</sup>

Another example of treatment to prevent re-attempts involves *active follow-up contact approaches* such as postcards, letters, and telephone calls intended to increase a patient's sense of connectedness with health care providers and decrease isolation.<sup>151</sup> These approaches include expression of care and support and typically invite patients to reconnect with their provider. Contacts are made periodically (e.g., monthly or every few months in the first 12 months post-discharge with some programs continuing contact for two or more years). In a meta-analysis conducted by Inagaki et al<sup>151</sup> interventions to prevent repeat suicide attempts in patients admitted to an emergency department for suicide attempt were found to reduce reattempts by approximately 17% for up to 12 months post-discharge; however, the effects of these approaches beyond 12 months on reattempts has not yet been demonstrated.<sup>151</sup> Also, because the number of trials and associated sample sizes included in this meta-analysis were small, it was not possible to determine the effect of active contact and follow-up approaches on death by suicide.

In a randomized controlled trial of the post-crisis suicide prevention long-term follow-up contact approach, Motto, Bostrom <sup>163</sup> found that patients who refused ongoing care but who were randomized to be contacted by letter four times per year had a lower rate of suicide over two years of follow-up than did patients in the control group who received no further contact. Other studies have also shown post-crisis letters and coping cards to be protective against suicide ideation and attempts.<sup>164,165</sup>

Finally, *Cognitive Behavior Therapy for Suicide Prevention (CBT-SP)* is an example of a therapeutic approach to prevent re-attempts. It uses a risk-reduction, relapse prevention approach that includes an analysis of proximal risk factors and stressors (e.g., relationship problems, school or work-related difficulties) leading up to and following the suicidal event; safety plan development; skill building; and psychoeducation. *CBT-SP* also has family skill modules focused on family support and communication patterns as well as improving the family's problem solving skills. A randomized controlled trial of *CBT-SP* found that 10-session outpatient cognitive therapy designed to prevent repeat suicide attempts resulted in a 50% reduction in the likelihood of a suicide reattempt among adults who had been admitted to an emergency department for a suicide attempt relative to treatment as usual.<sup>166</sup>



## Lessen Harms and Prevent Future Risk

### Rationale

Millions of people are bereaved by suicide every year in the United States and throughout the world.<sup>5</sup> Risk of suicide and suicide risk factors has been shown to increase among people who have lost a friend/peer, family member, co-worker, or other close contact to suicide.<sup>167</sup> Care and attention to the bereaved is therefore of high importance. Despite often good intentions, media and others responding to suicide may add to this risk. For example, research suggests that exposure to sensationalized or otherwise uninformed reporting on suicide may heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to what is known as suicide contagion.<sup>168,169</sup> While the evidence is still being built in this area, particularly with regard to the impact of policy and practices on suicide and suicide attempts in the United States, measures to care for the bereaved population through such means as postvention interventions (e.g. counseling, support groups and debriefing sessions) and safe reporting on suicide have shown impacts in other countries.

### Approaches

Some approaches that can be used to lessen harms and reduce future risk of suicide include caring for the bereaved and safe reporting following a suicide.

- **Postvention** approaches are implemented *after* a suicide has taken place and may include debriefing sessions, counseling, and/or bereavement support groups for surviving friends and family members/loved ones. These programs have not typically been evaluated for their impact on suicide or suicidal behavior but may reduce survivors' guilt, feelings of depression, and complicated grief.<sup>170</sup>
- **Safe reporting and messaging about suicide.** The manner in which information on a recent suicide is communicated to the public (e.g. school assemblies, mass media, social media) can heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to suicide contagion. Reports that are inclusive of suicide prevention messages, stories of hope and resilience, risk and protective factors, and links to helping resources (e.g., hotline), and that avoid sensationalizing events or reducing suicide to one cause, can help reduce the likelihood of suicide contagion.<sup>171</sup>

### Potential Outcomes

- Reductions in suicidal ideation
- Reductions in suicide attempts

- Reductions in psychological distress
- Increases in treatment seeking and engagement
- Improvements in reporting following suicide
- Reductions in contagion effects related to suicide

## Evidence

Current evidence suggests that lessening harm through postvention and safe reporting and messaging can impact risk and protective factors for suicide.

- **Postvention** programs are implemented with the goal of providing support to survivors of others' suicide to reduce their own risk of suicide. One example of a postvention program, *StandBy Response Service (StandBy)*, provides clients with face-to-face outreach and telephone support through a professional crisis response team. Site coordinators develop customized case management plans, referring clients to other existing community services matched to their needs.<sup>172</sup> In a study by Visser, Comans, and Scuffham,<sup>172</sup> *StandBy* clients were significantly less likely to be at high risk for suicidality (suicide ideation and attempts) and had less psychological distress than a suicide bereaved comparison group who had not had contact with the *StandBy* program (48% and 64% respectively). Additionally, research suggests that active postvention approaches in which outreach to suicide survivors occurs at the scene of a suicide is associated with intake into treatment sooner, greater attendance at support group meetings, and attendance at more meetings compared to passive postvention (versus passive approaches where survivors self-refer for services).<sup>173</sup>
- **Safe reporting and messaging about suicide.** One way to ensure safe reporting and messaging about suicide is to encourage news media adhere to *Recommendations for Reporting on Suicide* (<http://www.reportingonsuicide.org>). The most compelling evidence supporting these recommendations for reporting comes from Austria. After a sharp increase in suicides on the Viennese subway, media guidelines were introduced and an interrupted time series design was used to evaluate the national impact of the guidelines on subsequent suicides. Changes in the quality and quantity of media reporting resulted in a nationwide significant reduction of 81 suicides annually.<sup>169</sup> Finally, research suggests that not only does reporting on suicide in a negative way (e.g., reporting on suicide myths and repetition) have harmful effects on suicide, but reporting on positive coping skills in the face of adversity can also demonstrate protective effects against suicide.<sup>174</sup> Reports of individual suicidal ideation not accompanied by reports of suicide or suicide attempts, along with reports describing a “mastery” of a crisis situation where adversities were overcome, was associated with significant decreases in suicide rates in the time period immediately following such reports.<sup>174</sup>



## Sector Involvement

Public health can play an important and unique role in addressing suicide. Public health agencies, which typically place prevention at the forefront of efforts and work to create broad population-level impact, can bring critical leadership and resources to bear on this problem. For example, these agencies can serve as a convener, bringing together partners and stakeholders to plan, prioritize, and coordinate suicide prevention efforts. Public health agencies are also well positioned to collect and disseminate data, implement preventive measures, evaluate programs, and track progress. Although public health can play a leadership role in preventing suicide, the strategies and approaches outlined in this technical package cannot be accomplished by the public health sector alone. As noted in the *National Strategy for Suicide Prevention*,<sup>1</sup> the integration and coordination of prevention activities across sectors and settings is critical for expanding the reach and impact of suicide prevention efforts.

Other sectors vital to implementing this package include, but are not limited to, education, government (local, state, and federal), social services, health services, business, labor, justice, housing, media, and organizations that comprise the civil society sector such as faith-based organizations, youth-serving organizations, foundations, and other non-governmental organizations. Collectively, these sectors can make a difference in preventing suicide by impacting the various contexts and underlying risks that contribute to suicide.

The strategies and approaches described in this technical package are summarized in Appendix A along with the relevant sectors that are well positioned to lead implementation efforts. For example, business and labor, the health sector (including insurers, providers, and health systems), and government entities are in the best position to implement programs and policies that *Strengthen Economic Supports* and *Strengthen Access and Delivery of Suicide Care*. These types of supports go beyond individual behavior change and require commitment and support from those sectors that can directly address some of the underlying risks and the environmental contexts that increase the risk for suicide. Public health entities can play an important role by gathering and synthesizing information to inform policy, raise awareness, and evaluate the effectiveness of various policies. Moreover, partnerships with non-governmental and community organizations can be instrumental in increasing awareness of and garnering support for policies affecting individuals and families.

The public health sector has been at the forefront of many community-based prevention efforts, working collaboratively with schools and community-based organizations, to change social norms and positively impact health behavior. Public health is well suited to take on a similar leadership role in *Promoting Connectedness* through peer norm and community engagement activities and supporting the development, evaluation, and adoption of effective programs that *Teach Coping and Problem-Solving Skills* to prevent suicide from happening in the first place. These programs are often delivered in school and community settings, making education and non-governmental organizations vital partners in prevention.

Businesses, workplaces, and local and state government entities, on the other hand, are in the best position to establish policies and support practices that *Create Protective Environments* where people live, work, and play. Public health entities can play an important role by gathering and synthesizing information, working with other governmental agencies (e.g., criminal justice, defense) and agencies within the executive branch of their state or local government in support of policy and other approaches, and evaluating the effectiveness of measures taken. In a similar fashion, public health entities can partner with schools, workplaces, and community organizations to implement and evaluate prevention programs, policies and practices geared toward creating safe, healthy, and supportive environments.

Finally, this technical package includes a number of interventions delivered in hospital, primary care, behavioral health care, and community settings designed to *Identify and Support People At-Risk*. The intensity and activities for many of these interventions require the expertise of professionals who are licensed and trained to deliver critical intervention support. The health, social services, and justice sectors can work collaboratively to support individuals at high-risk for suicide and their families. These activities also require coordination of supports across various service providers and community organizations.

Regardless of strategy, action by many sectors will be necessary for the successful implementation of this package. In this regard, all sectors can play an important and influential role in preventing suicide from happening in the first place and lessening the immediate and long-term harms of suicidal behavior by helping those in times of crisis get the services and support they need.



## Monitoring and Evaluation

Monitoring and evaluation are necessary components of the public health approach to prevention. It is important to have timely and reliable data to monitor the extent of the problem and to evaluate the impact of prevention efforts. Data are also necessary for prevention planning and implementation.

Gathering ongoing and systematic data is important for prevention efforts. However, it is also important to gather data that are uniform and consistent across systems. Consistent data allow public health and other entities to better gauge the scope of the problem, identify high-risk groups, and monitor the effects of prevention programs and policies. Currently, it is common for different sectors, agencies, and organizations to employ varying definitions of suicidal ideation, behavior, and death that can make it difficult to consistently monitor specific outcomes across sectors and over time. For example, the manner in which deaths are classified can change from one jurisdiction to another, and can change based on local medical and/or medicolegal standards.<sup>4</sup> CDC's uniform definitions and recommended data elements for self-directed violence provide a useful framework to help ensure that data are collected in a consistent manner across surveillance systems.<sup>4</sup>

Surveillance systems exist at the federal, state, and local levels. It is important to assess the availability of surveillance data and data systems across these levels to identify and address gaps in the systems. CDC's *National Vital Statistics System (NVSS)*<sup>7</sup> and the *National Violent Death Reporting System (NVDRS)*<sup>175</sup> are examples of surveillance systems that provide data on deaths from suicide. NVSS is a nationwide surveillance system that collects demographic, geographic, and cause-of-death data from death certificates.<sup>7</sup> NVDRS is a state-based surveillance system (currently in 40 states, the District of Columbia, and Puerto Rico) that combines data from death certificates, law enforcement reports, and coroner or medical examiner reports to provide detailed information on the circumstances of violent deaths, including suicide, which can assist communities in guiding prevention approaches.<sup>175</sup> Data from state and local Child Death Review teams<sup>176</sup> and Suicide Death Review Teams (which are in a few states) offer another source to identify deaths and obtain insight into the gaps in services, systems, and modifiable risk factors for suicide.

The *National Electronic Injury Surveillance System-All Injury Program (NEISS-AIP)* provides nationally representative data about all types and causes of nonfatal injuries treated in U.S. hospital emergency departments, and can be used to assess national rates of, and trends in, self-harm injuries by cause (e.g., falls, poisoning, etc.), age, race/ethnicity, sex, disposition (where the injured person goes when released from the Emergency Department).<sup>6</sup>

In addition to information on deaths and nonfatal injuries, there are also surveillance systems that provide national, state, and some local estimates of suicidal behavior. The *Youth Risk Behavior Surveillance System (YRBSS)* collects information from a nationally representative sample of 9-12 grade students and is a key resource in monitoring health-risk behaviors among youth, including whether youth



have seriously considered attempting suicide, attempted suicide, made a plan, or required treatment by a doctor or nurse for a suicide attempt that resulted in an injury, poisoning, or overdose.<sup>177</sup> The YRBSS data are obtained from a national school-based survey conducted by CDC as well as from state, territorial, tribal, and large urban school district surveys conducted by education and health agencies.<sup>177</sup> The *National Survey on Drug Use and Health (NSDUH)*<sup>50</sup> is an annual survey of the civilian, non-institutionalized population aged 12 years and older. *NSDUH* provides both national and state-level estimates of substance use (alcohol, tobacco, illicit drugs, and non-medical use of prescription drugs); mental health (past year mental illness, co-occurring illnesses); and service utilization, along with suicide ideation, suicide plans, and suicide attempts. *NSDUH* is a key resource to track trends in suicide-related risk factors in the population and to help identify groups at increased risk.<sup>50</sup>

It is also important at all levels (local, state, and federal) to address gaps in responses, track progress of prevention efforts and evaluate the impact of those efforts, including the impact of this technical package. Evaluation data, produced through program implementation and monitoring, is essential to provide information on what does and does not work to reduce rates of suicide and its associated risk and protective factors. Theories of change and logic models that identify short, intermediate, and long-term outcomes are an important part of program evaluation.

The evidence-base for suicide prevention has advanced greatly over the last few decades. However, additional research is needed to understand the impact of programs, policies, and practices on suicide (and suicide attempts, at a minimum), as opposed to merely examining their effectiveness on risk factors. More research is also needed to examine the effectiveness of primary prevention strategies (before risk occurs) and community-level strategies to prevent suicide at the population level. It will be important for researchers to test the effectiveness of combinations of the strategies and approaches included in this package. Most existing evaluations focus on approaches implemented in isolation, but there is potential to understand the synergistic effects within a comprehensive prevention approach. Lastly, there are also many potential opportunities to build and strengthen partnerships across program areas (e.g., violence prevention, substance abuse prevention) to evaluate the impact of different approaches on multiple outcomes.

## Conclusion

Suicide is a serious public health problem whose rates have been on the rise for more than a decade and whose costs stretch well into the billions of dollars each year. While suicide is a rare outcome statistically, its human impact has a ripple effect that is far-reaching. Each of us likely interacts with suicide survivors, those with lived experience, and those with thoughts of suicide on a daily basis – at home, at work, and in our communities. Suicide and suicide attempts are public health issues of societal concern. There are a number of barriers that have impeded progress, including, for example, stigma related to help-seeking, mental illness, being a survivor and fear related to asking someone about suicidal thoughts. Fortunately,



like many public health problems, suicide is preventable,<sup>1,5</sup> and more is being done to prevent suicide than ever before, as evidenced by the work of the National Action Alliance for Suicide Prevention,<sup>39,40,75,88</sup> the release of the first world report on suicide,<sup>5</sup> and more timely surveillance data, to name just a few examples.

In an effort to continue pushing the field and society further towards prevention, this technical package includes strategies and approaches that ideally would be used in a comprehensive, multi-level and multi-sectoral way. It includes strategies and approaches to prevent suicide from occurring in the first place, as well as strategies focused on lessening the immediate and long-term harms of suicidal behavior. It includes strategies that range from a focus on the whole population regardless of risk to strategies designed to support people at highest risk. Importantly, this technical package extends the bounds of the typical prevention strategies to consider approaches that go beyond individual behavior change to better address risk factors impacting communities and populations more broadly (e.g., economic policies to strengthen housing and financial security).

While the evidence base continues to emerge, the collection of programs, policies, and practices laid out here are available for implementation now. In keeping with good public health practice, the intent is that monitoring and evaluation will play a key role in that implementation. Moreover, as new evidence becomes available, this technical package can be refined to reflect the current state of the science.

In closing, and in keeping with a message of resilience as spoken by those with lived experience, ‘hope, help, and healing is possible.’

## References

1. U.S. Office of the Surgeon General, National Action Alliance for Suicide Prevention. 2012 National Strategy for Suicide Prevention: Goals and Objectives for Action. Washington, D.C.: HHS; 2012.
2. National Action Alliance for Suicide Prevention. Action Alliance Priorities. 2017; <http://actionallianceforsuicideprevention.org/priorities>.
3. Frieden TR. Six components necessary for effective public health program implementation. *Am J Public Health*. 2014;104(1):17-22.
4. Crosby AE, Ortega L, Melanson C. Self-directed Violence Surveillance: Uniform Definitions and Recommended Data Elements, Version 1.0. Atlanta, GA: Centers for Disease Control and Prevention, National Center for Injury Prevention and Control; 2011.
5. World Health Organization. Suicide Prevention: A Global Imperative. Geneva, Switzerland: WHO Press; 2014.
6. Centers for Disease Control and Prevention. Web-Based Injury Statistics Query and Reporting System (WISQARS). Atlanta, GA: National Center for Injury Prevention and Control. Available online: <http://www.cdc.gov/injury/wisqars/index.html>.
7. Centers for Disease Control and Prevention, National Center for Health Statistics. National Vital Statistics System. <https://www.cdc.gov/nchs/nvss/deaths.htm>.
8. Bachynski KE, Canham-Chervak M, Black SA, Dada EO, Millikan AM, Jones BH. Mental health risk factors for suicides in the US Army, 2007–8. *Inj Prev*. 2012;18(6):405-412.
9. Lineberry TW, O'Connor SS. Suicide in the US Army. *Mayo Clinic Proceedings*. 2012;87(9):871-878.
10. McIntosh WL, Spies E, Stone DM, Lokey CN, Trudeau AR, Bartholow B. Suicide Rates by Occupational Group - 17 States, 2012. *MMWR Morb Mortal Wkly Rep*. 2016;65(25):641-645.
11. Han B, Crosby AE, Ortega LA, Parks SE, Compton WM, Gfroerer J. Suicidal ideation, suicide attempt, and occupations among employed adults aged 18–64 years in the United States. *Compr Psychiatry*. 2016;66:176-186.
12. Kann L, McManus T, Harris WA, et al. Youth Risk Behavior Surveillance - United States, 2015. *MMWR CDC Surveill Summ*. 2016;65(6):1-174.
13. Russell ST, Joyner K. Adolescent sexual orientation and suicide risk: Evidence from a national study. *Am J Public Health*. 2001;91(8):1276-1281.
14. Stone DM, Luo F, Ouyang L, Lippy C, Hertz MF, Crosby AE. Sexual orientation and suicide ideation, plans, attempts, and medically serious attempts: evidence from local Youth Risk Behavior Surveys, 2001-2009. *Am J Public Health*. 2014;104(2):262-271.
15. Crosby AE, Han B, Ortega LA, Parks SE, Gfroerer J. Suicidal thoughts and behaviors among adults aged ≥18 years--United States, 2008-2009. *MMWR CDC Surveill Summ*. 2011;60(13):1-22.
16. Lipari R, Piscopo K, Kroutil LA, Kilmer Miller G. Suicidal thoughts and behavior among adults: Results from the 2014 National Survey on Drug Use and Health. *NSDUH Data Review* 2015; <https://www.samhsa.gov/data/sites/default/files/NSDUH-FRR2-2014/NSDUH-FRR2-2014.pdf>.
17. Dahlberg LL, Krug EG. Violence-a global public health problem. In: Krug E, Dahlberg LL, Mercy JA, Zwi AB, Lozano R, eds. *World Report on Violence and Health*. Geneva, Switzerland: World Health Organization; 2002:1-56.
18. Owens D. Fatal and non-fatal repetition of self-harm: Systematic review. *Br J Psychiatry*. 2002;181(3):193-199.
19. Olfson M, Gerhard T, Huang C, Crystal S, Stroup TS. Premature Mortality Among Adults With Schizophrenia in the United States. *JAMA Psychiatry*. 2015;72(12):1172-1181.
20. Bossarte RM, Karras E, Lu N, et al. Associations between the Department of Veterans Affairs' suicide prevention campaign and calls to related crisis lines. *Public Health Rep (Washington, D.C. : 1974)*. 2014;129(6):516-525.



21. Chapman DP, Whitfield CL, Felitti VJ, Dube SR, Edwards VJ, Anda RF. Adverse childhood experiences and the risk of depressive disorders in adulthood. *J Affect Disord.* 2004;82(2):217-225.
22. Dube SR, Anda RF, Felitti VJ, Chapman DP, Williamson DF, Giles WH. Childhood abuse, household dysfunction, and the risk of attempted suicide throughout the life span: findings from the Adverse Childhood Experiences Study. *JAMA.* 2001;286(24):3089-3096.
23. Felitti VJ, Anda RF, Nordenberg D, et al. Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: The Adverse Childhood Experiences (ACE) Study. *Am J Prev Med.* 1998;14(4):245-258.
24. Klomek AB, Sourander A, Gould M. The association of suicide and bullying in childhood to young adulthood: a review of cross-sectional and longitudinal research findings. *Can J Psychiatry.* 2010;55(5):282-288.
25. Leeb RT, Lewis T, Zolotor AJ. A review of physical and mental health consequences of child abuse and neglect and implications for practice. *American Journal of Lifestyle Medicine.* 2011;5(5):454-468.
26. World Health Organization. Global and Regional Estimates of Violence Against Women: Prevalence and Health Effects of Intimate Partner Violence and Non-Partner Sexual Violence. Geneva: World Health Organization; 2013.
27. Bellis MA, Hughes K, Leckenby N, et al. Adverse childhood experiences and associations with health-harming behaviours in young adults: surveys in eight eastern European countries. *Bull World Health Organ.* 2014;92(9):641-655.
28. Haegerich TM, Dahlberg LL. Violence as a public health risk. *American Journal of Lifestyle Medicine.* 2011;5(5):392-406.
29. Wilkins N, Tsao B, Hertz M, Davis R, Klevens J. Connecting the dots: An overview of the links among multiple forms of violence. Atlanta, GA: National Center for Injury Prevention and Control, Centers for Disease Control and Prevention; 2014.
30. Hamby S, Grych J. The web of violence: exploring connections among different forms of interpersonal violence and abuse. *Briefs in Sociology.* New York, NY: Springer; 2013.
31. Kleiman EM, Riskind JH, Schaefer KE, Weingarden H. The moderating role of social support on the relationship between impulsivity and suicide risk. *Crisis.* 2012;33(5):273-279.
32. Carter M, McGee R, Taylor B, Williams S. Health outcomes in adolescence: associations with family, friends and school engagement. *J Adolesc.* 2007;30(1):51-62.
33. Maimon D, Browning CR, Brooks-Gunn J. Collective efficacy, family attachment, and urban adolescent suicide attempts. *J Health Soc Behav.* 2010;51(3):307-324.
34. Capaldi DM, Knoble NB, Shortt JW, Kim HK. A Systematic Review of Risk Factors for Intimate Partner Violence. *Partner Abuse.* 2012;3(2):231-280.
35. Losel F, Farrington DP. Direct protective and buffering protective factors in the development of youth violence. *Am J Prev Med.* 2012;43(2 Suppl 1):S8-S23.
36. Wyman PA, Brown CH, LoMurray M, et al. An outcome evaluation of the Sources of Strength suicide prevention program delivered by adolescent peer leaders in high schools. *Am J Public Health.* 2010;100(9):1653-1661.
37. Dunne EJ, McIntosh JL, Dunne-Maxim K, eds. *Suicide and its aftermath: Understanding and counseling the survivors.* New York: Norton; 1987.
38. Mishara BL. *The Impact of Suicide.* New York: Springer; 1995.
39. National Action Alliance for Suicide Prevention: Suicide Attempt Survivors Task Force. *The Way Forward: Pathways to hope, recovery, and wellness with insights from lived experience.* Washington, D.C. : Author; 2014.
40. National Action Alliance for Suicide Prevention: Survivors of Suicide Loss Task Force. *Responding to Grief, Trauma, and Distress After a Suicide: U.S. National Guidelines.* Washington, D.C. : Author; 2015.

41. Crosby AE, Sacks JJ. Exposure to suicide: incidence and association with suicidal ideation and behavior: United States, 1994. *Suicide Life Threat Behav.* 2002;32(3):321-328.
42. Cerel J, Maple M, De Venne A, Moore M, Flaherty C, Brown M. Exposure to Suicide in the Community: Prevalence and Correlates in One US State. *Public Health Rep (Washington, D.C. : 1974).* 2016;131(1):100-107.
43. Chapman AL, Dixon-Gordon KL. Emotional antecedents and consequences of deliberate self-harm and suicide attempts. *Suicide Life Threat Behav.* 2007;37(5):543-552.
44. Mitchell AM, Kim Y, Prigerson HG, Mortimer-Stephens M. Complicated grief in survivors of suicide. *Crisis.* 2004;25(1):12-18.
45. Sudak H, Maxim K, Carpenter M. Suicide and stigma: a review of the literature and personal reflections. *Acad Psychiatry.* 2008;32(2):136-142.
46. Cerel J, McIntosh JL, Neimeyer RA, Maple M, Marshall D. The Continuum of "Survivorship": Definitional Issues in the Aftermath of Suicide. *Suicide Life Threat Behav.* 2014;44(6):591-600.
47. Florence C, Simon T, Haegerich T, Luo F, Zhou C. Estimated lifetime medical and work-loss costs of fatal injuries-United States, 2013. *MMWR Morb Mortal Wkly Rep.* 2015;64(38):1074-1077.
48. Shepard DS, Gurewich D, Lwin AK, Reed GA, Jr., Silverman MM. Suicide and Suicidal Attempts in the United States: Costs and Policy Implications. *Suicide Life Threat Behav.* 2016;46(3):352-362.
49. Silverman MM, Maris RW. The prevention of suicidal behaviors: An overview. *Suicide Life Threat Behav.* 1995;25(1):10-21.
50. Substance Abuse and Mental Health Services Administration, Center for Behavioral Health Statistics and Quality. National Survey on Drug Use and Health. 2016; [https://nsduhwebesn.rti.org/respweb/project\\_description.html](https://nsduhwebesn.rti.org/respweb/project_description.html).
51. Desai RA, Dausey DJ, Rosenheck RA. Mental health service delivery and suicide risk: the role of individual patient and facility factors. *Am J Psychiatry.* 2005;162(2):311-318.
52. Turecki G. Epigenetics and suicidal behavior research pathways. *Am J Prev Med.* 2014;47(3):S144-S151.
53. Edwards RW, Jumper-Thurman P, Plested BA, Oetting ER, Swanson L. Community readiness: Research to practice. *Journal of Community Psychology.* 2000;28(3):291-307.
54. Hawkins JD, Catalano RF, Kuklinski MR. Communities that care. *Encyclopedia of Criminology and Criminal Justice*: Springer; 2014:393-408.
55. Plested BA, Edwards RW, Jumper-Thurman P. Community readiness: A handbook for successful change. *Fort Collins, CO: Tri-Ethnic Center for Prevention Research.* 2006.
56. Luo F, Florence CS, Quispe-Agnoli M, Ouyang L, Crosby AE. Impact of business cycles on US suicide rates, 1928-2007. *Am J Public Health.* 2011;101(6):1139-1146.
57. Fowler KA, Gladden RM, Vagi KJ, Barnes J, Frazier L. Increase in suicides associated with home eviction and foreclosure during the US housing crisis: findings from 16 National Violent Death Reporting System States, 2005-2010. *Am J Public Health.* 2015;105(2):311-316.
58. Stack S, Wasserman I. Economic strain and suicide risk: a qualitative analysis. *Suicide Life Threat Behav.* 2007;37(1):103-112.
59. Cylus J, Glymour MM, Avendano M. Do generous unemployment benefit programs reduce suicide rates? A state fixed-effect analysis covering 1968-2008. *Am J Epidemiol.* 2014;180(1):45-52.
60. Classen TJ, Dunn RA. The effect of job loss and unemployment duration on suicide risk in the United States: a new look using mass-layoffs and unemployment duration. *Health Econ.* 2012;21(3):338-350.
61. Flavin P, Radcliff B. Public policies and suicide rates in the American states. *Social Indicators Research.* 2009;90(2):195-209.
62. U.S. Department of Housing and Urban Development. Neighborhood Stabilization Program. <https://www.hudexchange.info/programs/nsp/>, 2017.
63. Houle JN, Light MT. The home foreclosure crisis and rising suicide rates, 2005 to 2010. *Am J Public Health.* 2014;104(6):1073-1079.



64. Arsenault-Lapierre G, Kim C, Turecki G. Psychiatric diagnoses in 3275 suicides: a meta-analysis. *BMC Psychiatry*. 2004;4:37.
65. Harris EC, Barraclough B. Suicide as an outcome for mental disorders. A meta-analysis. *Br J Psychiatry*. 1997;170:205-228.
66. Tyrer P, Reed GM, Crawford MJ. Classification, assessment, prevalence, and effect of personality disorder. *Lancet*. 2015;385(9969):717-726.
67. Harris EC, Barraclough B. Excess mortality of mental disorder. *Br J Psychiatry*. 1998;173:11-53.
68. Mark TL, Shern DL, Bagalman JE, Cao Z. Ranking America's mental health: An analysis of depression across the states. Alexandria, VA: Mental Health America. 2007.
69. Lang M. The impact of mental health insurance laws on state suicide rates. *Health Econ*. 2013;22(1):73-88.
70. Wang PS, Demler O, Kessler RC. Adequacy of treatment for serious mental illness in the United States. *Am J Public Health*. 2002;92(1):92-98.
71. Cunningham PJ. Beyond parity: primary care physicians' perspectives on access to mental health care. *Health Aff (Millwood)*. 2009;28(3):w490-501.
72. Coffey CE. Building a system of perfect depression care in behavioral health. *Jt Comm J Qual Patient Saf*. 2007;33(4):193-199.
73. The Paul Wellstone and Pete Domenici Mental Health Parity and Addiction Equity Act of 2008 (MHPEA), HR 1424, 110<sup>th</sup> Congress. 2008.
74. U.S. Department of Health and Human Services Health Resources and Services Administrations. Designated Health Professional Shortage Areas Statistics, As of November 4, 2016. 2016.
75. National Action Alliance for Suicide Prevention: Clinical Workforce Preparedness Task Force. *Suicide prevention and the clinical workforce: Guidelines for training*. Washington, D.C.: Author; 2014.
76. Harris KM, Carpenter C, Bao Y. The effects of state parity laws on the use of mental health care. *Med Care*. 2006;44(6):499-505.
77. Health Resources & Services Administration. National Health Service Corps. 2017; <https://www.nhsc.hrsa.gov/>.
78. U.S. Department of Health and Human Services Health Resources and Services Administrations. National Health Service Corp Clinician Retention: A Story of Dedication and Commitment. 2016.
79. Hailey D, Roine R, Ohinmaa A. The effectiveness of telemental health applications: a review. *The Can J Psychiatry*. 2008;53(11):769-778.
80. Mohr DC, Vella L, Hart S, Heckman T, Simon G. The effect of telephone-administered psychotherapy on symptoms of depression and attrition: A meta-analysis. *Clinical Psychology: Science and Practice*. 2008;15(3):243-253.
81. Coffey CE. Pursuing perfect depression care. *Psychiatr Serv*. 2006;57(10):1524-1526.
82. Coffey CE, Coffey MJ, Ahmedani BK. An update on perfect depression care. *Psychiatr Serv*. 2013;64(4):396.
83. Coffey M, Coffey C, Ahmedani BK. Suicide in a health maintenance organization population. *JAMA Psychiatry*. 2015;72(3):294-296.
84. Haddon W. Advances in the epidemiology of injuries as a basis for public policy. *Public Health Rep*. 1980;95(5):411-421.
85. Toosi M. Labor force projections to 2024: The labor force is growing, but slowly. Washington, D.C.: Bureau of Labor Statistics; *Monthly Labor Review*. 2015:1-33.
86. Noonan ME. Mortality in State Prisons, 2001-2014 *Bureau of Justice Statistical Tables*. 2016;250150(December).
87. Knox KL, Pflanz S, Talcott GW, et al. The US Air Force suicide prevention program: implications for public health policy. *Am J Public Health*. 2010;100(12):2457-2463.

88. National Action Alliance for Suicide Prevention Workplace Task Force. *Comprehensive Blueprint for Workplace Suicide Prevention*. Washington, D.C. : Author; 2015.
89. Runyan CW, Becker A, Brandspigel S, Barber C, Trudeau A, Novins D. Lethal Means Counseling for Parents of Youth Seeking Emergency Care for Suicidality. *West J Emerg Med*. 2016;17(1):8-14.
90. Miller M, Warren M, Hemenway D, Azrael D. Firearms and suicide in US cities. *Inj Prev*. 2015;21(e1):e116-119.
91. Crosby AE, Espitia-Hardeman V, Ortega L, Lozano B. Alcohol and suicide. *Alcohol: Science, Policy and Public Health*. 2013:190-193.
92. Kaplan MS, McFarland BH, Huguet N, et al. Acute alcohol intoxication and suicide: a gender-stratified analysis of the National Violent Death Reporting System. *Inj Prev*. 2013;19(1):38-43.
93. Beautrais AL, Gibb SJ, Fergusson DM, Horwood LJ, Larkin GL. Removing bridge barriers stimulates suicides: An unfortunate natural experiment. *Aust NZ J Psychiat*. 2009;43(6):495-497.
94. Stokes ML, McCoy KP, Abram KM, Byck GR, Teplin LA. Suicidal Ideation and Behavior in Youth in the Juvenile Justice System: A Review of the Literature. *Journal of Correctional Health Care*. 2015;21(3):222-242.
95. Elnour AA, Harrison J. Lethality of suicide methods. *Inj Prev*. 2008;14(1):39-45.
96. Simon OR, Swann AC, Powell KE, Potter LB, Kresnow MJ, O'Carroll PW. Characteristics of impulsive suicide attempts and attempters. *Suicide Life Threat Behav*. 2001;32(1 Suppl):49-59.
97. Deisenhammer EA, Ing CM, Strauss R, Kemmler G, Hinterhuber H, Weiss EM. The duration of the suicidal process: how much time is left for intervention between consideration and accomplishment of a suicide attempt? *J Clin Psychiatry*. 2009;70(1):19-24.
98. Hawton K. Restricting access to methods of suicide: Rationale and evaluation of this approach to suicide prevention. *Crisis*. 2007;28(S1):4-9.
99. Yip P, Caine E, Yousuf S, Chang S-S, Wu K, Chen Y-Y. Means restriction for suicide prevention. *Lancet*. 2012;379(9834):2393-2399.
100. Cox GR, Owens C, Robinson J, et al. Interventions to reduce suicides at suicide hotspots: a systematic review. *BMC Public Health*. 2013;13(1):1-12.
101. Rowhani-Rahbar A, Simonetti JA, Rivara FP. Effectiveness of Interventions to Promote Safe Firearm Storage. *Epidemiol Rev*. 2016;38(1):111-124.
102. Hayes LM. Suicide prevention in correctional facilities: reflections and next steps. *Int J Law Psychiatry*. 2013;36(3-4):188-194.
103. Giesbrecht N, Huguet N, Ogden L, et al. Acute alcohol use among suicide decedents in 14 US states: impacts of off-premise and on-premise alcohol outlet density. *Addiction*. 2015;110(2):300-307.
104. Escobedo LG, Ortiz M. The relationship between liquor outlet density and injury and violence in New Mexico. *Accid Anal Prev*. 2002;34(5):689-694.
105. Xuan Z, Naimi TS, Kaplan MS, et al. Alcohol Policies and Suicide: A Review of the Literature. *Alcohol Clin Exp Res*. 2016;40(10):2043-2055.
106. Cherpitel CJ, Borges GLG, Wilcox HC. Acute alcohol use and suicidal behavior: A review of the literature. *Alcoholism: Clinical and Experimental Research*. 2004;28(5 SUPPL.):18S-28S.
107. Pirkis J, Too LS, Spittal MJ, Kryszynska K, Robinson J, Cheung YTD. Interventions to reduce suicides at suicide hotspots: A systematic review and meta-analysis. *Lancet Psychiatry*. 2015;2(11):994-1001.
108. Perron S, Burrows S, Fournier M, Perron PA, Ouellet F. Installation of a bridge barrier as a suicide prevention strategy in Montreal, Quebec, Canada. *Am J Public Health*. 2013;103(7):1235-1239.
109. Beautrais AL. Effectiveness of barriers at suicide jumping sites: A case study. *Aust NZ J Psychiat*. 2001;35(5):557-562.
110. Grossman DC, Mueller BA, Riedy C, et al. Gun storage practices and risk of youth suicide and unintentional firearm injuries. *JAMA*. 2005;293(6):707-714.



111. Mishara BL, Martin N. Effects of a comprehensive police suicide prevention program. *Crisis*. 2012;33(3):162-168.
112. Knox KL, Litts DA, Talcott GW, Feig JC, Caine ED. Risk of suicide and related adverse outcomes after exposure to a suicide prevention programme in the US Air Force: cohort study. *BMJ*. 2003;327(7428):1376.
113. Hayes LM. Prison Suicide: An Overview and a Guide to Prevention. *The Prison Journal*. 1995;75(4):431-456.
114. Barker E, Kölves K, De Leo D. Management of Suicidal and Self-Harming Behaviors in Prisons: Systematic Literature Review of Evidence-Based Activities. *Archives of Suicide Research*. 2014;18(3):227-240.
115. Rush BR, Gliksman L, Brook R. Alcohol availability, alcohol consumption and alcohol-related damage. I. The distribution of consumption model. *J Stud Alcohol*. 1986;47(1):1-10.
116. Gruenewald PJ, Remer L. Changes in outlet densities affect violence rates. *Alcohol Clin Exp Res*. 2006;30(7):1184-1193.
117. Lipton R, Gruenewald P. The spatial dynamics of violence and alcohol outlets. *J Stud Alcohol*. 2002;63(2):187-195.
118. Lippy C, DeGue S. Exploring alcohol policy approaches to prevent sexual violence perpetration. *Trauma, Violence, & Abuse*. 2016;17(1):26-42.
119. Johnson FW, Gruenewald PJ, Remer LG. Suicide and alcohol: do outlets play a role? *Alcohol Clin Exp Res*. 2009;33(12):2124-2133.
120. Durkheim E. Suicide: A study in sociology (JA Spaulding & G. Simpson, trans.). *Glencoe, IL: Free Press. (Original work published 1897)*. 1897/1951.
121. Centers for Disease Control and Prevention. Strategic direction for the prevention of suicidal behavior: Promoting individual, family, and community connectedness to prevent suicidal behavior. 2009; Available at: [http://www.cdc.gov/ViolencePrevention/pdf/Suicide\\_Strategic\\_Direction\\_Full\\_version-a.pdf](http://www.cdc.gov/ViolencePrevention/pdf/Suicide_Strategic_Direction_Full_version-a.pdf).
122. Muennig P, Cohen AK, Palmer A, Zhu W. The relationship between five different measures of structural social capital, medical examination outcomes, and mortality. *Soc Sci Med*. 2013;85:18-26.
123. Beyer KM, Layde PM, Hamberger LK, Laud PW. Does neighborhood environment differentiate intimate partner femicides from other femicides? *Violence Against Women*. 2015;21(1):49-64.
124. Whitley R, McKenzie K. Social capital and psychiatry: review of the literature. *Harv Rev Psychiatry*. 2005;13(2):71-84.
125. De Silva MJ, McKenzie K, Harpham T, Huttly SR. Social capital and mental illness: a systematic review. *J Epidemiol Community Health*. 2005;59(8):619-627.
126. Wyman PA. Developmental approach to prevent adolescent suicides: research pathways to effective upstream preventive interventions. *Am J Prev Med*. 2014;47(3 Suppl 2):S251-256.
127. Centers for Disease Control and Prevention. Principles of community engagement. *CDC/ATSDR Committee on Community Engagement*. 1997.
128. Branas CC, Cheney RA, MacDonald JM, Tam VW, Jackson TD, Ten Have TR. A difference-in-differences analysis of health, safety, and greening vacant urban space. *Am J Epidemiol*. 2011;174(11):1296-1306.
129. Branas CC, Kondo MC, Murphy SM, South EC, Polsky D, MacDonald JM. Urban blight remediation as a cost-beneficial solution to firearm violence. *Am J Public Health*. 2016;106(12):2158-2164.
130. Bandura A. *Social foundations of thought and action: A social cognitive theory*. Prentice-Hall, Inc; 1986.
131. Pollock LR, Williams JM. Problem-solving in suicide attempters. *Psychol Med*. 2004;34(1):163-167.
132. Herman KC, Borden LA, Reinke WM, Webster-Stratton C. The Impact of the Incredible Years Parent, Child, and Teacher Training Programs on Children's Co-Occurring Internalizing Symptoms. *Sch Psychol Q*. 2011;26(3):189-201.
133. Knox MS, Burkhart K, Hunter KE. ACT against violence parents raising safe kids program: Effects on maltreatment-related parenting behaviors and beliefs. *Journal of Family Issues*. 2010.

134. Wasserman D, Hoven CW, Wasserman C, et al. School-based suicide prevention programmes: The SEYLE cluster-randomised, controlled trial. *Lancet*. 2014;385(9977):1536-1544.
135. Wilcox HC, Kellam SG, Brown CH, et al. The impact of two universal randomized first- and second-grade classroom interventions on young adult suicide ideation and attempts. *Drug Alcohol Depend*. 2008;95 Suppl 1:S60-73.
136. Kellam SG, Brown CH, Poduska JM, et al. Effects of a universal classroom behavior management program in first and second grades on young adult behavioral, psychiatric, and social outcomes. *Drug Alcohol Depend*. 2008;95 Suppl 1:S5-S28.
137. Webster-Stratton C, Jamila Reid M, Stoolmiller M. Preventing conduct problems and improving school readiness: evaluation of the incredible years teacher and child training programs in high-risk schools. *Journal of Child Psychology and Psychiatry*. 2008;49(5):471-488.
138. Webster-Stratton CH, Reid MJ, Beauchaine T. Combining parent and child training for young children with ADHD. *Journal of Clinical Child & Adolescent Psychology*. 2011;40(2):191-203.
139. Reid MJ, Webster-Stratton C, Hammond M. Follow-up of children who received the Incredible Years intervention for oppositional-defiant disorder: Maintenance and prediction of 2-year outcome. *Behavior Therapy*. 2003;34(4):471-491.
140. Webster-Stratton C, Hammond M. Treating children with early-onset conduct problems: a comparison of child and parent training interventions. *J Consult Clin Psychol*. 1997;65(1):93-109.
141. Webster-Stratton C, Reid MJ, Hammond M. Preventing conduct problems, promoting social competence: a parent and teacher training partnership in head start. *J Clin Child Psychol*. 2001;30(3):283-302.
142. Spoth RL, Gyll M, Day SX. Universal family-focused interventions in alcohol-use disorder prevention: cost-effectiveness and cost-benefit analyses of two interventions. *J Stud Alcohol*. 2002;63(2):219-228.
143. Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999-2014. *NCHS Data Brief*. Hyattsville, MD: National Center for Health Statistics; 2016.
144. Jobes DA. The Collaborative Assessment and Management of Suicidality (CAMS): an evolving evidence-based clinical approach to suicidal risk. *Suicide Life Threat Behav*. 2012;42(6):640-653.
145. Wilcox HC, Wyman PA. Suicide Prevention Strategies for Improving Population Health. *Child Adolesc Psychiatr Clin N Am*. 2016;25:219-233.
146. Isaac M, Elias B, Katz LY, et al. Gatekeeper training as a preventative intervention for suicide: a systematic review. *Can J Psychiatry*. 2009;54(4):260-268.
147. Gould MS, Munfakh JL, Kleinman M, Lake AM. National suicide prevention lifeline: enhancing mental health care for suicidal individuals and other people in crisis. *Suicide Life Threat Behav*. 2012;42(1):22-35.
148. Gilbody S, Bower P, Fletcher J, Richards D, Sutton AJ. Collaborative care for depression: a cumulative meta-analysis and review of longer-term outcomes. *Arch Int Med*. 2006;166(21):2314-2321.
149. Archer J, Bower P, Gilbody S, et al. Collaborative care for depression and anxiety problems. *Cochrane Database of Systematic Reviews*. 2012;10(Art No CD006525).
150. Bruce ML, Ten Have TR, Reynolds III CF, et al. Reducing suicidal ideation and depressive symptoms in depressed older primary care patients: a randomized controlled trial. *JAMA*. 2004;291(9):1081-1091.
151. Inagaki M, Kawashima Y, Kawanishi C, et al. Interventions to prevent repeat suicidal behavior in patients admitted to an emergency department for a suicide attempt: a meta-analysis. *J Affect Disord*. 2015;175:66-78.
152. Gould MS, Cross W, Pisani AR, Munfakh JL, Kleinman M. Impact of Applied Suicide Intervention Skills Training on the National Suicide Prevention Lifeline. *Suicide Life Threat Behav*. 2013;43(6):676-691.
153. Walrath C, Garraza LG, Reid H, Goldston DB, McKeon R. Impact of the Garrett Lee Smith youth suicide prevention program on suicide mortality. *Am J Public Health*. 2015;105(5):986-993.



154. Godoy Garraza L, Walrath C, Goldston DB, Reid H, McKeon R. Effect of the Garrett Lee Smith Memorial Suicide Prevention Program on Suicide Attempts Among Youths. *JAMA Psychiatry*. 2015;72(11):1143-1149.
155. Gould MS, Kalafat J, Harrismunfakh JL, Kleinman M. An evaluation of crisis hotline outcomes. Part 2: Suicidal callers. *Suicide Life Threat Behav*. 2007;37(3):338-352.
156. Hunkeler EM, Katon W, Tang L, et al. Long term outcomes from the IMPACT randomised trial for depressed elderly patients in primary care. *BMJ*. 2006;332(7536):259-263.
157. Unutzer J, Tang L, Oishi S, et al. Reducing suicidal ideation in depressed older primary care patients. *J Am Geriatr Soc*. 2006;54(10):1550-1556.
158. Comtois KA, Jobes DA, S. O'Connor S, et al. Collaborative assessment and management of suicidality (CAMS): feasibility trial for next-day appointment services. *Depress Anxiety*. 2011;28(11):963-972.
159. Linehan MM, Comtois KA, Murray AM, et al. Two-year randomized controlled trial and follow-up of dialectical behavior therapy vs therapy by experts for suicidal behaviors and borderline personality disorder. *Arch Gen Psychiatry*. 2006;63(7):757-766.
160. Diamond GS, Wintersteen MB, Brown GK, et al. Attachment-based family therapy for adolescents with suicidal ideation: a randomized controlled trial. *J Am Acad Child Adolesc Psychiatry*. 2010;49(2):122-131.
161. Rubenstein LV, Chaney EF, Ober S, et al. Using evidence-based quality improvement methods for translating depression collaborative care research into practice. *Families, Systems, & Health*. 2010;28(2):91-113.
162. Fleischmann A, Bertolote JM, Wasserman D, et al. Effectiveness of brief intervention and contact for suicide attempters: a randomized controlled trial in five countries. *Bull World Health Organ*. 2008;86(9):703-709.
163. Motto JA, Bostrom AG. A randomized controlled trial of postcrisis suicide prevention. *Psychiatr Serv*. 2001;52(6):828-833.
164. Hassanian-Moghaddam H, Sarjami S, Kolahi AA, Carter GL. Postcards in Persia: randomised controlled trial to reduce suicidal behaviours 12 months after hospital-treated self-poisoning. *Br J Psychiatry*. 2011;198(4):309-316.
165. Wang YC, Hsieh LY, Wang MY, Chou CH, Huang MW, Ko HC. Coping Card Usage can Further Reduce Suicide Reattempt in Suicide Attempter Case Management Within 3-Month Intervention. *Suicide Life Threat Behav*. 2016;46(1):106-120.
166. Brown GK, Ten Have T, Henriques GR, Xie SX, Hollander JE, Beck AT. Cognitive therapy for the prevention of suicide attempts: a randomized controlled trial. *JAMA*. 2005;294(5):563-570.
167. Pitman A, Osborn D, King M, Erlangsen A. Effects of suicide bereavement on mental health and suicide risk. *Lancet Psychiatry*. 2014;1:86-94.
168. Etzersdorfer E, Sonneck G. Preventing suicide by influencing mass-media reporting: The Viennese experience, 1980–1996. *Arch Suicide Res*. 1998;4(1):67-74.
169. Niederkrotenthaler T, Sonneck G. Assessing the impact of media guidelines for reporting on suicides in Austria: Interrupted time series analysis. *Aust N Z J Psychiatry*. 2007;41(5):419-428.
170. Szumilas M, Kutcher S. Post-suicide intervention programs: A systematic review. *Can J Public Health*. 2011;102(1):18-29.
171. Bohanna I, Wang X. Media guidelines for the responsible reporting of suicide: a review of effectiveness. *Crisis*. 2012;33(4):190-198.
172. Visser VS, Comans TA, Scuffham PA. Evaluation Of The Effectiveness Of A Community-Based Crisis Intervention Program For People Bereaved By Suicide. *Journal of Community Psychology*. 2014;42(1):19-28.
173. Cerel J, Campbell FR. Suicide survivors seeking mental health services: a preliminary examination of the role of an active postvention model. *Suicide Life Threat Behav*. 2008;38(1):30-34.

174. Niederkrotenthaler T, Voracek M, Herberth A, et al. Media and suicide. Papageno v Werther effect. *BMJ*. 2010;341:c5841.
175. Centers for Disease Control and Prevention. National Violent Death Reporting System. Atlanta, GA: Centers for Disease Control and Prevention, National Center for Injury Prevention and Control; 2017. Available online: <https://www.cdc.gov/injury/wisqars/nvdrs.html>.
176. The National Center for the Review & Prevention of Child Deaths. U.S. Child Death Review Programs. <https://www.childdeathreview.org/cdr-programs/u-s-cdr-programs/>.
177. Centers for Disease Control and Prevention, Brener ND, Kann L, et al. Methodology of the Youth Risk Behavior Surveillance System--2013. *MMWR Recomm Rep*. 2013;62(RR-1):1-20.

FINAL



## Appendix A: Summary of Strategies and Approaches to Prevent Suicide

Strategy	Approach/Program, Practice or Policy	Best Available Evidence			Lead Sectors <sup>1</sup>
		Suicide	Suicide Attempts or Ideation	Other Risk/Protective Factors for Suicide	
Strengthen economic supports	<b>Strengthen household financial security</b>				Government (local, state, Federal)
	<i>Unemployment benefit programs</i>	✓		✓	Business/labor
	<i>Other income supports</i>	✓			
	<b>Housing stabilization policies</b>				Government (local, state, Federal)
	<i>The National Neighborhood Stabilization Program</i>			✓	
Strengthen access and delivery of suicide care	<b>Coverage of mental health conditions in health insurance policies</b>				Government (local, state, Federal)  Healthcare  Social services
	<i>Mental Health Parity Laws</i>	✓		✓	
	<b>Reduce provider shortages in underserved areas</b>				
	<i>National Health Service Corps (NHSC)</i>			✓	
	<i>Telemental health (TMH)</i>			✓	
	<b>Safer suicide care through systems change</b>				
	<i>Henry Ford Perfect Depression Care (Precursor to Zero Suicide)</i>	✓		✓	
Create protective environments	<b>Reduce access to lethal means among persons at-risk</b>				Government (local, state)  Public Health  Healthcare
	<i>Intervening at suicide hot spots</i>	✓			
	<i>Safe storage practices</i>		✓	✓	
	<i>Emergency Department Counseling on Access to Lethal Means (ED CALM)</i>			✓	

		Best Available Evidence			
	Organizational policies and culture				
	Together for Life	✓			Business/Labor
	US Air Force Suicide Prevention Program	✓		✓	Justice
	Correctional suicide prevention	✓			Government (local, state, Federal)
	Community-based policies to reduce excessive alcohol use				Government (local, state)
	Alcohol outlet density	✓		✓	Business/labor
Promote connectedness	Peer norm programs				Public Health
	Sources of Strength			✓	Education
	Community engagement activities				Public Health
	Greening vacant urban spaces			✓	Government (local)
Teach coping and problem-solving skills	Social emotional learning programs				
	Youth Aware of Mental Health Program		✓	✓	Public Health
	Good Behavior Game		✓	✓	Education
	Parenting skill and family relationship approaches				
	The Incredible Years			✓	Public Health
				Education	



		Best Available Evidence			
	<i>Strengthening Families: For Parents and Youth 10-14</i>			✓	
Identify and support people at-risk	<b>Gatekeeper training</b>				Public Health
	<i>Applied Suicide Intervention Skills Training</i>			✓	Healthcare
	<i>Garret Lee Smith Federal Grant Program</i>	✓	✓		
	<b>Crisis Intervention</b>				Public Health
	<i>National Suicide Prevention Lifeline</i>		✓	✓	Social Services
	<b>Treatment for people at risk of suicide</b>				
	<i>Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)</i>		✓	✓	
	<i>Collaborative Assessment and Management of Suicidality (CAMS)</i>		✓	✓	Healthcare
	<i>Dialectical Behavioral Therapy (DBT)</i>		✓	✓	Social Services
	<i>Attachment-Based Family Therapy (ABFT)</i>		✓		Justice
	<i>Translating Initiatives for Depression into Effective Solutions project (TIDES)</i>			✓	
	<b>Treatment to prevent re-attempts</b>				
	<i>ED Brief Intervention with Follow-up Visits</i>	✓			Healthcare
	<i>Active follow-up contact approaches</i>	✓	✓		Social services
	<i>CBT for Suicide Prevention</i>		✓		

		Best Available Evidence			
Lessen harms and prevent future risk	Postvention				Healthcare
	StandBy Response Service		✓	✓	
	Safe reporting and message about suicide				Public Health
	Media Guidelines	✓			Media

<sup>1</sup>This column refers to the lead sectors well positioned to bring leadership and resources to implementation efforts. For each strategy, there are many other sectors such as non-governmental organizations that are instrumental to prevention planning and implementing specific activities.



**Preventing Suicide:  
A Technical Package of Policy, Programs, and Practices**

**Prepared by:**

**Deb Stone, ScD, MSW, MPH**

**Kristin Holland, PhD, MPH**

**Brad Bartholow, PhD**

**Alex Crosby, MD, MPH**

**Shane Davis, PhD**

**Natalie Wilkins, PhD**

**Division of Violence Prevention  
National Center for Injury Prevention and Control (NCIPC)  
Centers for Disease Control and Prevention**

**2017**

***Preventing Suicide: A Technical Package of Policies, Programs, and Practices* is a publication of the  
National Center for Injury Prevention and Control of the Centers for Disease Control and  
Prevention.**

Centers for Disease Control and Prevention  
Thomas R. Frieden, MD, MPH, Director

National Center for Injury Prevention and Control  
Debra E. Houry, MD, MPH, Director

Division of Violence Prevention  
James A. Mercy, PhD, Director

***Suggested Citation:*** Stone, D.M., Holland, K.M., Bartholow, B., Crosby, A.E., Davis, S., and Wilkins, N.  
***Preventing Suicide: A Technical Package of Policies, Programs, and Practices.*** Atlanta, GA: National  
Center for Injury Prevention and Control, Centers for Disease Control and Prevention, 2017.



## Contents

Acknowledgements.....	4
External Reviewers.....	5
Overview of Technical Package.....	6
Strengthen Economic Supports.....	14
Strengthen Access and Delivery of Suicide Care.....	17
Create Protective Environments.....	21
Promote Connectedness.....	26
Teach Coping and Problem-Solving Skills.....	28
Identify and Support People At-Risk.....	31
Lessen Harms and Prevent Future Risk.....	37
Sector Involvement.....	39
Monitoring and Evaluation.....	41
Conclusion.....	42
References.....	44
Appendix A.....	50

## Acknowledgements

We would like to thank the following individuals who contributed in specific ways to the development of this technical package. We give special thanks to Linda Dahlberg for her vision, guidance, and support throughout the development of this package. We thank Division, Center, and CDC leadership for their careful review and helpful feedback on earlier iterations of this document. We thank Alida Knuth for her formatting and design expertise. Last but definitely not least, we extend our thanks and gratitude to all the external reviewers for their helpful feedback, support and encouragement for this resource.



## External Reviewers

Casey Castaldi  
Prevention Institute

Carmen Clelland  
Office for State, Tribal, Local and Territorial  
Support, Centers for Disease Control and  
Prevention

Amalia Corby-Edwards  
American Psychological Association

Rachel Davis  
Prevention Institute

Pamela End of Horn  
Indian Health Service Headquarters

Craig Fisher  
American Psychological Association

Keita Franklin  
Department of Defense

Jill M. Harkavy Friedman  
American Foundation for Suicide Prevention

Jarrold Hindman  
Colorado Department of Public Health and  
Environment

Linda Langford  
Education Development Center, Inc.

Richard McKeon  
Substance Abuse and Mental Health Services  
Administration

Doreen S. Marshall  
American Foundation for Suicide Prevention

Christine Moutier  
American Foundation for Suicide Prevention

Jason H. Padgett  
Education Development Center, Inc.

Jerry Reed  
Education Development Center, Inc.

Christine Schuler  
National Institute for Occupational Safety and  
Health, Centers for Disease Control and  
Prevention

Morton Silverman  
Education Development Center, Inc.

Ellyson Stout  
Education Development Center, Inc.

Hope M. Tiesman  
National Institute for Occupational Safety and  
Health, Centers for Disease Control and  
Prevention

Dan Reidenberg  
Suicide Awareness Voices for Education (SAVE)

The experts above are listed with their affiliations at the time this document was reviewed.

## Overview

This technical package represents a select group of strategies based on the best available evidence to help communities and states sharpen their focus on prevention activities with the greatest potential to prevent suicide. These strategies include: strengthening economic supports; strengthening access and delivery of suicide care; creating protective environments; promoting connectedness; teaching coping and problem-solving skills; identifying and supporting people at-risk; and lessen harms and prevent future risk. The strategies represented in this package include those with a focus on preventing suicide from happening in the first place as well as approaches to lessen the immediate and long-term harms of suicidal behavior for individuals, families, communities, and society. The strategies in the technical package support the goals and objectives of the National Strategy for Suicide Prevention and the National Action Alliance for Suicide Prevention's priority to strengthen community-based prevention. Commitment, cooperation, and leadership from numerous sectors, including public health, education, justice, health care, social services, business, labor, and government can bring about the successful implementation of this package.

### What is a Technical Package?

A technical package is a compilation of a core set of strategies to achieve and sustain substantial reductions in a specific risk factor or outcome.<sup>1</sup> Technical packages help communities and states prioritize prevention activities based on the best available evidence. This technical package has three components. The first component is the **strategy** or the preventive direction or actions to achieve the goal of preventing suicide. The second component is the **approach**. The approach includes the specific ways to advance the strategy. This can be accomplished through *programs, policies, and practices*. The approaches included come primarily from studies based in the United States. The **evidence** for each of the approaches in preventing suicide or its associated risk factors is included as the third component. This package is intended as a resource to guide and inform prevention decision-making in communities and states.

### Preventing Suicide is a Priority

Suicide, as defined by the Centers for Disease Control and Prevention (CDC), is part of a broader class of behavior called *self-directed violence*. Self-directed violence refers to behavior directed at oneself that deliberately results in injury or the *potential* for injury.<sup>2</sup> Self-directed violence may be *suicidal* or *non-suicidal* in nature. For the purposes of this document, we refer only to behavior where suicide is intended:



- **Suicide** is a death caused by self-directed injurious behavior with any intent to die as a result of the behavior.
- **Suicide attempt** is defined as a *non-fatal* self-directed and potentially injurious behavior with any intent to die as a result of the behavior. A suicide attempt may or may not result in injury.

**Suicide is highly prevalent.** Suicide presents a major challenge to public health in the United States and worldwide. It contributes to premature death, morbidity, lost productivity, and health care costs.<sup>3,4</sup> In 2015 (the most recent year of available death data), suicide was responsible for 44,193 deaths in the U.S., which is approximately one suicide every 12 minutes.<sup>5</sup> In 2015, suicide ranked as the 10th leading cause of death and has been among the top 12 leading causes of death since 1975 in the U.S. Overall suicide rates increased 28% from 2000 to 2015.<sup>5</sup> Suicide is a problem throughout the life span; it is the second leading cause of death among those aged 10–34 years; the fourth leading cause among persons in their 40s, and the seventh leading cause among persons in their 50s.<sup>5</sup>

Suicide rates vary by race/ethnicity, age, and other population characteristics, with the highest rates across the lifespan occurring among non-Hispanic American Indian/Alaska Native (AI/AN) and non-Hispanic White population groups. In 2015, the rates for these groups were 19.9 and 16.9 per 100,000 population, respectively.<sup>5</sup> Other population groups disproportionately impacted by suicide include middle-aged adults (whose rates increased 45% from 2000 to 2015, with steep increases seen among both males (39%) and females (64%) aged 45-64 years;<sup>5</sup> veterans and other military personnel (whose suicide rate nearly doubled from 2003 to 2008, surpassing the rate of suicide among civilians for the first time in decades);<sup>6,7</sup> workers in certain occupational groups e.g., protective service occupations; workers in farming, fishing, and forestry;<sup>8</sup> and sexual minority youth, who experience increased suicidal ideation and behavior compared to their non-sexual minority peers.<sup>9,10</sup>

Suicides reflect only a portion of the problem.<sup>11</sup> Substantially more people are hospitalized as a result of nonfatal suicidal behavior (i.e. suicide attempts) than are fatally injured, and an even greater number are either treated in ambulatory settings (e.g., emergency departments) or not treated at all.<sup>11</sup> For example, during 2014, among adults aged 18 years and older, for every one suicide there were 9 adults treated in hospital emergency departments for self-harm injuries, 27 who reported making a suicide attempt, and over 227 who reported seriously considering suicide (i.e. ideation).<sup>11</sup>

**Suicide is associated with several risk and protective factors.** Suicide, like other human behaviors, has no single determining cause. Instead, suicide occurs in response to multiple biological, psychological, interpersonal, environmental and societal influences that interact with one another, often over time. The social-ecological model – encompassing multiple levels of focus from the individual, relationship, community, and societal – is a useful framework for viewing and understanding suicide risk factors identified in the literature.<sup>12</sup> Risk and protective factors for suicide exist at each level. For example, risk factors include:

- **Individual level:** history of depression and other mental illnesses, hopelessness, substance abuse, certain health conditions, previous suicide attempt, violence victimization and perpetration, and genetic and biological determinants
- **Relationship level:** high conflict or violent relationships, sense of isolation and lack of social support, family/loved one's history of suicide, financial and work stress
- **Community level:** inadequate community connectedness, barriers to health care (e.g., lack of access to providers and medications)
- **Societal level:** availability of lethal means of suicide, unsafe media portrayals of suicide, stigma associated with help-seeking and mental illness.<sup>3,4</sup>

It is important to recognize that the vast majority of individuals who are depressed, attempt suicide, or have other risk factors, do *not* die by suicide. Furthermore, the relevance of each risk factor can vary by age, race, gender, sexual orientation, residential geography, and socio-cultural and economic status.<sup>3,4</sup>

Protective factors, or those influences that buffer against the risk for suicide, can also be found across the different levels of the social-ecological model. Protective factors identified in the literature include: effective coping and problem solving skills, moral objections to suicide, strong and supportive relationships with partners, friends, and family; connectedness to school, community, and other social institutions; availability of quality and ongoing physical and mental health care, and reduced access to lethal means.<sup>3,4</sup> These protective factors can either counter a specific risk factor or buffer against a number of risks associated with suicide.

**Suicide is connected to other forms of violence.** Exposure to violence (e.g., child abuse and neglect, bullying, peer violence, dating violence, sexual violence, and intimate partner violence) is associated with increased risk of depression, post-traumatic stress disorder (PTSD), anxiety, suicide, and suicide attempts.<sup>13-19</sup> Women exposed to partner violence are nearly 5 times more likely to attempt suicide as women not exposed to partner violence.<sup>19</sup> Exposure to adverse experiences in childhood, such as physical, sexual, emotional abuse and neglect, and living in homes with violence, mental health, substance abuse problems and other instability, is also associated with increased risk for suicide and suicide attempts.<sup>15,20</sup> The psychosocial effects of violence in childhood and adolescence can be observed decades later, including severe problems with finances, family, jobs, and stress – factors that can increase the risk for suicide. Suicide and other forms of violence often share the same individual, relationship, community, and societal risk factors suggesting that efforts to prevent interpersonal violence may also prove beneficial in preventing suicide.<sup>21-23</sup> Further, just as risk factors may be shared across suicide and interpersonal violence, so too may protective factors overlap. For example, connectedness to one's community,<sup>24</sup> school,<sup>25</sup> family,<sup>26</sup> caring adults,<sup>27,28</sup> and pro-social peers<sup>29</sup> can enhance resilience and help reduce risk for suicide and other forms of violence.



**The health and economic consequences of suicide are substantial.** Suicide and suicide attempts have far reaching consequences for individuals, families, and communities.<sup>30-33</sup> In an early study, Crosby and Sacks<sup>34</sup> estimated that 7% of the U.S. adult population, or 13.2 million adults, knew someone in the prior 12 months who had died by suicide. They also estimated that for each suicide, 425 adults were exposed, or knew about the death. In a more recent study, in one state, Cerel et al.<sup>35</sup> found that 48% of the population knew at least one person who died by suicide in their lifetime. Research indicates that the impact of knowing someone who died by suicide and/or having lived experience (i.e., personally have attempted suicide, have had suicidal thoughts, or have been impacted by suicidal loss) is much more extensive than injury and death. People with lived experience may suffer long-term health and mental health consequences ranging from anger, guilt, and physical impairment, depending on the means and severity of the attempt.<sup>36</sup> Similarly, survivors of a loved one's suicide may experience ongoing pain and suffering including complicated grief,<sup>37</sup> stigma, depression, anxiety, post-traumatic stress disorder, and increased risk of suicidal ideation and suicide.<sup>38,39</sup> Less discussed but no less important, are the financial and occupational effects for those left behind.<sup>40</sup>

The economic toll of suicide is immense as well. According to conservative estimates, in 2013, suicide cost \$50.8 billion in estimated lifetime medical and work-loss costs alone.<sup>40</sup> Adjusting for potential under-reporting of suicide and drawing upon health expenditures per capita, GDP per capita, and variability among states in per capita health care expenditures and income, another study estimated the total lifetime costs associated with nonfatal injuries and deaths caused by self-directed violence to be approximately \$93.5 billion in 2013.<sup>41</sup> The overwhelming burden of these costs were from lost productivity over the life course, with the average cost per suicide being over \$1.3 million.<sup>41</sup> The true economic costs are likely higher, as neither study included monetary figures related to other societal costs such as those associated with the pain and suffering of family members or other impacts.

**Suicide can be prevented.** Like most public health problems, suicide is preventable.<sup>3</sup> While progress will continue to be made into the future, evidence for numerous programs, practices, and policies currently exists, and many programs are ready to be implemented now. Just as suicide is not caused by a single factor, research suggests that reductions in suicide will not be prevented by any single strategy or approach.<sup>4,42</sup> Rather, suicide prevention is best achieved by a focus across the individual, relationship, family, community, and societal-levels and across all sectors, private and public e.g., business, public health, physical and behavioral healthcare, justice, education, and labor;<sup>3,43</sup>

## Assessing the Evidence

This technical package includes programs, practices, and policies with evidence of impact on suicide or risk or protective factors for suicide. To be considered for inclusion in the technical package, the program, practice, or policy selected had to meet at least one of these criteria: a) meta-analyses or systematic reviews showing impact on suicide; b) evidence from at least one rigorous (e.g., randomized



controlled trial [RCT] or quasi-experimental design) evaluation study that found significant preventive effects on suicide; c) meta-analyses or systematic reviews showing impact on risk or protective factors for suicide, or d) evidence from at least one rigorous (e.g., RCT or quasi-experimental design) evaluation study that found significant impacts on risk or protective factors for suicide. Finally, consideration was also given to the likelihood of achieving beneficial effects on multiple forms of violence; no evidence of harmful effects on specific outcomes or with particular subgroups; and feasibility of implementation in a U.S. context if the program, policy, or practice has been evaluated in another country.

Within this technical package, some approaches do not yet have research evidence demonstrating impact on rates of suicide but instead are supported by evidence indicating impacts on risk or protective factors for suicide (e.g., help-seeking, stigma reduction, depression, connectedness). In terms of the strength of the evidence, programs that have demonstrated effects on suicidal behavior (e.g., reductions in deaths, attempts) provide a higher-level of evidence, but the evidence base is not that strong in all areas. For instance, there has been less evaluation of community engagement and family programs on suicidal behavior. Thus, approaches in this package that have effects on risk or protective factors reflect the developing nature of the evidence base and the use of the best available evidence at a given time.

It is also important to note that there is often significant heterogeneity among the programs, policies, or practices that fall within one approach or strategy area in terms of the nature and quality of the available evidence. Not all programs, policies, or practices that utilize the same approach are equally effective, and even those that are effective may not work across all populations. Tailoring programs and more evaluation may be necessary to address different population groups. The evidence-based programs, practices, or policies included in the package are not intended to be a comprehensive list for each approach, but rather to serve as examples that have been shown to impact suicide or have beneficial effects on risk or protective factors for suicide.

### Context and Cross-Cutting Themes

One important feature of the package is the complementary, but potentially synergistic impact of the strategies and approaches. The strategies and approaches included in this technical package represent different levels of the social ecology, with efforts intended to impact community and societal levels, as well individual and relationship levels. The strategies and approaches are intended to work in combination and reinforce each other to prevent suicide (see box below). The strategies are arranged in order such that those strategies hypothesized to have the greatest potential for broad public health impact on suicide are included first, followed by those that might impact more select populations (e.g., persons who have already made a suicide attempt).

Preventing Suicide	
Strategy	Approach
Strengthen economic supports	<ul style="list-style-type: none"> <li>Strengthen household financial security</li> <li>Housing stabilization policies</li> </ul>



Strengthen access and delivery of suicide care	<ul style="list-style-type: none"> <li>• Coverage of mental health conditions in health insurance policies</li> <li>• Reduce provider shortages in underserved areas</li> <li>• Safer suicide care through systems change</li> </ul>
Create protective environments	<ul style="list-style-type: none"> <li>• Reduce access to lethal means among persons at-risk of suicide</li> <li>• Organizational policies and culture</li> <li>• Community-based policies to reduce excessive alcohol use</li> </ul>
Promote connectedness	<ul style="list-style-type: none"> <li>• Peer norm programs</li> <li>• Community engagement activities</li> </ul>
Teach coping and problem-solving skills	<ul style="list-style-type: none"> <li>• Social-emotional learning programs</li> <li>• Parenting skill and family relationship programs</li> </ul>
Identify and support people at-risk	<ul style="list-style-type: none"> <li>• Gatekeeper training</li> <li>• Crisis Intervention</li> <li>• Treatment for people at-risk of suicide</li> <li>• Treatment to prevent re-attempts</li> </ul>
Lessen harms and prevent future risk	<ul style="list-style-type: none"> <li>• Postvention</li> <li>• Safe reporting and messaging about suicide</li> </ul>

It is important to note that these strategies are not mutually exclusive but each has an immediate focus. For instance, social emotional learning programs, an approach under the *Teach Coping and Problem-Solving Skills* strategy, sometimes include components to change peer norms and the broader environment. The primary focus of these programs, however, is to provide children and youth with skills to resolve problems in relationships, school, and with peers, and to help youth address other negative influences (e.g., substance use) associated with suicide.

The goal of this package is to stress the importance of comprehensive prevention efforts and to provide examples of effective programs addressing each level of the social ecology, with the knowledge that some programs, practices, and policies may impact multiple levels. Further, those that involve multiple sectors and that impact multiple levels of the social ecology are more likely to have a greater impact on the overall burden of suicide.

Suicide ideation, thoughts, attempts, and deaths vary by gender, race/ethnicity, age, occupation, and other important population characteristics. Further, certain transition periods are also associated with higher rates of suicide (e.g., transition from working into retirement, transition from active duty military status to civilian status). In fact, suicide risk can change along with dynamic risk factors. For example, individuals' coping skills may change during periods of crisis and heightened stress, limiting their normal ability to effectively solve problems and cope. Research indicates that suicide risk changes as a result of the number and intensity of key risk and protective factors experienced.<sup>44</sup> Ideally, the availability of multiple strategies and approaches tailored to the social, economic, cultural, and environmental context of individuals and communities are desirable as they may increase the likelihood of removing barriers to

supportive and effective care and provide opportunities to develop individual and community resilience.

Identifying programs, practices, and policies with evidence of impact on suicide, suicide attempts, or beneficial effects on risk or protective factors for suicide is only the first step. In practice, the effectiveness of the programs, policies and practices identified in this package will be strongly dependent on how well programs are implemented, as well as the partners and communities in which they are implemented. Practitioners in the field may be in the best position to assess the needs and strengths of their communities and work with community members to make decisions about the combination of approaches included here that are best suited to their context.

Data-driven strategic planning processes can help communities with this work.<sup>45-47</sup> These planning processes engage and guide community stakeholders through a prevention planning process designed to address a community's profile of risk and protective factors with evidence-based programs, practices, and policies. These processes can also be used to monitor implementation, track outcomes, and make adjustments as indicated by the data. The readiness of the program for broad dissemination and implementation (e.g., availability of program materials, training and technical assistance) can also influence program effects. Implementation guidance to assist practitioners, organizations and communities will be developed separately.

This package includes strategies where public health agencies are well positioned to bring leadership and resources to implementation efforts. It also includes strategies where public health can serve as an important collaborator (e.g., strategies addressing community and societal level risks), but where leadership and commitment from other sectors such as business, labor or health care is critical to implement a particular policy or program (e.g., workplace policies; treatment to prevent re-attempts). The role of various sectors in the implementation of a strategy or approach in preventing suicide is described further in the section on *Sector Involvement*.

In the sections that follow, the strategies and approaches with the best available evidence for preventing suicide are described.



## Strengthen Economic Supports

### Rationale

Studies from the U.S. examining historical trends indicate that suicide rates increase during economic recessions marked by high unemployment rates, job losses, and economic instability and decrease during economic expansions and periods marked by low unemployment rates, particularly for working-age individuals 25 to 64 years old.<sup>48,49</sup> Economic and financial strain, such as job loss, long periods of unemployment, reduced income, difficulty covering medical, food, and housing expenses, and even the anticipation of such financial stress may increase an individual's risk for suicide or may indirectly increase risk by exacerbating related physical and mental health problems. Buffering these risks can, therefore, potentially protect against suicide.<sup>50</sup> For example, strengthening economic support systems can help people stay in their homes or obtain affordable housing while also paying for necessities such as food and medical care, job training, child care, among other expenses required for daily living. In providing this support, stress and anxiety and the potential for a crisis situation may be reduced, thereby preventing suicide. Although more research is needed to understand how economic factors interact with other factors to increase suicide risk, the available evidence suggests that strengthening economic supports may be one opportunity to buffer suicide risk.

### Approaches

Economic supports for individuals and families can be strengthened by targeting household financial security and ensuring stability in housing during periods of economic stress.

- **Strengthening household financial security** can potentially buffer the risk of suicide by providing individuals with the financial means to lessen the stress and hardship associated with a job loss or other unanticipated financial problems. The provision of unemployment benefits and other forms of temporary assistance, livable wages, medical benefits, and retirement and disability insurance to help cover the cost of necessities or to offset costs in the event of disability, are examples of ways to strengthen household financial security.
- **Housing stabilization policies** aim to keep people in their homes and provide housing options for those in need during times of financial insecurity. This may occur through programs that provide affordable housing such as through government subsidies or through other options available to potential homebuyers such as loan modification programs, move-out planning, or financial counseling services that help minimize the risk or impact of foreclosures and eviction.

### Potential Outcomes

- Reductions in foreclosure rates



- Reductions in eviction rates
- Reductions in emotional distress
- Reductions in suicide

## Evidence

There is evidence suggesting that strengthening household financial security and stabilizing housing can reduce suicide risk.

- **Strengthen household financial security.** The *Federal-State Unemployment Insurance Program* allows states to define the maximum amount and duration of unemployment benefits that workers are entitled to receive after a job loss.<sup>51</sup> An examination of variations in *unemployment benefit programs* across states demonstrated that the impact of unemployment on rates of suicide was offset in those states that provided greater than average unemployment benefits mean level: \$7,990 per person in U.S. constant dollars;<sup>51</sup> The effects of *unemployment benefit programs* were also consistent by sex and age group. Another U.S. study examining the link between unemployment and suicide rates using monthly suicide data, length of unemployment (less than 5 weeks, 5-14 weeks, 15-26 weeks, and greater than 26 weeks), and job losses found that the duration of unemployment, as opposed to just the loss of job, predicted suicide risk.<sup>52</sup> Together, these results suggest that not only should state unemployment benefit programs be generous in their financial allocations, but also in their duration.

Other measures to strengthen household financial security (e.g., transfer payments related to retirement and disability insurance, unemployment insurance compensation, medical benefits, and other forms of family assistance) have also shown an impact on rates of suicide. A study by Flavin and Radcliff<sup>53</sup> examined the impact of states' per capita spending on transfer payments, medical benefits, and family assistance (Temporary Assistance to Needy Families – TANF) and total state spending on suicide rates between 1990-2000, controlling for a number of suicide risk factors (e.g., residential mobility, divorce rate, unemployment rate) at the state level. As per capita spending on total transfer payments, medical benefits, and family assistance increased there was an associated decrease in state suicide rates. In terms of lives saved, Flavin & Radcliff calculated the cost of reducing a state's suicide rate by a full point for the years studied. At the national level, they estimated 3,000 fewer suicides would occur per year nationwide if every state increased its per capita spending on these types of assistance by \$45 per year.<sup>53</sup> Although this was a correlational study, the results demonstrate the potential benefits of policies that reach particularly vulnerable individuals during periods of great need and increased risk for suicide. More evaluation studies are needed to further understand the outcomes impacted by programs such as these.



- **Housing stabilization policies.** The *National Neighborhood Stabilization Program* was designed to help neighborhoods suffering from high rates of foreclosure and abandonment by slowing the deterioration of the neighborhoods and providing affordable housing options for low, moderate, and middle-income homebuyers. This program also offers financial assistance to eligible individuals for the purchase of a new home. Although this program has not been rigorously evaluated for its impact on suicide outcomes, it addresses foreclosure and eviction, which are risk factors for suicide. A longitudinal analysis of annual data on suicides and foreclosures demonstrated that as the proportion of foreclosed properties increased in U.S. states, so did the state suicide rate, particularly among working-aged adults.<sup>54</sup> Another study of data from 16 U.S. states participating in the National Violent Death Reporting System found that suicides precipitated by home foreclosures and evictions increased more than 100% from 2005 (before the housing crisis began) to 2010 (after it had peaked).<sup>49</sup> Most of these suicides occurred prior to the actual loss of the decedent's home. These findings suggest that integrating suicide prevention resources, messaging, and referrals into financial, foreclosure, and move-out planning and counseling services may help to prevent suicide.

## Strengthen Access and Delivery of Suicide Care

### Rationale

While most people with mental health problems do not attempt or die by suicide<sup>55,56</sup> and the level of risk conferred by different types of mental illness varies,<sup>57-59</sup> previous research indicates that mental illness is an important risk factor for suicide.<sup>3,60</sup> State-level suicide rates have also been found to be correlated with general mental health measures such as depression.<sup>61,62</sup> Findings from the National Comorbidity Survey indicate that relatively few people in the U.S. with mental health disorders receive treatment for those conditions.<sup>63</sup> Lack of access to mental health care is one of the contributing factors related to the underuse of mental health services.<sup>64</sup> Identifying ways to improve access to timely, affordable, and quality mental health and suicide care for people in need is a critical component to prevention.<sup>3</sup> Additionally, research suggests that services provided are maximized when health and behavioral health care systems are set up to effectively and efficiently deliver such care.<sup>65</sup> Apart from treatment benefits, these approaches can also normalize help-seeking behavior and increase the use of such services.

### Approaches

There are a number of approaches that can be used to strengthen access and delivery of suicide care, including:

- **Coverage of mental health conditions in health insurance policies.** Federal and state laws include provisions for equal coverage of mental health services in health insurance plans that is on par with coverage for other health concerns (i.e., mental health parity). Benefits and services covered include such things as the number of visits, co-pays, deductibles, inpatient/outpatient services, prescription drugs, and hospitalizations. If a state has a stronger mental health parity law than the federal parity law, then insurance plans regulated by the state must follow the state parity law. If a state has a weaker parity law than the federal parity law (e.g., includes coverage for some mental health conditions but not others), then the federal parity law will replace the state law. Equal coverage does not necessarily imply good coverage as health insurance plans vary in the extent to which benefits and services are offered to address various health conditions. Rather it helps to ensure that mental health services are covered on par with other health concerns.
- **Reduce provider shortages in underserved areas.** Access to effective and state-of-the-art mental health care is largely dependent upon the training and the size of the mental health care workforce. Over 85 million Americans live in areas with an insufficient number of mental health providers; this shortage is particularly severe among low-income urban and rural communities.<sup>66</sup> There are various ways to increase the number and distribution of practicing mental health providers in underserved areas including offering financial incentives through existing state and



federal programs (e.g., loan repayment programs) and expanding the reach of health services through telephone, video and web-based technologies. Such approaches can increase the likelihood that those in need will be able to access affordable, quality care for mental health problems, which can reduce risk for suicide.

- **Safer suicide care through systems change.** Access to health and behavioral health care services is critical for people at risk of suicide; however this is just one piece of the puzzle. Care should also be *delivered* efficiently and effectively. More specifically, care should take place within a system that supports suicide prevention and patient safety through strong leadership, workforce training, systematic identification and assessment of suicide risk, implementation of evidence-based treatments (see *Identify and Support People At-Risk*), continuity of care, and continuous quality improvement. Care that is patient-centered and promotes equity for all patients is also of critical importance.<sup>67</sup>

### Potential Outcomes

- Increases in access to mental health services
- Increase in utilization of mental health services
- Reductions in symptoms of mental illnesses and suicidality
- Reductions in rates of suicide attempts
- Reductions in rates of suicide

### Evidence

There is evidence suggesting that coverage of mental health conditions in health insurance policies and improving access and the delivery of care can reduce risk factors associated with suicide and may directly impact suicide rates.

- **Coverage of mental health conditions in health insurance policies.** The National Survey of Drug Use and Health is a nationally representative survey of the U.S. population that provides data on substance use, mental health conditions, and service utilization. Using data from this survey, Harris, Carpenter, Bao <sup>68</sup> found that 12 months after states enacted *mental health parity laws*, self-reported use of mental healthcare services significantly increased. Moreover, subsequent research by Lang <sup>62</sup> examined state mental health laws and suicide rates between 1990 and 2004 and found that mental health parity laws, specifically, were associated with an approximate 5% reduction in suicide rates. This reduction, in the 29 states with parity laws, equated to the prevention of 592 suicides per year.<sup>62</sup>
- **Reduce provider shortages in underserved areas.** One example of a program to improve access to mental health care providers is the *National Health Service Corps (NHSC)*, which offers

financial incentives to attract mental/behavioral health clinicians to underserved areas. Programs such as *NHSC* encourage individuals to work in the mental health profession in locations designated as Health Professional Shortage Areas (HPSAs) in exchange for student loan debt repayment. A 2012 retention survey conducted by the Health Resources and Services Administration (HRSA), found that 61% of mental and behavioral health care providers continued to practice in designated mental health shortage areas after their four year commitment to The National Health Service Corps.<sup>69</sup> Although this program has not been evaluated for impact on suicide, it addresses access to care, which is a critical component to suicide prevention.

*Telemental health (TMH)* services refer to the use of telephone, video and web-based technologies for providing psychiatric or psychological care at a distance. *TMH* can be used in a variety of settings (e.g. outpatient clinics, hospitals, military treatment facilities) to treat a wide range of mental health conditions. It can also improve access to care for patients in isolated areas, as well as reduce travel time and expenses, reduce delays in receiving care, and improve satisfaction interacting with the mental health care system. A systematic review of *TMH* services found that services rated as high or good quality were effective in treating mental health conditions such as depression, schizophrenia, substance abuse, and suicidal ideation and suicide deaths among other outcomes.<sup>70</sup> Further, Mohr and colleagues<sup>71</sup> conducted a meta-analysis examining the effect of psychotherapy delivered specifically via telephone and found that it significantly reduced depressive symptoms in comparison to face-to-face psychotherapy. They also found that treatment attrition rates were significantly lower among patients receiving telephone-administered psychotherapy compared to patients receiving face-to-face therapy. Thus, *TMH* may not only offer improved access to mental health care, but it may also ensure continuity of care, and thereby further reduce the risk for suicide.

- **Safer suicide care through systems change.** *Henry Ford Health System*, which is a large health maintenance organization (HMO) in the state of Michigan, pioneered the *Perfect Depression Care* program, the pre-cursor to what is now called *Zero Suicide*. The overall goal of *Perfect Depression Care* was to eliminate suicide among HMO members. More broadly, the goal of the program was to redesign delivery of depression care to achieve “breakthrough improvement” in quality and safety by focusing on effectiveness, safety, patient centeredness, timeliness, efficiency, and equity among patients. The program screened and assessed each patient for suicide risk and implemented coordinated continuous follow-up care system wide.<sup>72</sup> An examination of the impact of the program found that there was a dramatic and statistically significant decrease in the rate of suicide between the baseline years, 1999 and 2000, prior to the intervention to the intervention years, 2002-2009. During this time period, the suicide rate fell by 82%.<sup>72,73</sup> Further, among HMO members who received mental health specialty services, the suicide rate significantly decreased over time from 1999 to 2010 (110.3 to 47.6 per 100,000 population;



$p < .04$ ) with a mean of 36.2 per 100,000 over the period. Additionally, for those HMO members who accessed only general medical services as opposed to specialty mental health services, the suicide rate increased from 2.7 to 5.6 per 100,000 ( $p < .01$ ). Similarly, in the state of Michigan, rates of suicide in the general population increased over the period from 9.8 to 12.5 per 100,000 ( $p < .001$ ).<sup>74</sup>

FINAL

## Create Protective Environments

### Rationale

Prevention efforts that focus not only on individual behavior change (e.g., help-seeking, treatment interventions) but on changes to the environment can increase the likelihood of positive behavioral and health outcomes.<sup>75</sup> Creating environments that address risk and protective factors where individuals live, work, and play can help prevent suicide.<sup>4,12</sup> For example, rates of suicide are high among middle-aged adults who comprise 42.6% of the workforce;<sup>76</sup> among certain occupational groups e.g., farming, fishing, forestry, and construction;<sup>8,77</sup> and among people in detention facilities (e.g. jail, prison), to name a few. Thus, settings where these populations work and reside are ideal for implementing programs, practices and policies to buffer against suicide. Changes to organizational culture through the implementation of supportive policies, for instance, can change social norms, encourage help-seeking, and demonstrate that good health and mental health are valued and that stigma and other risk factors for suicide are not.<sup>78,79</sup> Similarly, modifying the characteristics of the physical environment to prevent harmful behavior such as access to lethal means can reduce suicide rates, particularly in times of crisis or transition.<sup>80-85</sup>

### Approaches

The current evidence suggests three potential approaches for creating environments that protect against suicide.

- **Reduce access to lethal means among persons at-risk of suicide.** Means of suicide such as firearms, hanging/suffocation, or jumping from heights provide little opportunity for rescue and, as such, have high case fatality rates (e.g., about 85% of people who use a firearm in a suicide attempt will die from the injury). Research also indicates that: 1) the interval between deciding to act and attempting suicide can be as short as 5 or 10 minutes,<sup>86,87</sup> and 2) people tend *not* to substitute a different method when a highly lethal method is unavailable or difficult to access.<sup>88,89</sup> Therefore, increasing the time interval between deciding to act and the suicide attempt, for example, by making it more difficult to access lethal means, can be lifesaving. The following are examples of approaches reducing access to lethal means for persons at-risk of suicide:
  - *Intervening at Suicide Hotspots.* Suicide hotspots, or places where suicides may take place relatively easily, include tall structures (e.g., bridges, cliffs, balconies, and rooftops), railway tracks, and isolated locations such as parks. Efforts to prevent suicide at these locations include erecting barriers or limiting access to prevent jumping, and installing



signs and telephones to encourage individuals who are considering suicide, to seek help.<sup>90</sup>

- *Safe Storage Practices.* Safe storage of medications, firearms, and other household products can reduce the risk for suicide by separating vulnerable individuals from easy access to lethal means. Such practices may include education and counseling around storing firearms--locked in a secure place (e.g., in a gun safe or lock box), unloaded and separate from the ammunition--and keeping medicines in a locked cabinet or other secure location away from people who may be at risk or who have made prior attempts.<sup>80,91</sup>
- **Organizational policies and culture** that promote protective environments may be implemented in places of employment, detention facilities, and other secured environments (e.g. residential settings). Such policies and cultural values encourage leadership from the top down and may promote prosocial behavior (e.g., asking for help), skill building, positive social norms, assessment, referral and access to helping services (e.g. mental health, substance abuse treatment, financial counseling), and development of crisis response plans, postvention and other measures to foster a safe physical environment. Such policies and cultural shifts can positively impact organizational climate and morale and help prevent suicide and its related risk factors (e.g. depression, social isolation).<sup>79,92</sup>
- **Community-based policies to reduce excessive alcohol use.** Research studies in the United States have found that greater alcohol availability is positively associated with alcohol-involved suicides.<sup>93,94</sup> Policies to reduce excessive alcohol use broadly include zoning to limit alcohol outlet locations and density, taxes on alcohol, and bans on the sale of alcohol for individuals under the legal drinking age. These policies are important because acute alcohol use has been found to be associated with more than one-third of suicides and approximately 40% of suicide attempts.<sup>95</sup>

### Potential Outcomes

- Increases in safe storage of lethal means
- Reductions in rates of suicide
- Reductions in suicide attempts
- Reductions in suicide deaths
- Increases in help-seeking
- Reductions in alcohol-related suicide deaths

## Evidence

The evidence suggests that creating protective environments can reduce suicide and suicide attempts and increase protective behaviors.

- **Reduce access to lethal means among persons at-risk of suicide.** A meta-analysis examining the impact of *suicide hotspot interventions* implemented in combination or in isolation, both in the U.S. and abroad, found associated reduced rates of suicide.<sup>90,96</sup> For example, after erecting a barrier on the Jacques-Cartier bridge in Canada, the suicide rate from jumping from the bridge decreased from about 10 suicide deaths per year to about 3 deaths per year.<sup>97</sup> Moreover, the reduction in suicides by jumping was sustained even when all bridges and nearby jumping sites were considered, suggesting little to no displacement of suicides to other jumping sites.<sup>97</sup> Further evidence for the effectiveness of bridge barriers was demonstrated by a study examining the impact of the *removal* of safety barriers from the Grafton Bridge in Auckland, New Zealand. After removal of the barrier, both the number and rate of suicide increased five-fold.<sup>84,98</sup>

Another form of means reduction involves implementation of *safe storage practices*. In a case-control study of firearm-related events identified from 37 counties in Washington, Oregon, and Missouri, and from 5 trauma centers, Grossman, Mueller, Riedy, Dowd, Villaveces, Prodzinski, Nakagawara, Howard, Thiersch, Harruff<sup>99</sup> found that storing firearms unloaded, separate from ammunition, in a locked place or secured with a safety device was protective of suicide attempts among adolescents. Further, a recent systematic review of clinic and community-based education and counseling interventions suggested that the provision of safety devices significantly increased safe firearm storage practices compared to counseling alone or compared to the provision of economic incentives to acquire safety devices on one's own.<sup>91</sup>

Another program, the *Emergency Department Counseling on Access to Lethal Means (ED CALM)*, trained psychiatric emergency clinicians in a large children's hospital to provide lethal means counseling and safe storage boxes to parents of patients under age 18 receiving care for suicidal behavior. In a pre-post quality improvement project, Runyan et al.<sup>80</sup> found that at post-test 76% (of the 55% of parents followed up, n=114) reported that all medications in the home were locked up as compared to fewer than 10% at the time of the initial emergency department visit. Among parents who indicated the presence of guns in the home at pre-test (i.e. 67%), all (100%) reported guns were currently locked up at post-test.<sup>80</sup>

- **Organizational policies and culture.** *Together for Life* is a workplace program of the Montreal Police Force implemented to address suicide among officers. Policy and program components were designed to foster an organizational culture that promoted mutual support and solidarity among all members of the Force. The program included training of supervisors, managers and



all units to improve competencies in identifying suicidal risk and to improve use and awareness of existing resources. The program also included an education campaign to improve awareness and help-seeking.<sup>100</sup> Police suicides were tracked over 12 years and compared to rates in the control city of Quebec. The suicide rate in the intervention group decreased significantly by 78.9% to a rate of 6.4 suicides per 100,000 population per year compared to an 11% increase in the control city 29.0 per 100,000;<sup>100</sup>

Another example of this approach is the *United States Air Force Suicide Prevention Program*. The program included 11 policy and education initiatives and was designed to change the culture of the Air Force surrounding suicide. The program uses leaders as role models and agents of change, establishes expectations for behavior related to awareness of suicide risk, develops population skills and knowledge (i.e., education and training), and investigates every suicide (i.e., outcomes measurement). The program represents a fundamental shift from viewing suicide and mental illness solely as medical problem and instead sees them as larger service-wide problems impacting the whole community.<sup>101</sup> Using a time-series design to examine the impact of the program on various violence-related outcomes, researchers found that the program was associated with a 33% relative risk reduction in suicide.<sup>101</sup> The program was also associated with relative risk reductions in related outcomes including moderate and severe family violence (30% and 54%, respectively), homicide (51%), and accidental death (18%).<sup>101</sup> A longitudinal assessment of the program over the period 1981 to 2008 (16 years before the 1997 launch of the program and 11 years post-launch) found significantly lower rates of suicide after the program was launched than before.<sup>78</sup> These effects were sustained over time, except in 2004, which the authors found was associated with less rigorous implementation of program components in that year than in the other years.<sup>78</sup>

Finally, while the evidence is still being built for *suicide prevention in correctional facilities*, preliminary evidence suggests organizational policies and practices that include routine suicide prevention training for all staff, standardized intake screening and risk assessment, provision of shared information between staff members, especially in transitioning or transferring of inmates, varying levels of observation, safe physical environment, emergency response protocols, notification of suicidal behavior/suicide through the chain of command, and critical incident stress debriefing and death review can potentially reduce suicide. When these policies and practices were implemented across 11 state prisons in Louisiana, suicide rates dropped 46%, from a rate of 23.1 per 100,000 before the intervention to 12.4 per 100,000 the following year.<sup>102</sup> Other similar programs have seen declines in suicide both in the United States and internationally.<sup>103</sup>

- **Community-based policies to reduce excessive alcohol use.** While multiple policies to limit excessive use of alcohol exist, several studies on alcohol outlet density and risk factors for

suicide, such as interpersonal violence and social connectedness<sup>104-107</sup> suggest that measures to reduce alcohol outlet density can potentially reduce alcohol-involved suicides. Additionally, a longitudinal analysis of alcohol outlet density, suicide mortality, and hospitalizations for suicide attempts over 6 years in 581 California zip codes indicated that greater density of bars, specifically, is related to greater suicide and suicide attempts, particularly in rural areas.<sup>108</sup>

FINAL



## Promote Connectedness

### Rationale

Sociologist, Emile Durkheim theorized in 1897 that weak social bonds, i.e. lack of connectedness, are among the chief causes for suicidality.<sup>109</sup> Connectedness is the degree to which an individual or group of individuals are socially close, interrelated, or share resources with others.<sup>110</sup> Social connections can be formed within and between multiple levels of the social ecology,<sup>12</sup> for instance between individuals (e.g. peers, neighbors, co-workers), families, schools, neighborhoods, workplaces, faith communities, cultural groups, and society as a whole. Related to connectedness, social capital refers to a sense of trust in one's community and neighborhood, social integration, and also the availability and participation in social organizations.<sup>111,112</sup> Many ecological cross-sectional and longitudinal studies have examined the impact of aspects of social capital on depression symptoms, depressive disorder, mental health more generally, and suicide. While the evidence is limited, existing studies suggest a positive association between social capital (as measured by social trust and community/neighborhood engagement), and improved mental health. Connectedness and social capital together may protect against suicidal behaviors by decreasing isolation, encouraging adaptive coping behaviors, and by increasing belongingness, personal value, and worth, to help build resilience in the face of adversity. Connectedness can also provide individuals with better access to formal supports and resources, mobilize communities to meet the needs of its members and provide collective primary prevention activities to the community as a whole.<sup>110</sup>

### Approaches

Promoting connectedness among individuals and within communities through modeling peer norms and enhancing community engagement may protect against suicide.

- **Peer norm programs** seek to normalize protective factors for suicide such as help-seeking, reaching out and talking to trusted adults, and promote peer connectedness. By leveraging the leadership qualities and social influence of peers, these approaches can be used to shift group-level beliefs and promote positive social and behavioral change. These approaches typically target youth and are delivered in school settings but can also be implemented in community settings.
- **Community engagement activities.** Community engagement is an aspect of social capital. Community engagement approaches may involve residents participating in a range of activities, including religious activities, community clean-up and greening activities, and physical exercise. These activities provide opportunities for residents to become more involved in the community and to connect with other community members, organizations, and resources, resulting in enhanced overall physical health, reduced stress, and decreased depressive symptoms, thereby reducing risk of suicide.

## Potential Outcomes

- Reductions in maladaptive coping attitudes and behaviors
- Increases in healthy coping attitudes and behaviors
- Increases in referrals for youth in distressed
- Increases help-seeking behaviors
- Increases in positive perceptions of adult support

## Evidence

Current evidence suggests a number of positive benefits of peer norm and community engagement activities, although more evaluation research is needed to examine whether these improvements in factors that protect against suicidal behavior translate into reduced suicide attempts and deaths.

- **Peer norm programs.** Evaluations show that programs such as *Sources of Strength* can improve school norms and beliefs about suicide that are created and disseminated by student peers. In a randomized controlled trial of *Sources of Strength* conducted with 18 high-schools (6 metropolitan, 12 rural), Wyman, Brown, LoMurray, Schmeelk-Cone, Petrova, Yu, Walsh, Tu, Wang <sup>29</sup> found that the program improved adaptive norms regarding suicide among peer leaders, connectedness to adults, and school engagement. Peer leaders were also more likely than controls to refer a suicidal friend to an adult. For students, the program resulted in increased perceptions of adult support for suicidal youths, particularly among those with a history of suicidal ideation, and the acceptability of help-seeking behaviors. Finally, trained peer leaders also reported a greater decrease in maladaptive coping attitudes compared with untrained leaders.<sup>29</sup>
- **Community engagement activities.** A vacant lot greening initiative was undertaken in Philadelphia between 1999 and 2008. Local residents and community members worked together to green 4,436 lots (or 7.8 million square feet) in 4 areas of the city. Researchers found significant reductions in community residents' self-reported level of stress, which is a risk factor for suicide, and engagement in more physical exercise, a protective factor for suicide, than residents in control vacant lot areas. There is some evidence for other benefits, including reductions in firearm assaults and vandalism.<sup>113,114</sup>



## Teach Coping and Problem-Solving Skills

### Rationale

Building life skills prepares individuals to successfully tackle every day challenges and adapt to stress and adversity. Life skills encompasses many concepts, but most often include coping and problem-solving skills, emotional regulation, conflict resolution, and critical thinking. Life skills are important in shielding individuals from suicidal behaviors.<sup>3</sup> Suicide prevention programs that focus on life and social skills training are drawn from social cognitive theories,<sup>115</sup> surmising that suicidal behavior is attributed to either direct learning and modeling or environmental and individual (e.g. hopelessness) characteristics. The inability to employ adequate strategies to cope with immediate stressors or identify and find solutions for problems has been characterized among suicide attempters.<sup>116</sup> Teaching and providing youth with the skills to tackle every day challenges and stressors is, therefore, an important developmental component to suicide prevention.

### Approaches

Social emotional learning programs and parenting skill and family relationship programs are two approaches for teaching coping and problem-solving skills.

- **Social-emotional learning programs** focus on developing and strengthening communication and problem-solving skills, emotion regulation, conflict resolution, help seeking and coping skills. These approaches address a range of risk and protective factors for suicidal behavior. They provide children and youth with skills to resolve problems in relationships, school, and with peers, and help youth to address other negative influences (e.g., substance use) associated with suicide. These approaches are typically delivered to all students in a particular grade or school, although some programs also focus on groups of students considered to be at high risk for suicide. Opportunities to practice and reinforce skills are an important part of programs that work.<sup>117</sup>
- **Parenting skill and family relationship programs** provide caregivers with support and are designed to strengthen parenting skills, enhance positive parent-child interactions, and improve children's behavioral and emotional skills and abilities. Programs are typically designed for parents or caregivers with children in a specific age range and can be self-directed or delivered to individual families or groups of families. Some programs have sessions primarily with parents or caregivers while others include sessions for parents or caregivers, youth, and the family. Specific program content typically varies by the age of the child but often has consistent themes of child development, parent-child communication and relationships, and youth's interpersonal and problem-solving skills.



## Potential Outcomes

- Reductions in suicide attempts and suicide ideation
- Reductions in suicide risk behaviors (i.e., depression, anxiety, conduct problems, substance abuse)
- Improvements in help-seeking behavior
- Improvements in social competence and emotional regulation skills
- Improvements in problem-solving and conflict management skills

## Evidence

Several social emotional learning and parenting and family relationship programs have been shown in rigorous evaluations to improve resilience and reduce problem behavior and risk factors for various behaviors, including ones closely related to suicide, such as depression, internalizing behaviors, and substance abuse.<sup>118</sup>

- **Social-emotional learning programs.** The *Youth Aware of Mental Health Program (YAM)* is a program developed for teenagers aged 14-16 that uses interactive dialogue and role-playing to teach adolescents about the risk and protective factors associated with suicide (including knowledge about depression and anxiety) and enhances their problem-solving skills for dealing with adverse life events, stress, school and other problems.<sup>119</sup> In a cluster-randomized controlled trial conducted across 10 European Union countries and 168 schools, students in schools randomized to *YAM* were significantly less likely to attempt suicide and have severe suicidal ideation at the 12-month follow-up compared to students in control schools which received educational materials and care as usual. Overall, the relative risk of youth suicide attempts among the *YAM* group was reduced by over 50% demonstrating that out of 1000 students, five attempted suicide in the *YAM* group compared to 11 in the control group. Additionally, related to severe suicide ideation, in the *YAM* group relative risk fell by 49.6%.<sup>119</sup>

Another example is the *Good Behavior Game (GBG)*, which is a classroom-based program for elementary school children aged 6-10. The program uses a team-based behavior management strategy that promotes good behavior by setting clear expectations for good behavior and consequences for maladaptive behavior. The goal of the *GBG* program is to create an integrated classroom social system that is supportive of all children being able to learn with little aggressive or disruptive behavior.<sup>120</sup> Two cohorts of youths participated in the program in 1985-86 and 1986-87 school years when they were in the first and second grades. A number of proximal and distal outcomes were assessed among the two cohorts over time. With respect to distal suicide-related outcomes, an outcome evaluation of the *GBG* indicated that individuals in the first cohort who were assigned to participate in *GBG* when they were in the first grade reported half the adjusted odds of suicidal ideation and



suicide attempts when assessed approximately 15 years later, between the ages of 19 to 21, compared to peers who had been in a standard classroom setting. The beneficial effect of the program was consistent for suicidal ideation regardless of whether baseline covariates were included. The *GBG* effect on attempts was less robust in some adjusted models including caregiver mental health. In the second cohort of *GBG* students, neither suicidal ideation nor suicide attempts were significantly different between *GBG* and the control interventions.<sup>120</sup> The researchers believed this may have been due to a lack of implementation fidelity, including less mentoring and monitoring of teachers. *GBG* was also found to be associated with reduced risk of later substance abuse and other suicide risk factors among the first cohort of students. Results for the second cohort were generally smaller but in the desired direction.<sup>121</sup>

- **Parenting skill and family relationship programs.** Parenting and family skills training approaches have shown promising impacts in preventing key risk factors associated with suicide. For example, the *Incredible Years (IY)* is a comprehensive group training program for parents, teachers and children designed to reduce conduct and substance abuse problems, two important suicide risk factors in youth by improving protective factors such as responsive and positive parent-teacher-child interactions and relationships, emotion self-regulation and social competence (all protective factors for suicide).<sup>117</sup> The program includes 9-20 sessions offered in community-based settings (e.g., religious, recreation centers, mental health treatment centers, and hospitals). Several studies have demonstrated the effect of the *IY* program on reducing internalizing symptoms, such as anxiety and depression, and child conduct problems.<sup>122,123</sup> The program is also associated with improved problem-solving and conflict management; these skills were maintained at 1-year follow-up.<sup>124-126</sup> Additionally, the program demonstrated greater benefits in mother-rated child internalizing symptoms, compared to the waitlisted control group, when parent, child, and teacher components were included.<sup>117</sup>

Additionally, *Strengthening Families 10–14* is a program that involves sessions between parents, youth, and family with the goal of improving parents' skills for disciplining, managing emotions and conflict, and communicating with their children; promoting youths' interpersonal and problem-solving skills; and creating family activities to build cohesion and positive parent-child interactions. The premise of the program is that developing these skills for both parents and children will reduce internalizing behavior and adolescent substance abuse, two important risk factors for suicide.<sup>127</sup> *Strengthening Families* has been shown to significantly decrease externalizing behaviors, such as aggression, alcohol use, and drug use among youth participants, as well as reduce depression, alcohol use, and drug use among participating families.<sup>127</sup>

## Identify and Support People At-Risk

### Rationale

In order to decrease suicide, care of, and attention to, vulnerable populations is necessary, as these groups tend to experience suicidal behavior at higher than average rates. Such vulnerable populations include, but are not limited to, individuals with lower socio-economic status or who are living with a mental health problem; people who have previously attempted suicide; Veterans and active duty military personnel; individuals who are institutionalized, have been victims of violence, or are homeless; individuals of sexual minority status; and members of certain racial and ethnic minority groups.<sup>6,7,9,10,128</sup> Supporting people at-risk requires proactive case finding and effective response, crisis intervention, and evidence-based treatment. Finding optimal ways of identifying at-risk individuals, customizing services to make them more accessible (e.g., Internet-based services when appropriate) and engaging people in evidence-based care (e.g. through such measures as collaborative treatment), remain key challenges. Simply improving or expanding services does not guarantee that those services will be used by people most in need, nor will it necessarily increase the number of people who follow recommended referrals or treatment. For example, some people living in disadvantaged communities may face social and economic issues that can adversely affect their ability to access supportive services.

### Approaches

The following approaches focus on identifying and supporting people at increased risk of suicide.

- **Gatekeeper training** is designed to train teachers, coaches, clergy, emergency responders, primary and urgent care providers, and others in the community to identify people who may be at risk of suicide and to respond effectively, including facilitating treatment seeking and support services. Gatekeeper training may be implemented in a variety of settings to identify and support people at risk.
- **Crisis intervention.** These approaches provide support and referral services, typically by connecting a person in crisis (or a friend or family member of someone at-risk) to trained volunteers or professional staff via telephone hotline, online chat, text messaging, or in-person. Crisis intervention approaches are intended to impact key risk factors for suicide, including feelings of depression, hopelessness, and subsequent mental health care utilization. Similar to means reduction, crisis interventions can put space or time between an individual who may be considering suicide and harmful behavior.
- **Treatment for people at-risk of suicide** can include various forms of psychotherapy delivered by licensed providers to help individuals with mental health problems and other suicide risk factors with problem-solving and emotion regulation. Treatment usually takes place in a one-on-one or group format between patients and clinicians and can vary in duration from several weeks to



ongoing therapy, as needed. Treatment that employs collaborative (i.e., between patient and therapist or care manager) and/or integrated care (e.g., linkage between primary care and behavioral health care) can help engage and motivate patients, thereby increasing retention in therapy and decreasing suicide risk.<sup>129-131</sup>

- **Treatment to prevent re-attempts.** These approaches typically include follow-up contact and use diverse modalities (e.g., home visits, mail, telephone, e-mail) to engage recent suicide attempt survivors in continued treatment to prevent re-attempts. Treatment may focus on improved coping skills, mindfulness, and other emotional regulation skills, and may include case management home visits to increase adherence to treatment and continuity of care; and one-on-one interpersonal therapy and/or group therapy. Approaches that engage and connect attempters to peers and providers are especially important because many attempters do not present to aftercare; 12%-25% reattempt within a year, and 3%-9% of attempt survivors die by suicide within 1 to 5 years of their initial attempt.<sup>132</sup>

### Potential Outcomes

- Reductions in suicide attempts
- Reductions in suicide rates
- Reductions in suicide deaths
- Reductions in symptoms of mental illnesses
- Reductions in suicidal ideation
- Reductions in mental health-related sequelae
- Reductions in re-attempts
- Increases in connectedness
- Improvements in coping skills
- Increases in identification of individuals at-risk for suicidal behavior
- Increases in treatment engagement and compliance by at-risk individuals
- Increases in community members trained to identify at-risk individuals
- Increases in referrals for health care

### Evidence

The current evidence suggests that identifying people at risk of suicide and the continued provision of treatment and support for these individuals can positively impact suicide and its associated risk factors.

- **Gatekeeper training.** *Applied Suicide Intervention Skills Training (ASIST)* is a widely implemented training program that helps hotline counselors, emergency workers, and other gatekeepers to identify and connect with suicidal individuals, understand their reasoning for living and dying,

and assist with safely connecting those in need to available resources. In a study employing a randomized controlled trial, Gould, Cross, Pisani, Munfakh, & Kleinman<sup>133</sup> evaluated the training across the *National Suicide Prevention Lifeline* network of hotlines over the period 2008-2009. Using data from 1,410 suicidal individuals who called 17 Lifeline centers, the researchers found that callers who spoke with *ASIST*-trained counselors were significantly more likely to feel less depressed, less suicidal, less overwhelmed, and more hopeful by the end of their call, compared to callers who spoke to non-*ASIST* trained counselors. Counselors trained in *ASIST* were also more skilled at keeping callers on the phone longer and establishing a connection with them. However, training in *ASIST* did not result in more comprehensive suicide risk assessments than usual care training.<sup>133</sup>

Gatekeeper training has also been a primary component of the *Garret Lee Smith (GLS) Suicide Prevention Program*, which is in place in 49 states and 48 tribes. A multi-site evaluation assessed the impact of community gatekeeper training on suicide attempts and deaths by comparing the change in suicide rates and nonfatal suicidal behavior among young people aged 10-24 in counties implementing *GLS* trainings, with the trajectory observed in similar counties that did not implement these trainings. Counties that implemented *GLS* trainings had significantly lower youth suicide rates one year following the training implementation.<sup>134</sup> This finding equates to a decrease of 1 suicide death per 100,000 among youth ages 10 to 24, or the prevention of approximately 237 deaths in the age group, between 2007 and 2010. Counties implementing *GLS* program activities also had significantly lower suicide attempt rates among youth ages 16 to 23 in the year following implementation of the *GLS* program than did similar counties that did not implement *GLS* activities (4.9 fewer attempts per 1000 youths).<sup>135</sup> More than 79,000 suicide attempts may have been prevented during the period examined.

- **Crisis intervention.** Suicide prevention hotlines are one way to provide crisis intervention. In an evaluation of the effectiveness of the *National Suicide Prevention Lifeline* to prevent suicide, 1,085 suicidal individuals who called the hotline completed a standard risk assessment for suicide, and 380 of those completed a follow-up assessment between 1 and 52 days (mean=13.5 days) after the initial assessment. Researchers found that over half of the initial sample were seriously considering suicide when they called, and they had a plan for their suicide. Researchers also found that among follow-up participants, there was a significant decrease in psychological pain, hopelessness, and intent to die between initiation of the call (time 1) to follow-up (time 3). Between time 2 (end of the call) to time 3, the effect remained for psychological pain and hopelessness, but was not significant for intent to die, suggesting that greater effort at outreach during and following the call is needed for the callers with high levels of suicide intent.<sup>136</sup>



- **Treatment for people at-risk of suicide.** The *Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)* program aims to prevent suicide among older primary care patients by reducing suicide ideation and depression. *IMPACT* facilitates the development of a therapeutic alliance, a personalized treatment plan that includes patient preferences, as well as proactive follow-up (biweekly during an acute phase and monthly during continuation phase) by a depression care manager.<sup>137</sup> The program has been shown to significantly improve quality of life, and to reduce functional impairment, depression and suicidal ideation over 24-months of follow-up<sup>137,138</sup> relative to patients who received care as usual.

*Collaborative Assessment and Management of Suicidality (CAMS)*, is a therapeutic approach for suicide-specific assessment and treatment. The program's flexible approach can be used across treatment settings and clinician theoretical orientations and involves the clinician and patient working together in an interactive assessment process to develop patient-specific treatment plans. Sessions are collaborative and involve constant patient input about what is and is not working with the ultimate goal of enhancing the therapeutic alliance and increasing treatment motivation in the suicidal patient. *CAMS* has been tested and supported in 6 correlational studies,<sup>139</sup> in a variety of inpatient and outpatient settings, and in one RCT with several additional RCTs under way. A feasibility trial with a community-based sample of suicidal outpatients randomly assigned to *CAMS* or enhanced care as usual (intake with a psychiatrist or psychiatric nurse practitioner followed by 1-11 visits with a case manager and medication as needed) found better treatment retention among the *CAMS* group and significant improvements in suicidal ideation, overall symptom distress, and feelings of hopelessness at the 12 month follow-up.<sup>140</sup>

Other examples include *Dialectical Behavioral Therapy (DBT)* and *Attachment-Based Family Therapy (ABFT)*. *DBT* is a multicomponent therapy for individuals at high risk for suicide and who may struggle with impulsivity and emotional regulation issues. The components of *DBT* include individual therapy, group skills training, between-session telephone coaching and a therapist consultation team. In a randomized controlled trial of women with recent suicidal or self-injurious behavior, those receiving *DBT* were half as likely to make a suicide attempt at two-year follow-up than women receiving community treatment (23% vs 46%), required less hospitalization for suicide ideation, and had lower medical risk across all suicide attempts and self-injurious acts combined.<sup>141</sup>

*ABFT* is a program for adolescents aged 12-18 and is designed to treat clinically diagnosed major depressive disorder, eliminate suicidal ideation, and reduce dispositional anxiety.<sup>142</sup> A randomized controlled trial of *ABFT* found that suicidal adolescents assigned to *ABFT* experienced significantly greater improvement in suicidal ideation over 24 weeks of follow-up than did adolescents assigned to enhanced usual care. Additionally, a significantly higher percentage of *ABFT* participants reported no suicidal ideation in the week prior to assessment at 12 weeks than

did adolescents receiving enhanced usual care (69.2% vs. 34.6%) and at 24 weeks (82.1% vs. 46.2%).<sup>142</sup>

The Veterans Affairs *Translating Initiatives for Depression into Effective Solutions* project (*TIDES*) uses a depression care liaison to link primary care and mental health services. The depression care liaison assesses and educates patients and follows up with both patients and providers between primary care visits to optimize treatment. This collaborative care increases the efficiency of providing mental health services by bringing mental health care to the primary care setting, where most patients are first detected and subsequently treated for many mental health conditions. An evaluation of *TIDES* found significant decreases in depression severity scores among 70% of primary care patients.<sup>143</sup> *TIDES* also demonstrated 85% and 95% compliance with medication and follow-up visits, respectively.<sup>143</sup>

- **Treatment to prevent re-attempts.** Several strategies that aim to prevent re-attempts have demonstrated impact on reducing suicide deaths. For example, *Emergency Department Brief Intervention with Follow-up Visits* is a program that involves a one-hour discharge information session that addresses suicidal ideation and attempts, distress, risk and protective factors, alternatives to self-harm, and referral options, combined with nine follow-up contacts over 18 months (at 1, 2, 4, 7, 11 weeks and 4, 6, 12, 18 months). Follow-up contacts are either conducted by phone or through home visits according to a specific timeline for up to 18 months. A randomized controlled trial that enrolled suicide attempters from eight hospital emergency departments in five countries (Brazil, India, Sri Lanka, Iran, and China) found that a brief intervention combined with nine follow-up visits over 18 months was associated with significantly fewer deaths from suicide relative to a treatment-as-usual group (0.2% versus 2.2%, respectively).<sup>144</sup>

Another example of treatment to prevent re-attempts involves *active follow-up contact approaches* such as postcards, letters, and telephone calls intended to increase a patient's sense of connectedness with health care providers and decrease isolation. These approaches include expression of care and support and typically invite patients to reconnect with their provider. Contacts are made periodically (e.g., monthly or every few months in the first 12 months post-discharge with some programs continuing contact for two or more years). In a meta-analysis conducted by Inagaki et al.,<sup>132</sup> interventions to prevent repeat suicide attempts in patients admitted to an emergency department for suicide attempt were found to reduce reattempts by approximately 17% for up to 12 months post-discharge; however, the effects of these approaches beyond 12 months on reattempts has not yet been demonstrated.<sup>132</sup> Also, because the number of trials and associated sample sizes included in this meta-analysis were small, it was not possible to determine the effect of active contact and follow-up approaches on death by suicide.



In a randomized controlled trial of the post-crisis suicide prevention long-term follow-up contact approach, Motto, Bostrom <sup>145</sup> found that patients who refused ongoing care but who were randomized to be contacted by letter four times per year had a lower rate of suicide over two years of follow-up than did patients in the control group who received no further contact. Other studies have also shown post-crisis letters and coping cards to be protective against suicide ideation and attempts.<sup>146,147</sup>

Finally, *Cognitive Behavior Therapy for Suicide Prevention (CBT-SP)* is an example of a therapeutic approach to prevent re-attempts. It uses a risk-reduction, relapse prevention approach that includes an analysis of proximal risk factors and stressors (e.g., relationship problems, school or work-related difficulties) leading up to and following the suicidal event; safety plan development; skill building; and psychoeducation. *CBT-SP* also has family skill modules focused on family support and communication patterns as well as improving the family's problem solving skills. A randomized controlled trial of *CBT-SP* found that 10-session outpatient cognitive therapy designed to prevent repeat suicide attempts resulted in a 50% reduction in the likelihood of a suicide reattempt among adults who had been admitted to an emergency department for a suicide attempt relative to treatment as usual.<sup>148</sup>

## Lessen Harms and Prevent Future Risk

### Rationale

Millions of people are bereaved by suicide every year in the United States and throughout the world. Risk of suicide and suicide risk factors has been shown to increase among people who have lost a friend/peer, family member, co-worker, or other close contact to suicide.<sup>149</sup> Care and attention to the bereaved is therefore of high importance. Despite often good intentions, media and others responding to suicide may add to this risk. For example, research suggests that exposure to sensationalized or otherwise uninformed reporting on suicide may heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to what is known as suicide contagion.<sup>150,151</sup> While the evidence is still being built in this area, particularly with regard to the impact of policy and practices on suicide and suicide attempts in the United States, measures to care for the bereaved population through such means as postvention interventions (e.g. counseling, support groups and debriefing sessions) and safe reporting on suicide have shown impacts in other countries.

### Approaches

Some approaches that can be used to lessen harms and reduce future risk of suicide include caring for the bereaved and safe reporting following a suicide.

- **Postvention** approaches are implemented *after* a suicide has taken place and may include debriefing sessions, counseling, and/or bereavement support groups for surviving friends and family members/loved ones. These programs have not typically been evaluated for their impact on suicide or suicidal behavior but may reduce survivors' guilt, feelings of depression, and complicated grief.<sup>152</sup>
- **Safe reporting and messaging about suicide.** The manner in which information on a recent suicide is communicated to the public (e.g. school assemblies, mass media, social media) can heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to suicide contagion. Reports that are inclusive of suicide prevention messages, stories of hope and resilience, risk and protective factors, and links to helping resources (e.g., hotline), and that avoid sensationalizing events or reducing suicide to one cause, can help reduce the likelihood of suicide contagion.

### Potential Outcomes

- Reductions in suicidal ideation
- Reductions in suicide attempts



- Reductions in psychological distress
- Increases in treatment seeking and engagement
- Improvements in reporting following suicide
- Reductions in contagion effects related to suicide

## Evidence

Current evidence suggests that lessening harm through postvention and safe reporting and messaging can impact risk and protective factors for suicide.

- **Postvention** programs are implemented with the goal of providing support to survivors of others' suicide to reduce their own risk of suicide. One example of a postvention program, *StandBy Response Service (StandBy)*, provides clients with face-to-face outreach and telephone support through a professional crisis response team. Site coordinators develop customized case management plans, referring clients to other existing community services matched to their needs.<sup>153</sup> In a study by Visser, Comans, Scuffham <sup>153</sup> *StandBy* clients were significantly less likely to be at high risk for suicidality (suicide ideation and attempts) and had less psychological distress than a suicide bereaved comparison group who had not had contact with the *StandBy* program (48% and 64% respectively). Additionally, research suggests that active postvention approaches in which outreach to suicide survivors occurs at the scene of a suicide is associated with intake into treatment sooner, greater attendance at support group meetings, and attendance at more meetings compared to passive postvention (versus passive approaches where survivors self-refer for services).<sup>154</sup>
- **Safe reporting and messaging about suicide.** One way to ensure safe reporting and messaging about suicide is to encourage news media adhere to *Recommendations for Reporting on Suicide* (<http://www.reportingonsuicide.org>). The most compelling evidence supporting these recommendations for reporting comes from Austria. After a sharp increase in suicides on the Viennese subway, media guidelines were introduced and an interrupted time series design was used to evaluate the national impact of the guidelines on subsequent suicides. Changes in the quality and quantity of media reporting resulted in a nationwide significant reduction of 81 suicides annually.<sup>151</sup> Finally, research suggests that not only does reporting on suicide in a negative way (e.g., reporting on suicide myths and repetition) have harmful effects on suicide, but reporting on positive coping skills in the face of adversity can also demonstrate protective effects against suicide.<sup>155</sup> Reports of individual suicidal ideation not accompanied by reports of suicide or suicide attempts, along with reports describing a “mastery” of a crisis situation where adversities were overcome, was associated with significant decreases in suicide rates in the time period immediately following such reports.<sup>155</sup>



## Sector Involvement

Public health can play an important and unique role in addressing suicide. Public health agencies, which typically place prevention at the forefront of efforts and work to create broad population-level impact, can bring critical leadership and resources to bear on this problem. For example, these agencies can serve as a convener, bringing together partners and stakeholders to plan, prioritize, and coordinate suicide prevention efforts. Public health agencies are also well positioned to collect and disseminate data, implement preventive measures, evaluate programs, and track progress. Although public health can play a leadership role in preventing suicide, the strategies and approaches outlined in this technical package cannot be accomplished by the public health sector alone. As noted in the National Strategy to Prevent Suicide, the integration and coordination of prevention activities across sectors and settings is critical for expanding the reach and impact of suicide prevention efforts.

Other sectors vital to implementing this package include, but are not limited to, education, government (local, state, and federal), social services, health services, business, labor, justice, housing, media, and organizations that comprise the civil society sector such as faith-based organizations, youth-serving organizations, foundations, and other non-governmental organizations. Collectively, these sectors can make a difference in preventing suicide by impacting the various contexts and underlying risks that contribute to suicide.

The strategies and approaches described in this technical package are summarized in Appendix A along with the relevant sectors that are well positioned to lead implementation efforts. For example, business and labor, the health sector (including insurers, providers, and health systems), and government entities are in the best position to implement programs and policies that *Strengthen Economic Supports* and *Strengthen Access and Delivery of Suicide Care*. These types of supports go beyond individual behavior change and require commitment and support from those sectors that can directly address some of the underlying risks and the environmental contexts that increase the risk for suicide. Public health entities can play an important role by gathering and synthesizing information to inform policy, raise awareness, and evaluate the effectiveness of various policies. Moreover, partnerships with non-governmental and community organizations can be instrumental in increasing awareness of and garnering support for policies affecting individuals and families.

The public health sector has been at the forefront of many community-based prevention efforts, working collaboratively with schools and community-based organizations, to change social norms and positively impact health behavior. Public health is well suited to take on a similar leadership role in *Promoting Connectedness* through peer norm and community engagement activities and supporting the development, evaluation, and adoption of effective programs that *Teach Coping and Problem-Solving Skills* to prevent suicide from happening in the first place. These programs are often delivered in school and community settings, making education and non-governmental organizations vital partners in prevention.



Businesses, workplaces, and local and state government entities, on the other hand, are in the best position to establish policies and support practices that *Create Protective Environments* where people live, work, and play. Public health entities can play an important role by gathering and synthesizing information, working with other governmental agencies (e.g., criminal justice, defense) and agencies within the executive branch of their state or local government in support of policy and other approaches, and evaluating the effectiveness of measures taken. In a similar fashion, public health entities can partner with schools, workplaces, and community organizations to implement and evaluate prevention programs, policies and practices geared toward creating safe, healthy, and supportive environments.

Finally, this technical package includes a number of interventions delivered in hospital, primary care, behavioral health care, and community settings designed to *Identify and Support People At-Risk*. The intensity and activities for many of these interventions require the expertise of professionals who are licensed and trained to deliver critical intervention support. The health, social services, and justice sectors can work collaboratively to support individuals at high-risk for suicide and their families. These activities also require coordination of supports across various service providers and community organizations.

Regardless of strategy, action by many sectors will be necessary for the successful implementation of this package. In this regard, all sectors can play an important and influential role in preventing suicide from happening in the first place and lessening the immediate and long-term harms of suicidal behavior by helping those in times of crisis get the services and support they need.

## Monitoring and Evaluation

Monitoring and evaluation are necessary components of the public health approach to prevention. It is important to have timely and reliable data to monitor the extent of the problem and to evaluate the impact of prevention efforts. Data are also necessary for prevention planning and implementation.

Gathering ongoing and systematic data is important for prevention efforts. However, it is also important to gather data that are uniform and consistent across systems. Consistent data allow public health and other entities to better gauge the scope of the problem, identify high-risk groups, and monitor the effects of prevention programs and policies. Currently, it is common for different sectors, agencies, and organizations to employ varying definitions of suicidal ideation, behavior, and death that can make it difficult to consistently monitor specific outcomes across sectors and over time. For example, the manner in which deaths are classified can change from one jurisdiction to another, and can change based on local medical and/or medicolegal standards.<sup>2</sup> CDC's uniform definitions and recommended data elements for self-directed violence provide a useful framework to help ensure that data are collected in a consistent manner across surveillance systems.<sup>2</sup>

Surveillance systems exist at the federal, state, and local levels. It is important to assess the availability of surveillance data and data systems across these levels to identify and address gaps in the systems. CDC's *National Vital Statistics System (NVSS)*<sup>156</sup> and the *National Violent Death Reporting System (NVDRS)*<sup>157</sup> are examples of surveillance systems that provide data on deaths from suicide. NVSS is a nationwide surveillance system that collects demographic, geographic, and cause-of-death data from death certificates.<sup>156</sup> NVDRS is a state-based surveillance system (currently in 40 states, the District of Columbia, and Puerto Rico) that combines data from death certificates, law enforcement reports, and coroner or medical examiner reports to provide detailed information on the circumstances of violent deaths, including suicide, which can assist communities in guiding prevention approaches.<sup>157</sup> Data from state and local Child Death Review teams<sup>158</sup> and Suicide Death Review Teams (which are in a few states) offer another source to identify deaths and obtain insight into the gaps in services, systems, and modifiable risk factors for suicide.

The *National Electronic Injury Surveillance System-All Injury Program (NEISS-AIP)* provides nationally representative data about all types and causes of nonfatal injuries treated in U.S. hospital emergency departments, and can be used to assess national rates of, and trends in, self-harm injuries by cause (e.g., falls, poisoning, etc.), age, race/ethnicity, sex, disposition (where the injured person goes when released from the Emergency Department).<sup>5</sup>

In addition to information on deaths and nonfatal injuries, there are also surveillance systems that provide national, state, and some local estimates of suicidal behavior. The *Youth Risk Behavior Surveillance System (YRBSS)* collects information from a nationally representative sample of 9-12 grade students and is a key resource in monitoring health-risk behaviors among youth, including whether youth



have seriously considered attempting suicide, attempted suicide, made a plan, or required treatment by a doctor or nurse for a suicide attempt that resulted in an injury, poisoning, or overdose.<sup>159</sup> The YRBSS data are obtained from a national school-based survey conducted by CDC as well as from state, territorial, tribal, and large urban school district surveys conducted by education and health agencies.<sup>159</sup> The *National Survey on Drug Use and Health (NSDUH)*<sup>160</sup> is an annual survey of the civilian, non-institutionalized population aged 12 years and older. *NSDUH* provides both national and state-level estimates of substance use (alcohol, tobacco, illicit drugs, and non-medical use of prescription drugs); mental health (past year mental illness, co-occurring illnesses); and service utilization, along with suicide ideation, suicide plans, and suicide attempts. *NSDUH* is a key resource to track trends in suicide-related risk factors in the population and to help identify groups at increased risk.<sup>160</sup>

It is also important at all levels (local, state, and federal) to address gaps in responses, track progress of prevention efforts and evaluate the impact of those efforts, including the impact of this technical package. Evaluation data, produced through program implementation and monitoring, is essential to provide information on what does and does not work to reduce rates of suicide and its associated risk and protective factors. Theories of change and logic models that identify short, intermediate, and long-term outcomes are an important part of program evaluation.

The evidence-base for suicide prevention has advanced greatly over the last few decades. However, additional research is needed to understand the impact of programs, policies, and practices on suicide (and suicide attempts, at a minimum), as opposed to merely examining their effectiveness on risk factors. More research is also needed to examine the effectiveness of primary prevention strategies (before risk occurs) and community-level strategies to prevent suicide at the population level. It will be important for researchers to test the effectiveness of combinations of the strategies and approaches included in this package. Most existing evaluations focus on approaches implemented in isolation, but there is potential to understand the synergistic effects within a comprehensive prevention approach. Lastly, there are also many potential opportunities to build and strengthen partnerships across program areas (e.g., violence prevention, substance abuse prevention) to evaluate the impact of different approaches on multiple outcomes.

## Conclusion

Suicide is a serious public health problem whose rates have been on the rise for more than a decade and whose costs stretch well into the billions of dollars each year. While suicide is a rare outcome statistically, its human impact has a ripple effect that is far-reaching. Each of us likely interacts with suicide survivors, those with lived experience, and those with thoughts of suicide on a daily basis – at home, at work, and in our communities. Suicide and suicide attempts are public health issues of societal concern. There are a number of barriers that have impeded progress, including, for example, stigma related to help-seeking, mental illness, being a survivor and fear related to asking someone about suicidal thoughts. Fortunately,

like many public health problems, suicide is preventable, and more is being done to prevent suicide than ever before, as evidenced by the work of the National Action Alliance for Suicide Prevention, the release of the first world report on suicide, and more timely surveillance data, to name just a few examples.

In an effort to continue pushing the field and society further towards prevention, this technical package includes strategies and approaches that ideally would be used in a comprehensive, multi-level and multi-sectoral way. It includes strategies and approaches to prevent suicide from occurring in the first place, as well as strategies focused on lessening the immediate and long-term harms of suicidal behavior. It includes strategies that range from a focus on the whole population regardless of risk to strategies designed to support people at highest risk. Importantly, this technical package extends the bounds of the typical prevention strategies to consider approaches that go beyond individual behavior change to better address risk factors impacting communities and populations more broadly (e.g., economic policies to strengthen housing and financial security).

While the evidence base continues to emerge, the collection of programs, policies, and practices laid out here are available for implementation now. In keeping with good public health practice, the intent is that monitoring and evaluation will play a key role in that implementation. Moreover, as new evidence becomes available, this technical package can be refined to reflect the current state of the science.

In closing, and in keeping with a message of resilience as spoken by those with lived experience, ‘hope, help, and healing is possible.’



## References

1. Frieden TR. Six components necessary for effective public health program implementation. *Am J Public Health*. 2014;104(1):17-22.
2. Crosby AE, Ortega L, Melanson C. Self-directed Violence Surveillance: Uniform Definitions and Recommended Data Elements, Version 1.0. Atlanta, GA: Centers for Disease Control and Prevention, National Center for Injury Prevention and Control; 2011.
3. World Health Organization. Suicide Prevention: A Global Imperative. Geneva, Switzerland: WHO Press; 2014.
4. U.S. Office of the Surgeon General, National Action Alliance for Suicide Prevention. 2012 National Strategy for Suicide Prevention: Goals and Objectives for Action. Washington, D.C.: HHS; 2012.
5. Centers for Disease Control and Prevention, National Center for Injury Prevention and Control. Web-Based Injury Statistics Query and Reporting System (WISQARS). Available online: <http://www.cdc.gov/injury/wisqars/index.html>.
6. Bachynski KE, Canham-Chervak M, Black SA, Dada EO, Millikan AM, Jones BH. Mental health risk factors for suicides in the US Army, 2007–8. *Injury Prevention*. 2012;18(6):405-412.
7. Lineberry TW, O'Connor SS. Suicide in the US Army. *Mayo Clinic Proceedings*. 2012;87(9):871-878.
8. McIntosh WL, Spies E, Stone DM, Lokey CN, Trudeau AR, Bartholow B. Suicide Rates by Occupational Group - 17 States, 2012. *MMWR Morb Mortal Wkly Rep*. 2016;65(25):641-645.
9. Kann L, McManus T, Harris WA, et al. Youth Risk Behavior Surveillance - United States, 2015. *Morbidity and mortality weekly report. Surveillance summaries (Washington, D.C. : 2002)*. 2016;65(6):1-174.
10. Russell ST, Joyner K. Adolescent sexual orientation and suicide risk: Evidence from a national study. *American Journal of public health*. 2001;91(8):1276-1281.
11. Crosby AE, Han B, Ortega LA, Parks SE, Gfroerer J. Suicidal thoughts and behaviors among adults aged ≥18 years--United States, 2008-2009. *Morbidity and mortality weekly report. Surveillance summaries (Washington, D.C. : 2002)*. 2011;60(13):1-22.
12. Dahlberg LL, Krug EG. Violence-a global public health problem. In: Krug E, Dahlberg LL, Mercy JA, Zwi AB, Lozano R, eds. *World Report on Violence and Health*. Geneva, Switzerland: World Health Organization; 2002:1-56.
13. Bossarte RM, Karras E, Lu N, et al. Associations between the Department of Veterans Affairs' suicide prevention campaign and calls to related crisis lines. *Public health reports (Washington, D.C. : 1974)*. 2014;129(6):516-525.
14. Chapman DP, Whitfield CL, Felitti VJ, Dube SR, Edwards VJ, Anda RF. Adverse childhood experiences and the risk of depressive disorders in adulthood. *Journal of affective disorders*. 2004;82(2):217-225.
15. Dube SR, Anda RF, Felitti VJ, Chapman DP, Williamson DF, Giles WH. Childhood abuse, household dysfunction, and the risk of attempted suicide throughout the life span: findings from the Adverse Childhood Experiences Study. *JAMA*. 2001;286(24):3089-3096.
16. Felitti VJ, Anda RF, Nordenberg D, et al. Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: The Adverse Childhood Experiences (ACE) Study. *American journal of preventive medicine*. 1998;14(4):245-258.
17. Klomek AB, Sourander A, Gould M. The association of suicide and bullying in childhood to young adulthood: a review of cross-sectional and longitudinal research findings. *The Canadian Journal of Psychiatry*. 2010;55(5):282-288.
18. Leeb RT, Lewis T, Zolotor AJ. A review of physical and mental health consequences of child abuse and neglect and implications for practice. *American Journal of Lifestyle Medicine*. 2011;5(5):454-468.
19. World Health Organization. Global and Regional Estimates of Violence Against Women: Prevalence and Health Effects of Intimate Partner Violence and Non-Partner Sexual Violence. Geneva: World Health Organization; 2013.

20. Bellis MA, Hughes K, Leckenby N, et al. Adverse childhood experiences and associations with health-harming behaviours in young adults: surveys in eight eastern European countries. *Bull World Health Organ.* 2014;92(9):641-655.
21. Haegerich TM, Dahlberg LL. Violence as a public health risk. *American Journal of Lifestyle Medicine.* 2011;1559827611409127.
22. Wilkins N, Tsao B, Hertz M, Davis R, Klevens J. Connecting the dots: an overview of the links among multiple forms of violence. Atlanta, GA: National Center for Injury Prevention and Control, Centers for Disease Control and Prevention; 2014.
23. Hamby S, Grych J. The web of violence: exploring connections among different forms of interpersonal violence and abuse. *Briefs in Sociology.* New York, NY: Springer; 2013.
24. Kleiman EM, Riskind JH, Schaefer KE, Weingarden H. The moderating role of social support on the relationship between impulsivity and suicide risk. *Crisis.* 2012;33(5):273-279.
25. Carter M, McGee R, Taylor B, Williams S. Health outcomes in adolescence: associations with family, friends and school engagement. *J Adolesc.* 2007;30(1):51-62.
26. Maimon D, Browning CR, Brooks-Gunn J. Collective efficacy, family attachment, and urban adolescent suicide attempts. *J Health Soc Behav.* 2010;51(3):307-324.
27. Capaldi DM, Knoble NB, Shortt JW, Kim HK. A Systematic Review of Risk Factors for Intimate Partner Violence. *Partner Abuse.* 2012;3(2):231-280.
28. Losel F, Farrington DP. Direct protective and buffering protective factors in the development of youth violence. *American journal of preventive medicine.* 2012;43(2 Suppl 1):S8-S23.
29. Wyman PA, Brown CH, LoMurray M, et al. An outcome evaluation of the Sources of Strength suicide prevention program delivered by adolescent peer leaders in high schools. *Am J Public Health.* 2010;100(9):1653-1661.
30. Dunne EJ, McIntosh JL, Dunne-Maxim K, eds. Suicide and its aftermath: Understanding and counseling the survivors. New York: Norton; 1987.
31. Mishara BL, ed The Impact of Suicide. New York: Springer; 1995.
32. National Action Alliance for Suicide Prevention: Suicide Attempt Survivors Task Force. The Way Forward: Pathways to hope, recovery, and wellness with insights from lived experience. Washington, D.C. : Author; 2014.
33. National Action Alliance for Suicide Prevention: Survivors of Suicide Loss Task Force. Responding to Grief, Trauma, and Distress After a Suicide: U.S. National Guidelines. Washington, D.C. : Author; 2015.
34. Crosby AE, Sacks JJ. Exposure to Suicide: Incidence and Association with Suicidal Ideation and Behavior: United States, 1994. *Suicide and Life-Threatening Behavior.* 2002;32(3):321-328.
35. Cerel J, Maple M, De Venne A, Moore M, Flaherty C, Brown M. Exposure to Suicide in the Community: Prevalence and Correlates in One US State. *Public Health Reports.* 2016;131(1).
36. Chapman AL, Dixon-Gordon KL. Emotional antecedents and consequences of deliberate self-harm and suicide attempts. *Suicide Life Threat Behav.* 2007;37(5):543-552.
37. Mitchell AM, Kim Y, Prigerson HG, Mortimer-Stephens M. Complicated grief in survivors of suicide. *Crisis.* 2004;25(1):12-18.
38. Sudak H, Maxim K, Carpenter M. Suicide and stigma: a review of the literature and personal reflections. *Acad Psychiatry.* 2008;32(2):136-142.
39. Cerel J, McIntosh JL, Neimeyer RA, Maple M, Marshall D. The Continuum of "Survivorship": Definitional Issues in the Aftermath of Suicide. *Suicide and Life-Threatening Behavior.* 2014;44(6):591-600.
40. Florence C, Simon T, Haegerich T, Luo F, Zhou C. Estimated lifetime medical and work-loss costs of fatal injuries-United States, 2013. *MMWR: Morbidity and mortality weekly report.* 2015;64(38):1074-1077.
41. Shepard DS, Gurewicz D, Lwin AK, Reed GA, Jr., Silverman MM. Suicide and Suicidal Attempts in the United States: Costs and Policy Implications. *Suicide Life Threat Behav.* 2016;46(3):352-362.



42. Silverman MM, Maris RW. The prevention of suicidal behaviors: An overview. *Suicide and Life-Threatening Behavior*. 1995;25(1):10-21.
43. National Action Alliance for Suicide Prevention. Research Prioritization Task Force.(2014). A prioritized research agenda for suicide prevention: An action plan to save lives. 2014.
44. Turecki G. Epigenetics and suicidal behavior research pathways. *American journal of preventive medicine*. 2014;47(3):S144-S151.
45. Edwards RW, Jumper-Thurman P, Plested BA, Oetting ER, Swanson L. Community readiness: Research to practice. *Journal of community psychology*. 2000;28(3):291-307.
46. Hawkins JD, Catalano RF, Kuklinski MR. Communities that care. *Encyclopedia of Criminology and Criminal Justice*: Springer; 2014:393-408.
47. Plested BA, Edwards RW, Jumper-Thurman P. Community readiness: A handbook for successful change. Fort Collins, CO: Tri-Ethnic Center for Prevention Research. 2006.
48. Luo F, Florence CS, Quispe-Agnoli M, Ouyang L, Crosby AE. Impact of business cycles on US suicide rates, 1928-2007. *Am J Public Health*. 2011;101(6):1139-1146.
49. Fowler KA, Gladden RM, Vagi KJ, Barnes J, Frazier L. Increase in suicides associated with home eviction and foreclosure during the US housing crisis: findings from 16 National Violent Death Reporting System States, 2005-2010. *Am J Public Health*. 2015;105(2):311-316.
50. Stack S, Wasserman I. Economic strain and suicide risk: a qualitative analysis. *Suicide and life-threatening behavior*. 2007;37(1):103-112.
51. Cylus J, Glymour MM, Avendano M. Do generous unemployment benefit programs reduce suicide rates? A state fixed-effect analysis covering 1968-2008. *Am J Epidemiol*. 2014;180(1):45-52.
52. Classen TJ, Dunn RA. The effect of job loss and unemployment duration on suicide risk in the United States: a new look using mass-layoffs and unemployment duration. *Health Econ*. 2012;21(3):338-350.
53. Flavin P, Radcliff B. Public policies and suicide rates in the American states. *Social Indicators Research*. 2009;90(2):195-209.
54. Houle JN, Light MT. The home foreclosure crisis and rising suicide rates, 2005 to 2010. *Am J Public Health*. 2014;104(6):1073-1079.
55. Owens D. Fatal and non-fatal repetition of self-harm: Systematic review. *British journal of psychiatry*. 2002;181(3):193-199.
56. Olfson M, Gerhard T, Huang C, Crystal S, Stroup TS. Premature Mortality Among Adults With Schizophrenia in the United States. *JAMA psychiatry*. 2015;72(12):1172-1181.
57. Arsenault-Lapierre G, Kim C, Turecki G. Psychiatric diagnoses in 3275 suicides: a meta-analysis. *BMC Psychiatry*. 2004;4:37.
58. Harris EC, Barraclough B. Suicide as an outcome for mental disorders. A meta-analysis. *Br J Psychiatry*. 1997;170:205-228.
59. Tyrer P, Reed GM, Crawford MJ. Classification, assessment, prevalence, and effect of personality disorder. *Lancet*. 2015;385(9969):717-726.
60. Harris EC, Barraclough B. Excess mortality of mental disorder. *Br J Psychiatry*. 1998;173:11-53.
61. Mark TL, Shern DL, Bagalman JE, Cao Z. Ranking America's mental health: An analysis of depression across the states. Alexandria, VA: Mental Health America. 2007.
62. Lang M. The impact of mental health insurance laws on state suicide rates. *Health Econ*. 2013;22(1):73-88.
63. Kessler RC, Demler O, Frank RG, et al. Prevalence and treatment of mental disorders, 1990 to 2003. *N Engl J Med*. 2005;352(24):2515-2523.
64. Cunningham PJ. Beyond parity: primary care physicians' perspectives on access to mental health care. *Health Aff (Millwood)*. 2009;28(3):w490-501.
65. Coffey CE. Building a system of perfect depression care in behavioral health. *Jt Comm J Qual Patient Saf*. 2007;33(4):193-199.

66. U.S. Department of Health and Human Services Health Resources and Services Administrations. Designated Health Professional Shortage Areas Statistics, As of November 4, 2016. 2016.
67. National Action Alliance for Suicide Prevention: Clinical Workforce Preparedness Task Force. Suicide prevention and the clinical workforce: Guidelines for training. Washington, D.C.: Author; 2014.
68. Harris KM, Carpenter C, Bao Y. The effects of state parity laws on the use of mental health care. *Med Care*. 2006;44(6):499-505.
69. U.S. Department of Health and Human Services Health Resources and Services Administrations. NHSC Clinician Retention: A Story of Dedication and Commitment. 2016.
70. Hailey D, Roine R, Ohinmaa A. The effectiveness of telemental health applications: a review. *The Canadian Journal of Psychiatry*. 2008;53(11):769-778.
71. Mohr DC, Vella L, Hart S, Heckman T, Simon G. The effect of telephone-administered psychotherapy on symptoms of depression and attrition: A meta-analysis. *Clinical Psychology: Science and Practice*. 2008;15(3):243-253.
72. Coffey CE. Pursuing perfect depression care. *Psychiatr Serv*. 2006;57(10):1524-1526.
73. Coffey CE, Coffey MJ, Ahmedani BK. An update on perfect depression care. *Psychiatr Serv*. 2013;64(4):396.
74. Coffey M, Coffey C, Ahmedani BK. Suicide in a health maintenance organization population. *JAMA psychiatry*. 2015;72(3):294-296.
75. Haddon W. Advances in the epidemiology of injuries as a basis for public policy. *Public Health Reports*. 1980;95(5):411-421.
76. Toosi M. Labor force projections to 2024: The labor force is growing, but slowly. In: Statistics BoL, ed. Washington, D.C.: Bureau of Labor Statistics; 2015:1-33.
77. Han B, Crosby AE, Ortega LA, Parks SE, Compton WM, Gfroerer J. Suicidal ideation, suicide attempt, and occupations among employed adults aged 18–64 years in the United States. *Comprehensive psychiatry*. 2016;66:176-186.
78. Knox KL, Pflanz S, Talcott GW, et al. The US Air Force suicide prevention program: implications for public health policy. *Am J Public Health*. 2010;100(12):2457-2463.
79. National Action Alliance for Suicide Prevention Workplace Task Force. Comprehensive Blueprint for Workplace Suicide Prevention. Washington, D.C. : Author; 2015.
80. Runyan CW, Becker A, Brandspigel S, Barber C, Trudeau A, Novins D. Lethal Means Counseling for Parents of Youth Seeking Emergency Care for Suicidality. *West J Emerg Med*. 2016;17(1):8-14.
81. Miller M, Warren M, Hemenway D, Azrael D. Firearms and suicide in US cities. *Inj Prev*. 2015;21(e1):e116-119.
82. Crosby AE, Espitia-Hardeman V, Ortega L, Lozano B. Alcohol and suicide. *Alcohol: Science, Policy and Public Health*. 2013:190.
83. Kaplan MS, McFarland BH, Huguet N, et al. Acute alcohol intoxication and suicide: a gender-stratified analysis of the National Violent Death Reporting System. *Inj Prev*. 2013;19(1):38-43.
84. Beautrais AL, Gibb SJ, Fergusson DM, Horwood LJ, Larkin GL. Removing bridge barriers stimulates suicides: An unfortunate natural experiment. *Aust NZ J Psychiat*. 2009;43(6):495-7.
85. Stokes ML, McCoy KP, Abram KM, Byck GR, Teplin LA. Suicidal Ideation and Behavior in Youth in the Juvenile Justice System: A Review of the Literature. *Journal of correctional health care : the official journal of the National Commission on Correctional Health Care*. 2015;21(3):222-242.
86. Simon OR, Swann AC, Powell KE, Potter LB, Kresnow MJ, O'Carroll PW. Characteristics of impulsive suicide attempts and attempters. *Suicide Life Threat Behav*. 2001;32(1 Suppl):49-59.
87. Deisenhammer EA, Ing CM, Strauss R, Kemmler G, Hinterhuber H, Weiss EM. The duration of the suicidal process: how much time is left for intervention between consideration and accomplishment of a suicide attempt? *J Clin Psychiatry*. 2009;70(1):19-24.



88. Hawton K. Restricting access to methods of suicide: Rationale and evaluation of this approach to suicide prevention. *Crisis*. 2007;28(Suppl. 1):4-9.
89. Yip P, Caine E, Yousuf S, Chang S-S, Wu K, Chen Y-Y. Means restriction for suicide prevention. *Lancet*. 2012;379(9834):2393-9.
90. Cox GR, Owens C, Robinson J, et al. Interventions to reduce suicides at suicide hotspots: a systematic review. *BMC Public Health*. 2013;13(1):1-12.
91. Rowhani-Rahbar A, Simonetti JA, Rivara FP. Effectiveness of Interventions to Promote Safe Firearm Storage. *Epidemiol Rev*. 2016;38(1):111-124.
92. Hayes LM. Suicide prevention in correctional facilities: reflections and next steps. *International journal of law and psychiatry*. 2013;36(3-4):188-194.
93. Giesbrecht N, Huguette N, Ogden L, et al. Acute alcohol use among suicide decedents in 14 US states: impacts of off-premise and on-premise alcohol outlet density. *Addiction*. 2015;110(2):300-307.
94. Escobedo LG, Ortiz M. The relationship between liquor outlet density and injury and violence in New Mexico. *Accid Anal Prev*. 2002;34(5):689-694.
95. Cherpitel CJ, Borges GLG, Wilcox HC. Acute alcohol use and suicidal behavior: A review of the literature. *Alcoholism: Clinical and Experimental Research*. 2004;28(5 SUPPL.):18S-28S.
96. Pirkis J, Too LS, Spittal MJ, Krysinaka K, Robinson J, Cheung YTD. Interventions to reduce suicides at suicide hotspots: a systematic review and meta-analysis. *The Lancet Psychiatry*. 2015;2(11):994-1001.
97. Perron S, Burrows S, Fournier M, Perron PA, Ouellet F. Installation of a bridge barrier as a suicide prevention strategy in Montreal, Quebec, Canada. *Am J Public Health*. 2013;103(7):1235-1239.
98. Beautrais AL. Effectiveness of barriers at suicide jumping sites: A case study. *Aust NZ J Psychiat*. 2001;35(5):557-62.
99. Grossman DC, Mueller BA, Riedy C, et al. Gun storage practices and risk of youth suicide and unintentional firearm injuries. *JAMA*. 2005;293(6):707-714.
100. Mishara BL, Martin N. Effects of a comprehensive police suicide prevention program. *Crisis: Journal of Crisis Intervention & Suicide*. 2012;33(3):162-168.
101. Knox KL, Litts DA, Talcott GW, Feig JC, Caine ED. Risk of suicide and related adverse outcomes after exposure to a suicide prevention programme in the US Air Force: cohort study. *BMJ*. 2003;327(7428):1376.
102. Hayes LM. Prison Suicide: An Overview and a Guide to Prevention. *The Prison Journal*. 1995;75(4):431-456.
103. Barker E, Kölves K, De Leo D. Management of Suicidal and Self-Harming Behaviors in Prisons: Systematic Literature Review of Evidence-Based Activities. *Archives of Suicide Research*. 2014;18(3):227-240.
104. Rush BR, Gliksman L, Brook R. Alcohol availability, alcohol consumption and alcohol-related damage. I. The distribution of consumption model. *J Stud Alcohol*. 1986;47(1):1-10.
105. Gruenewald PJ, Remer L. Changes in outlet densities affect violence rates. *Alcohol Clin Exp Res*. 2006;30(7):1184-1193.
106. Lipton R, Gruenewald P. The spatial dynamics of violence and alcohol outlets. *J Stud Alcohol*. 2002;63(2):187-195.
107. Lippy C, DeGue S. Exploring alcohol policy approaches to prevent sexual violence perpetration. *Trauma, Violence, & Abuse*. 2016;17(1):26-42.
108. Johnson FW, Gruenewald PJ, Remer LG. Suicide and alcohol: do outlets play a role? *Alcohol Clin Exp Res*. 2009;33(12):2124-2133.
109. Durkheim E. Suicide: A study in sociology (JA Spaulding & G. Simpson, trans.). *Glencoe, IL: Free Press.(Original work published 1897)*. 1897/1951.
110. Centers for Disease Control and Prevention. Strategic direction for the prevention of suicidal behavior: Promoting individual, family, and community connectedness to prevent suicidal behavior. 2009;

Available at: [http://www.cdc.gov/ViolencePrevention/pdf/Suicide\\_Strategic\\_Direction\\_Full\\_version-a.pdf](http://www.cdc.gov/ViolencePrevention/pdf/Suicide_Strategic_Direction_Full_version-a.pdf).

111. Muennig P, Cohen AK, Palmer A, Zhu W. The relationship between five different measures of structural social capital, medical examination outcomes, and mortality. *Social science & medicine* (1982). 2013;85:18-26.
112. Beyer KM, Layde PM, Hamberger LK, Laud PW. Does neighborhood environment differentiate intimate partner femicides from other femicides? *Violence Against Women*. 2015;21(1):49-64.
113. Branas CC, Cheney RA, MacDonald JM, Tam VW, Jackson TD, Ten Have TR. A difference-in-differences analysis of health, safety, and greening vacant urban space. *Am J Epidemiol*. 2011;174(11):1296-1306.
114. Branas CC, Kondo MC, Murphy SM, South EC, Polsky D, MacDonald JM. Urban blight remediation as a cost-beneficial solution to firearm violence. *American journal of public health*. 2016;106(12):2158-2164.
115. Bandura A. *Social foundations of thought and action: A social cognitive theory*. Prentice-Hall, Inc; 1986.
116. Pollock LR, Williams JM. Problem-solving in suicide attempters. *Psychol Med*. 2004;34(1):163-167.
117. Herman KC, Borden LA, Reinke WM, Webster-Stratton C. The Impact of the Incredible Years Parent, Child, and Teacher Training Programs on Children's Co-Occurring Internalizing Symptoms. *Sch Psychol Q*. 2011;26(3):189-201.
118. Knox MS, Burkhart K, Hunter KE. ACT against violence parents raising safe kids program: Effects on maltreatment-related parenting behaviors and beliefs. *Journal of Family Issues*. 2010;32(1):55-74.
119. Wasserman D, Hoven CW, Wasserman C, et al. School-based suicide prevention programmes: The SEYLE cluster-randomised, controlled trial. *The Lancet*. 2014;385(9977):1536-1544.
120. Wilcox HC, Kellam SG, Brown CH, et al. The impact of two universal randomized first- and second-grade classroom interventions on young adult suicide ideation and attempts. *Drug Alcohol Depend*. 2008;95 Suppl 1:S60-73.
121. Kellam SG, Brown CH, Poduska JM, et al. Effects of a universal classroom behavior management program in first and second grades on young adult behavioral, psychiatric, and social outcomes. *Drug Alcohol Depend*. 2008;95 Suppl 1:S5-S28.
122. Webster-Stratton C, Jamila Reid M, Stoolmiller M. Preventing conduct problems and improving school readiness: evaluation of the incredible years teacher and child training programs in high-risk schools. *Journal of child psychology and psychiatry*. 2008;49(5):471-488.
123. Webster-Stratton CH, Reid MJ, Beauchaine T. Combining parent and child training for young children with ADHD. *Journal of Clinical Child & Adolescent Psychology*. 2011;40(2):191-203.
124. Reid MJ, Webster-Stratton C, Hammond M. Follow-up of children who received the Incredible Years intervention for oppositional-defiant disorder: Maintenance and prediction of 2-year outcome. *Behavior Therapy*. 2003;34(4):471-491.
125. Webster-Stratton C, Hammond M. Treating children with early-onset conduct problems: a comparison of child and parent training interventions. *J Consult Clin Psychol*. 1997;65(1):93-109.
126. Webster-Stratton C, Reid MJ, Hammond M. Preventing conduct problems, promoting social competence: a parent and teacher training partnership in head start. *J Clin Child Psychol*. 2001;30(3):283-302.
127. Spoth RL, Guyll M, Day SX. Universal family-focused interventions in alcohol-use disorder prevention: cost-effectiveness and cost-benefit analyses of two interventions. *J Stud Alcohol*. 2002;63(2):219-228.
128. Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999-2014. *NCHS Data Brief*. Hyattsville, MD: National Center for Health Statistics; 2016.
129. Gilbody S, Bower P, Fletcher J, Richards D, Sutton AJ. Collaborative care for depression: a cumulative meta-analysis and review of longer-term outcomes. *Archives of internal medicine*. 2006;166(21):2314-2321.
130. Archer J, Bower P, Gilbody S, et al. Collaborative care for depression and anxiety problems. *Cochrane Database of Systematic Reviews*. 2012;10(Art. No. CD006525).



131. Bruce ML, Ten Have TR, Reynolds III CF, et al. Reducing suicidal ideation and depressive symptoms in depressed older primary care patients: a randomized controlled trial. *Jama*. 2004;291(9):1081-1091.
132. Inagaki M, Kawashima Y, Kawanishi C, et al. Interventions to prevent repeat suicidal behavior in patients admitted to an emergency department for a suicide attempt: a meta-analysis. *Journal of affective disorders*. 2015;175:66-78.
133. Gould MS, Cross W, Pisani AR, Munfakh JL, Kleinman M. Impact of Applied Suicide Intervention Skills Training on the National Suicide Prevention Lifeline. *Suicide Life Threat Behav*. 2013;43(6):676-691.
134. Walrath C, Garraza LG, Reid H, Goldston DB, McKeon R. Impact of the Garrett Lee Smith youth suicide prevention program on suicide mortality. *Am J Public Health*. 2015;105(5):986-993.
135. Godoy Garraza L, Walrath C, Goldston DB, Reid H, McKeon R. Effect of the Garrett Lee Smith Memorial Suicide Prevention Program on Suicide Attempts Among Youths. *JAMA psychiatry*. 2015;72(11):1143-1149.
136. Gould MS, Kalafat J, Harrismunfakh JL, Kleinman M. An evaluation of crisis hotline outcomes. Part 2: Suicidal callers. *Suicide Life Threat Behav*. 2007;37(3):338-352.
137. Hunkeler EM, Katon W, Tang L, et al. Long term outcomes from the IMPACT randomised trial for depressed elderly patients in primary care. *BMJ*. 2006;332(7536):259-263.
138. Unutzer J, Tang L, Oishi S, et al. Reducing suicidal ideation in depressed older primary care patients. *J Am Geriatr Soc*. 2006;54(10):1550-1556.
139. Jobes DA. The Collaborative Assessment and Management of Suicidality (CAMS): an evolving evidence-based clinical approach to suicidal risk. *Suicide Life Threat Behav*. 2012;42(6):640-653.
140. Comtois KA, Jobes DA, S. O'Connor S, et al. Collaborative assessment and management of suicidality (CAMS): feasibility trial for next-day appointment services. *Depression and anxiety*. 2011;28(11):963-972.
141. Linehan MM, Comtois KA, Murray AM, et al. Two-year randomized controlled trial and follow-up of dialectical behavior therapy vs therapy by experts for suicidal behaviors and borderline personality disorder. *Arch Gen Psychiatry*. 2006;63(7):757-766.
142. Diamond GS, Wintersteen MB, Brown GK, et al. Attachment-based family therapy for adolescents with suicidal ideation: a randomized controlled trial. *J Am Acad Child Adolesc Psychiatry*. 2010;49(2):122-131.
143. Rubenstein LV, Chaney EF, Ober S, et al. Using evidence-based quality improvement methods for translating depression collaborative care research into practice. *Families, Systems, & Health*. 2010;28(2):91.
144. Fleischmann A, Bertolote JM, Wasserman D, et al. Effectiveness of brief intervention and contact for suicide attempters: a randomized controlled trial in five countries. *Bull World Health Organ*. 2008;86(9):703-709.
145. Motto JA, Bostrom AG. A randomized controlled trial of postcrisis suicide prevention. *Psychiatr Serv*. 2001;52(6):828-833.
146. Hassanian-Moghaddam H, Sarjami S, Kolahi AA, Carter GL. Postcards in Persia: randomised controlled trial to reduce suicidal behaviours 12 months after hospital-treated self-poisoning. *British Journal of Psychiatry*. 2011;198(4):309-316.
147. Wang YC, Hsieh LY, Wang MY, Chou CH, Huang MW, Ko HC. Coping Card Usage can Further Reduce Suicide Reattempt in Suicide Attempter Case Management Within 3-Month Intervention. *Suicide Life Threat Behav*. 2016;46(1):106-120.
148. Brown GK, Ten Have T, Henriques GR, Xie SX, Hollander JE, Beck AT. Cognitive therapy for the prevention of suicide attempts: a randomized controlled trial. *JAMA*. 2005;294(5):563-570.
149. Pitman A, Osborn D, King M, Erlangsen A. Effects of suicide bereavement on mental health and suicide risk. *Lancet Psychiatry*. 2014;1:86-94.
150. Etzersdorfer E, Sonneck G. Preventing suicide by influencing mass-media reporting: The Viennese experience, 1980–1996. *Arch Suicide Res*. 1998;4(1):67-74.

151. Niederkrotenthaler T, Sonneck G. Assessing the impact of media guidelines for reporting on suicides in Austria: Interrupted time series analysis. *Aust N Z J Psychiatry*. 2007;41(5):419-28.
152. Szumilas M, Kutcher S. Post-suicide intervention programs: a systematic review. *Can J Public Health*. 2011;102(1):18-29.
153. Visser VS, Comans TA, Scuffham PA. Evaluation Of The Effectiveness Of A Community-Based Crisis Intervention Program For People Bereaved By Suicide. *Journal of Community Psychology*. 2014;42(1):19-28.
154. Cerel J, Campbell FR. Suicide survivors seeking mental health services: a preliminary examination of the role of an active postvention model. *Suicide Life Threat Behav*. 2008;38(1):30-34.
155. Niederkrotenthaler T, Voracek M, Herberth A, et al. Media and suicide. Papageno v Werther effect. *BMJ*. 2010;341:c5841.
156. Centers for Disease Control and Prevention, National Center for Health Statistics. National Vital Statistics System. <https://www.cdc.gov/nchs/nvss/deaths.htm>.
157. Centers for Disease Control and Prevention, National Center for Injury Prevention and Control. National Violent Death Reporting System. Atlanta, GA: Available online: <https://www.cdc.gov/injury/wisqars/nvdrs.html>.
158. The National Center for the Review & Prevention of Child Deaths. U.S. Child Death Review Programs. <https://www.childdeathreview.org/cdr-programs/u-s-cdr-programs/>.
159. Centers for Disease Control and Prevention, Brener ND, Kann L, et al. Methodology of the Youth Risk Behavior Surveillance System--2013. *MMWR Recomm Rep*. 2013;62(RR-1):1-20.
160. Substance Abuse and Mental Health Services Administration, Center for Behavioral Health Statistics and Quality. National Survey on Drug Use and Health. 2016; [https://nsduhwebesn.rti.org/respweb/project\\_description.html](https://nsduhwebesn.rti.org/respweb/project_description.html).



## Appendix A: Summary of Strategies and Approaches to Prevent Suicide

Strategy	Approach/Program, Practice or Policy	Best Available Evidence			Lead Sectors <sup>1</sup>
		Suicide	Suicide Attempts or Ideation	Other Risk/Protective Factors for Suicide	
Strengthen economic supports	<b>Strengthen household financial security</b>				Government (local, state, Federal)
	<i>Unemployment benefit programs</i>	✓		✓	Business/labor
	<i>Other income supports</i>	✓			
	<b>Housing stabilization policies</b>				Government (local, state, Federal)
	<i>The National Neighborhood Stabilization Program</i>			✓	
Strengthen access and delivery of suicide care	<b>Coverage of mental health conditions in health insurance policies</b>				Government (local, state, Federal)  Healthcare  Social services
	<i>Mental Health Parity Laws</i>	✓		✓	
	<b>Reduce provider shortages in underserved areas</b>				
	<i>National Health Service Corps (NHSC)</i>			✓	
	<i>Telemental health (TMH)</i>			✓	
	<b>Safer suicide care through systems change</b>				
	<i>Henry Ford Perfect Depression Care (Precursor to Zero Suicide)</i>	✓		✓	
Create protective environments	<b>Reduce access to lethal means among persons at-risk</b>				Government (local, state)  Public Health  Healthcare
	<i>Intervening at suicide hot spots</i>	✓			
	<i>Safe storage practices</i>		✓	✓	
	<i>Emergency Department Counseling on Access to Lethal Means (ED CALM)</i>			✓	

		Best Available Evidence			
	Organizational policies and culture				
	Together for Life	✓			Business/Labor
	US Air Force Suicide Prevention Program	✓		✓	Justice
	Correctional suicide prevention	✓			Government (local, state, Federal)
	Community-based policies to reduce excessive alcohol use				Government (local, state)
	Alcohol outlet density	✓		✓	Business/labor
Promote connectedness	Peer norm programs				Public Health
	Sources of Strength			✓	Education
	Community engagement activities				Public Health
	Greening vacant urban spaces			✓	Government (local)
Teach coping and problem-solving skills	Social emotional learning programs				
	Youth Aware of Mental Health Program		✓	✓	Public Health
	Good Behavior Game		✓	✓	Education
	Parenting skill and family relationship approaches				
	The Incredible Years			✓	Public Health
					Education



		Best Available Evidence			
	<i>Strengthening Families 10–14</i>			✓	
Identify and support people at-risk	<b>Gatekeeper training</b>				Public Health
	<i>Applied Suicide Intervention Skills Training</i>			✓	Healthcare
	<i>Garret Lee Smith Federal Grant Program</i>	✓	✓		
	<b>Crisis Intervention</b>				Public Health
	<i>National Suicide Prevention Lifeline</i>		✓	✓	Social Services
	<b>Treatment for people at risk of suicide</b>				
	<i>Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)</i>		✓	✓	
	<i>Collaborative Assessment and Management of Suicidality (CAMS)</i>		✓	✓	Healthcare
	<i>Dialectical Behavioral Therapy (DBT)</i>		✓	✓	Social Services
	<i>Attachment-Based Family Therapy (ABFT)</i>		✓		Justice
	<i>Translating Initiatives for Depression into Effective Solutions project (TIDES)</i>			✓	
	<b>Treatment to prevent re-attempts</b>				
	<i>ED Brief Intervention with Follow-up Visits</i>	✓			Healthcare
	<i>Active follow-up contact approaches</i>	✓	✓		Social services
	<i>CBT for Suicide Prevention</i>		✓		

		Best Available Evidence			
Lessen harms and prevent future risk	<b>Postvention</b>				Healthcare
	<i>StandBy Response Service</i>		✓	✓	
	<b>Safe reporting and message about suicide</b>				Public Health
	<i>Media Guidelines</i>	✓			Media

<sup>1</sup>This column refers to the lead sectors well positioned to bring leadership and resources to implementation efforts. For each strategy, there are many other sectors such as non-governmental organizations that are instrumental to prevention planning and implementing specific activities.



**Preventing Suicide:  
A Technical Package of Policy, Programs, and Practices**

**Prepared by:**

**Deb Stone, ScD, MSW, MPH**

**Kristin Holland, PhD, MPH**

**Brad Bartholow, PhD**

**Alex Crosby, MD, MPH**

**Shane Davis, PhD**

**Natalie Wilkins, PhD**

**Division of Violence Prevention  
National Center for Injury Prevention and Control (NCIPC)  
Centers for Disease Control and Prevention**

**2017**

***Preventing Suicide: A Technical Package of Policies, Programs, and Practices* is a publication of the  
National Center for Injury Prevention and Control of the Centers for Disease Control and  
Prevention.**

Centers for Disease Control and Prevention  
Thomas R. Frieden, MD, MPH, Director

National Center for Injury Prevention and Control  
Debra E. Houry, MD, MPH, Director

Division of Violence Prevention  
James A. Mercy, PhD, Director

*Suggested Citation:* Stone, D.M., Holland, K.M., Bartholow, B., Crosby, A.E., Davis, S., and Wilkins, N.  
*Preventing Suicide: A Technical Package of Policies, Programs, and Practices*. Atlanta, GA: National  
Center for Injury Prevention and Control, Centers for Disease Control and Prevention, 2017.



## Contents

Acknowledgements.....	4
External Reviewers.....	5
Overview of Technical Package.....	6
Strengthen Economic Supports.....	14
Strengthen Access and Delivery of Suicide Care.....	17
Create Protective Environments.....	21
Promote Connectedness.....	26
Teach Coping and Problem-Solving Skills.....	28
Identify and Support People At-Risk.....	31
Lessen Harms and Prevent Future Risk.....	37
Sector Involvement.....	39
Monitoring and Evaluation.....	41
Conclusion.....	42
References.....	44
Appendix A.....	50

## Acknowledgements

We would like to thank the following individuals who contributed in specific ways to the development of this technical package. We give special thanks to Linda Dahlberg for her vision, guidance, and support throughout the development of this package. We thank Division, Center, and CDC leadership for their careful review and helpful feedback on earlier iterations of this document. We thank Alida Knuth for her formatting and design expertise. Last but definitely not least, we extend our thanks and gratitude to all the external reviewers for their helpful feedback, support and encouragement for this resource.



## External Reviewers

Casey Castaldi  
Prevention Institute

Carmen Clelland  
Office for State, Tribal, Local and Territorial  
Support, Centers for Disease Control and  
Prevention

Amalia Corby-Edwards  
American Psychological Association

Rachel Davis  
Prevention Institute

Pamela End of Horn  
Indian Health Service Headquarters

Craig Fisher  
American Psychological Association

Keita Franklin  
Department of Defense

Jill M. Harkavy Friedman  
American Foundation for Suicide Prevention

Jarrold Hindman  
Colorado Department of Public Health and  
Environment

Linda Langford  
Education Development Center, Inc.

Richard McKeon  
Substance Abuse and Mental Health Services  
Administration

Doreen S. Marshall  
American Foundation for Suicide Prevention

Christine Moutier  
American Foundation for Suicide Prevention

Jason H. Padgett  
Education Development Center, Inc.

Jerry Reed  
Education Development Center, Inc.

Christine Schuler  
National Institute for Occupational Safety and  
Health, Centers for Disease Control and  
Prevention

Morton Silverman  
Education Development Center, Inc.

Ellyson Stout  
Education Development Center, Inc.

Hope M. Tiesman  
National Institute for Occupational Safety and  
Health, Centers for Disease Control and  
Prevention

Dan Reidenberg  
Suicide Awareness Voices for Education (SAVE)

The experts above are listed with their affiliations at the time this document was reviewed.

## Overview

This technical package represents a select group of strategies based on the best available evidence to help communities and states sharpen their focus on prevention activities with the greatest potential to prevent suicide. These strategies include: strengthening economic supports; strengthening access and delivery of suicide care; creating protective environments; promoting connectedness; teaching coping and problem-solving skills; identifying and supporting people at-risk; and lessening harms and preventing future risk. The strategies represented in this package include those with a focus on preventing suicide from happening in the first place as well as approaches to lessen the immediate and long-term harms of suicidal behavior for individuals, families, communities, and society. The strategies in the technical package support the goals and objectives of the *National Strategy for Suicide Prevention*<sup>1</sup> and the National Action Alliance for Suicide Prevention's priority to strengthen community-based prevention.<sup>2</sup> Commitment, cooperation, and leadership from numerous sectors, including public health, education, justice, health care, social services, business, labor, and government can bring about the successful implementation of this package.

### What is a Technical Package?

A technical package is a compilation of a core set of strategies to achieve and sustain substantial reductions in a specific risk factor or outcome.<sup>3</sup> Technical packages help communities and states prioritize prevention activities based on the best available evidence. This technical package has three components. The first component is the **strategy** or the preventive direction or actions to achieve the goal of preventing suicide. The second component is the **approach**. The approach includes the specific ways to advance the strategy. This can be accomplished through *programs, policies, and practices*. The approaches included come primarily from studies based in the United States. The **evidence** for each of the approaches in preventing suicide or its associated risk factors is included as the third component. This package is intended as a resource to guide and inform prevention decision-making in communities and states.

### Preventing Suicide is a Priority

Suicide, as defined by the Centers for Disease Control and Prevention (CDC), is part of a broader class of behavior called *self-directed violence*. Self-directed violence refers to behavior directed at oneself that deliberately results in injury or the *potential* for injury.<sup>4</sup> Self-directed violence may be *suicidal* or *non-suicidal* in nature. For the purposes of this document, we refer only to behavior where suicide is intended:



- **Suicide** is a death caused by self-directed injurious behavior with any intent to die as a result of the behavior.
- **Suicide attempt** is defined as a *non-fatal* self-directed and potentially injurious behavior with any intent to die as a result of the behavior. A suicide attempt may or may not result in injury.

**Suicide is highly prevalent.** Suicide presents a major challenge to public health in the United States and worldwide. It contributes to premature death, morbidity, lost productivity, and health care costs.<sup>1,5</sup> In 2015 (the most recent year of available death data), suicide was responsible for 44,193 deaths in the U.S., which is approximately one suicide every 12 minutes.<sup>6</sup> In 2015, suicide ranked as the 10th leading cause of death and has been among the top 12 leading causes of death since 1975 in the U.S.<sup>7</sup> Overall suicide rates increased 28% from 2000 to 2015.<sup>6</sup> Suicide is a problem throughout the life span; it is the second leading cause of death among those aged 15–34 years; the fourth leading cause among persons in their 40s<sup>35 to 44</sup>, and the seventh-fifth leading cause among persons in their 50s<sup>45-54</sup> and eighth leading cause among persons 55-64.<sup>6</sup>

Suicide rates vary by race/ethnicity, age, and other population characteristics, with the highest rates across the lifespan occurring among non-Hispanic American Indian/Alaska Native (AI/AN) and non-Hispanic White population groups. In 2015, the rates for these groups were 19.9 and 16.9 per 100,000 population, respectively.<sup>6</sup> Other population groups disproportionately impacted by suicide include middle-aged adults (whose rates increased 45% from 2000 to 2015, with steep increases seen among both males (39%) and females (64%) aged 45-64 years<sup>6</sup>); Veterans and other military personnel (whose suicide rate nearly doubled from 2003 to 2008, surpassing the rate of suicide among civilians for the first time in decades)<sup>8,9</sup>; workers in certain occupational groups,<sup>10</sup> and sexual minority youth, who experience increased suicidal ideation and behavior compared to their non-sexual minority peers.<sup>11,12</sup>

Suicides reflect only a portion of the problem.<sup>13</sup> Substantially more people are hospitalized as a result of nonfatal suicidal behavior (i.e. suicide attempts) than are fatally injured, and an even greater number are either treated in ambulatory settings (e.g., emergency departments) or not treated at all.<sup>13</sup> For example, during 2014, among adults aged 18 years and older, for every one suicide there were 9 adults treated in hospital emergency departments for self-harm injuries, 27 who reported making a suicide attempt, and over 227 who reported seriously considering suicide.<sup>6,14</sup>

**Suicide is associated with several risk and protective factors.** Suicide, like other human behaviors, has no single determining cause. Instead, suicide occurs in response to multiple biological, psychological, interpersonal, environmental and societal influences that interact with one another, often over time.<sup>1,5</sup> The social-ecological model – encompassing multiple levels of focus from the individual, relationship, community, and societal – is a useful framework for viewing and understanding suicide risk factors identified in the literature.<sup>15</sup> Risk and protective factors for suicide exist at each level. For example, risk factors include:

**Comment [A]:** Linda, the field is really used to these age groups. I wouldn't use the 40's and 50's. I think it gets confusing to ask people to make that shift. It confused me!

**Comment [A]:** We always use 35-64 as middle aged, both in the mmwr and in our foa targeting middle aged males. If we go with 35-64, the corresponding percentages would be 33% overall, with increases among men=27.8 and females=51.1%

- **Individual level:** history of depression and other mental illnesses, hopelessness, substance abuse, certain health conditions, previous suicide attempt, violence victimization and perpetration, and genetic and biological determinants
- **Relationship level:** high conflict or violent relationships, sense of isolation and lack of social support, family/loved one's history of suicide, financial and work stress
- **Community level:** inadequate community connectedness, barriers to health care (e.g., lack of access to providers and medications)
- **Societal level:** availability of lethal means of suicide, unsafe media portrayals of suicide, stigma associated with help-seeking and mental illness.<sup>1,5</sup>

It is important to recognize that the vast majority of individuals who are depressed, attempt suicide, or have other risk factors, do *not* die by suicide. Furthermore, the relevance of each risk factor can vary by age, race, gender, sexual orientation, residential geography, and socio-cultural and economic status.<sup>1,5</sup>

Protective factors, or those influences that buffer against the risk for suicide, can also be found across the different levels of the social-ecological model. Protective factors identified in the literature include: effective coping and problem solving skills, moral objections to suicide, strong and supportive relationships with partners, friends, and family; connectedness to school, community, and other social institutions; availability of quality and ongoing physical and mental health care, and reduced access to lethal means.<sup>1,5</sup> These protective factors can either counter a specific risk factor or buffer against a number of risks associated with suicide.

**Suicide is connected to other forms of violence.** Exposure to violence (e.g., child abuse and neglect, bullying, peer violence, dating violence, sexual violence, and intimate partner violence) is associated with increased risk of depression, post-traumatic stress disorder (PTSD), anxiety, suicide, and suicide attempts.<sup>16-22</sup> Women exposed to partner violence are nearly 5 times more likely to attempt suicide as women not exposed to partner violence.<sup>22</sup> Exposure to adverse experiences in childhood, such as physical, sexual, emotional abuse and neglect, and living in homes with violence, mental health, substance abuse problems and other instability, is also associated with increased risk for suicide and suicide attempts.<sup>18,23</sup> The psychosocial effects of violence in childhood and adolescence can be observed decades later, including severe problems with finances, family, jobs, and stress – factors that can increase the risk for suicide. Suicide and other forms of violence often share the same individual, relationship, community, and societal risk factors suggesting that efforts to prevent interpersonal violence may also prove beneficial in preventing suicide.<sup>24-26</sup> Further, just as risk factors may be shared across suicide and interpersonal violence, so too may protective factors overlap. For example, connectedness to one's community,<sup>27</sup> school,<sup>28</sup> family,<sup>29</sup> caring adults,<sup>30,31</sup> and pro-social peers<sup>32</sup> can enhance resilience and help reduce risk for suicide and other forms of violence.



**The health and economic consequences of suicide are substantial.** Suicide and suicide attempts have far reaching consequences for individuals, families, and communities.<sup>33-36</sup> In an early study, Crosby and Sacks<sup>37</sup> estimated that 7% of the U.S. adult population, or 13.2 million adults, knew someone in the prior 12 months who had died by suicide. They also estimated that for each suicide, 425 adults were exposed, or knew about the death.<sup>37</sup> In a more recent study, in one state, Cerel et al<sup>38</sup> found that 48% of the population knew at least one person who died by suicide in their lifetime. Research indicates that the impact of knowing someone who died by suicide and/or having lived experience (i.e., personally have attempted suicide, have had suicidal thoughts, or have been impacted by suicidal loss) is much more extensive than injury and death. People with lived experience may suffer long-term health and mental health consequences ranging from anger, guilt, and physical impairment, depending on the means and severity of the attempt.<sup>39</sup> Similarly, survivors of a loved one's suicide may experience ongoing pain and suffering including complicated grief,<sup>40</sup> stigma, depression, anxiety, post-traumatic stress disorder, and increased risk of suicidal ideation and suicide.<sup>41,42</sup> Less discussed but no less important, are the financial and occupational effects on those left behind.<sup>43</sup>

The economic toll of suicide on society is immense as well. According to conservative estimates, in 2013, suicide cost \$50.8 billion in estimated lifetime medical and work-loss costs alone.<sup>43</sup> Adjusting for potential under-reporting of suicide and drawing upon health expenditures per capita, gross domestic product per capita, and variability among states in per capita health care expenditures and income, another study estimated the total lifetime costs associated with nonfatal injuries and deaths caused by self-directed violence to be approximately \$93.5 billion in 2013.<sup>44</sup> The overwhelming burden of these costs were from lost productivity over the life course, with the average cost per suicide being over \$1.3 million.<sup>44</sup> The true economic costs are likely higher, as neither study included monetary figures related to other societal costs such as those associated with the pain and suffering of family members or other impacts.

**Suicide can be prevented.** Like most public health problems, suicide is preventable.<sup>1,5</sup> While progress will continue to be made into the future, evidence for numerous programs, practices, and policies currently exists, and many programs are ready to be implemented now. Just as suicide is not caused by a single factor, research suggests that reductions in suicide will not be prevented by any single strategy or approach.<sup>1,45</sup> Rather, suicide prevention is best achieved by a focus across the individual, relationship, family, community, and societal-levels and across all sectors, private and public.<sup>1,5</sup>

## Assessing the Evidence

This technical package includes programs, practices, and policies with evidence of impact on suicide or risk or protective factors for suicide. To be considered for inclusion in the technical package, the program, practice, or policy selected had to meet at least one of these criteria: a) meta-analyses or systematic reviews showing impact on suicide; b) evidence from at least one rigorous (e.g., randomized



controlled trial [RCT] or quasi-experimental design) evaluation study that found significant preventive effects on suicide; c) meta-analyses or systematic reviews showing impact on risk or protective factors for suicide, or d) evidence from at least one rigorous (e.g., RCT or quasi-experimental design) evaluation study that found significant impacts on risk or protective factors for suicide. Finally, consideration was also given to the likelihood of achieving beneficial effects on multiple forms of violence; no evidence of harmful effects on specific outcomes or with particular subgroups; and feasibility of implementation in a U.S. context if the program, policy, or practice has been evaluated in another country.

Within this technical package, some approaches do not yet have research evidence demonstrating impact on rates of suicide but instead are supported by evidence indicating impacts on risk or protective factors for suicide (e.g., help-seeking, stigma reduction, depression, connectedness). In terms of the strength of the evidence, programs that have demonstrated effects on suicidal behavior (e.g., reductions in deaths, attempts) provide a higher-level of evidence, but the evidence base is not that strong in all areas. For instance, there has been less evaluation of community engagement and family programs on suicidal behavior. Thus, approaches in this package that have effects on risk or protective factors reflect the developing nature of the evidence base and the use of the best available evidence at a given time.

It is also important to note that there is often significant heterogeneity among the programs, policies, or practices that fall within one approach or strategy in terms of the nature and quality of the available evidence. Not all programs, policies, or practices that utilize the same approach are equally effective, and even those that are effective may not work across all populations. Tailoring programs and conducting more evaluations may be necessary to address different population groups. The evidence-based programs, practices, or policies included in the package are not intended to be a comprehensive list for each approach, but rather to serve as examples that have been shown to impact suicide or have beneficial effects on risk or protective factors for suicide.

### Context and Cross-Cutting Themes

One important feature of the package is the complementary, but potentially synergistic impact of the strategies and approaches. The strategies and approaches included in this technical package represent different levels of the social ecology, with efforts intended to impact community and societal levels, as well individual and relationship levels. The strategies and approaches are intended to work in combination and reinforce each other to prevent suicide (see box below). The strategies are arranged in order such that those strategies hypothesized to have the greatest potential for broad public health impact on suicide are included first, followed by those that might impact more selected and indicated populations (e.g., persons who have already made a suicide attempt).

**Comment [A]:** Can we add a sentence about as more evidence becomes available we will be updating this document? Trying to appease Dan R a little further here.

**Comment [A]:** This may be the language from other packages as well but seems like a word(s) is missing—not only complementary, but potentially synergistic?

**Comment [A]:** We (the SP field) usually refers to it this way, not sure if this is standard language or can be changed.

Preventing Suicide	
Strategy	Approach
Strengthen economic supports	<ul style="list-style-type: none"> <li>Strengthen household financial security</li> <li>Housing stabilization policies</li> </ul>



Strengthen access and delivery of suicide care	<ul style="list-style-type: none"> <li>• Coverage of mental health conditions in health insurance policies</li> <li>• Reduce provider shortages in underserved areas</li> <li>• Safer suicide care through systems change</li> </ul>
Create protective environments	<ul style="list-style-type: none"> <li>• Reduce access to lethal means among persons at-risk of suicide</li> <li>• Organizational policies and culture</li> <li>• Community-based policies to reduce excessive alcohol use</li> </ul>
Promote connectedness	<ul style="list-style-type: none"> <li>• Peer norm programs</li> <li>• Community engagement activities</li> </ul>
Teach coping and problem-solving skills	<ul style="list-style-type: none"> <li>• Social-emotional learning programs</li> <li>• Parenting skill and family relationship programs</li> </ul>
Identify and support people at-risk	<ul style="list-style-type: none"> <li>• Gatekeeper training</li> <li>• Crisis Intervention</li> <li>• Treatment for people at-risk of suicide</li> <li>• Treatment to prevent re-attempts</li> </ul>
Lessen harms and prevent future risk	<ul style="list-style-type: none"> <li>• Postvention</li> <li>• Safe reporting and messaging about suicide</li> </ul>

It is important to note that these strategies are not mutually exclusive but each has an immediate focus. For instance, social emotional learning programs, an approach under the *Teach Coping and Problem-Solving Skills* strategy, sometimes include components to change peer norms and the broader environment. The primary focus of these programs, however, is to provide children and youth with skills to resolve problems in relationships, school, and with peers, and to help youth address other negative influences (e.g., substance use) associated with suicide.

The goal of this package is to stress the importance of comprehensive prevention efforts and to provide examples of effective programs addressing each level of the social ecology, with the knowledge that some programs, practices, and policies may impact multiple levels. Further, those that involve multiple sectors and that impact multiple levels of the social ecology are more likely to have a greater impact on the overall burden of suicide.

Suicide ideation, thoughts, attempts, and deaths vary by gender, race/ethnicity, age, occupation, and other important population characteristics. Further, certain transition periods are also associated with higher rates of suicide (e.g., transition from working into retirement, transition from active duty military status to civilian status). In fact, suicide risk can change along with dynamic risk factors. For example, individuals' coping skills may change during periods of crisis and heightened stress, limiting their normal ability to effectively solve problems and cope. Research indicates that suicide risk changes as a result of the number and intensity of key risk and protective factors experienced.<sup>46</sup> Ideally, the availability of multiple strategies and approaches tailored to the social, economic, cultural, and environmental context of individuals and communities are desirable as they may increase the likelihood of removing barriers to

supportive and effective care and provide opportunities to develop individual and community resilience.

Identifying programs, practices, and policies with evidence of impact on suicide, suicide attempts, or beneficial effects on risk or protective factors for suicide is only the first step. In practice, the effectiveness of the programs, policies and practices identified in this package will be strongly dependent on how well programs are implemented, as well as the partners and communities in which they are implemented. Practitioners in the field may be in the best position to assess the needs and strengths of their communities and work with community members to make decisions about the combination of approaches included here that are best suited to their context.

Data-driven strategic planning processes can help communities with this work.<sup>47-49</sup> These planning processes engage and guide community stakeholders through a prevention planning process designed to address a community's profile of risk and protective factors with evidence-based programs, practices, and policies. These processes can also be used to monitor implementation, track outcomes, and make adjustments as indicated by the data. The readiness of the program for broad dissemination and implementation (e.g., availability of program materials, training and technical assistance) can also influence program effects. Implementation guidance to assist practitioners, organizations and communities will be developed separately.

This package includes strategies where public health agencies are well positioned to bring leadership and resources to implementation efforts. It also includes strategies where public health can serve as an important collaborator (e.g., strategies addressing community and societal level risks), but where leadership and commitment from other sectors such as business, labor or health care is critical to implement a particular policy or program (e.g., workplace policies; treatment to prevent re-attempts). The role of various sectors in the implementation of a strategy or approach in preventing suicide is described further in the section on *Sector Involvement*.

In the sections that follow, the strategies and approaches with the best available evidence for preventing suicide are described.

**Comment [A]:** Linda, the Action Alliance is creating an implementation paper that will come out shortly after our technical package. Is there any way to add that here? Something like "A forthcoming document on implementation of comprehensive community-based suicide prevention for states and communities is forthcoming."



## Strengthen Economic Supports

### Rationale

Studies from the U.S. examining historical trends indicate that suicide rates increase during economic recessions marked by high unemployment rates, job losses, and economic instability and decrease during economic expansions and periods marked by low unemployment rates, particularly for working-age individuals 25 to 64 years old.<sup>50,51</sup> Economic and financial strain, such as job loss, long periods of unemployment, reduced income, difficulty covering medical, food, and housing expenses, and even the anticipation of such financial stress may increase an individual's risk for suicide or may indirectly increase risk by exacerbating related physical and mental health problems.<sup>52</sup> Buffering these risks can, therefore, potentially protect against suicide. For example, strengthening economic support systems can help people stay in their homes or obtain affordable housing while also paying for necessities such as food and medical care, job training, child care, among other expenses required for daily living. In providing this support, stress and anxiety and the potential for a crisis situation may be reduced, thereby preventing suicide. Although more research is needed to understand how economic factors interact with other factors to increase suicide risk, the available evidence suggests that strengthening economic supports may be one opportunity to buffer suicide risk.

### Approaches

Economic supports for individuals and families can be strengthened by targeting household financial security and ensuring stability in housing during periods of economic stress.

- **Strengthening household financial security** can potentially buffer the risk of suicide by providing individuals with the financial means to lessen the stress and hardship associated with a job loss or other unanticipated financial problems. The provision of unemployment benefits and other forms of temporary assistance, livable wages, medical benefits, and retirement and disability insurance to help cover the cost of necessities or to offset costs in the event of disability, are examples of ways to strengthen household financial security.
- **Housing stabilization policies** aim to keep people in their homes and provide housing options for those in need during times of financial insecurity. This may occur through programs that provide affordable housing such as through government subsidies or through other options available to potential homebuyers such as loan modification programs, move-out planning, or financial counseling services that help minimize the risk or impact of foreclosures and eviction.

### Potential Outcomes

- Reductions in foreclosure rates

- Reductions in eviction rates
- Reductions in emotional distress
- Reductions in suicide

### Evidence

There is evidence suggesting that strengthening household financial security and stabilizing housing can reduce suicide risk.

- **Strengthen household financial security.** The *Federal-State Unemployment Insurance Program* allows states to define the maximum amount and duration of unemployment benefits that workers are entitled to receive after a job loss.<sup>53</sup> An examination of variations in *unemployment benefit programs* across states demonstrated that the impact of unemployment on rates of suicide was offset in those states that provided greater than average unemployment benefits (mean level: \$7,990 per person in U.S. constant dollars). The effects of *unemployment benefit programs* were also consistent by sex and age group.<sup>53</sup> Another U.S. study examining the link between unemployment and suicide rates using monthly suicide data, length of unemployment (less than 5 weeks, 5-14 weeks, 15-26 weeks, and greater than 26 weeks), and job losses found that the duration of unemployment, as opposed to just the loss of job, predicted suicide risk.<sup>54</sup> Together, these results suggest that not only should state unemployment benefit programs be generous in their financial allocations, but also in their duration.

Other measures to strengthen household financial security (e.g., transfer payments related to retirement and disability insurance, unemployment insurance compensation, medical benefits, and other forms of family assistance) have also shown an impact on rates of suicide. A study by Flavin and Radcliff<sup>55</sup> examined the impact of states' per capita spending on transfer payments, medical benefits, and family assistance (Temporary Assistance to Needy Families – TANF) and total state spending on suicide rates between 1990-2000, controlling for a number of suicide risk factors (e.g., residential mobility, divorce rate, unemployment rate) at the state level. As per capita spending on total transfer payments, medical benefits, and family assistance increased there was an associated decrease in state suicide rates. In terms of lives saved, Flavin and Radcliff calculated the cost of reducing a state's suicide rate by a full point for the years studied.<sup>55</sup> At the national level, they estimated 3,000 fewer suicides would occur per year nationwide if every state increased its per capita spending on these types of assistance by \$45 per year.<sup>55</sup> Although this was a correlational study, the results demonstrate the potential benefits of policies that reach particularly vulnerable individuals during periods of great need and decreased risk for suicide. More evaluation studies are needed to further understand the outcomes impacted by programs such as these.

**Comment [A]:** Kristin can you confirm this. It seems obvious that it's decreasing not increasing but maybe I'm missing something??



- **Housing stabilization policies.** The *National Neighborhood Stabilization Program* was designed to help neighborhoods suffering from high rates of foreclosure and abandonment by slowing the deterioration of the neighborhoods and providing affordable housing options for low, moderate, and middle-income homebuyers. This program also offers financial assistance to eligible individuals for the purchase of a new home. Although this program has not been rigorously evaluated for its impact on suicide outcomes, it addresses foreclosure and eviction, which are risk factors for suicide. A longitudinal analysis of annual data on suicides and foreclosures demonstrated that as the proportion of foreclosed properties increased in U.S. states, so did the state suicide rate, particularly among working-aged adults.<sup>56</sup> Another study of data from 16 U.S. states participating in the *National Violent Death Reporting System* found that suicides precipitated by home foreclosures and evictions increased more than 100% from 2005 (before the housing crisis began) to 2010 (after it had peaked).<sup>51</sup> Most of these suicides occurred prior to the actual loss of the decedent's home. These findings suggest that integrating suicide prevention resources, messaging, and referrals into financial, foreclosure, and move-out planning and counseling services may help to prevent suicide.

**Comment [A]:** Kristin, I think this just called the Neighborhood Stabilization program. Thinking to add this ref: <https://www.hudexchange.info/programs/nsp/>

## Strengthen Access and Delivery of Suicide Care

### Rationale

While most people with mental health problems do not attempt or die by suicide<sup>57,58</sup> and the level of risk conferred by different types of mental illness varies,<sup>59-61</sup> previous research indicates that mental illness is an important risk factor for suicide.<sup>5,62</sup> State-level suicide rates have also been found to be correlated with general mental health measures such as depression.<sup>63,64</sup> Findings from the *National Comorbidity Survey* indicate that relatively few people in the U.S. with mental health disorders receive treatment for those conditions.<sup>65</sup> Lack of access to mental health care is one of the contributing factors related to the underuse of mental health services.<sup>66</sup> Identifying ways to improve access to timely, affordable, and quality mental health and suicide care for people in need is a critical component to prevention.<sup>5</sup> Additionally, research suggests that services provided are maximized when health and behavioral health care systems are set up to effectively and efficiently deliver such care.<sup>67</sup> Apart from treatment benefits, these approaches can also normalize help-seeking behavior and increase the use of such services.

### Approaches

There are a number of approaches that can be used to strengthen access and delivery of suicide care, including:

- **Coverage of mental health conditions in health insurance policies.** Federal and state laws include provisions for equal coverage of mental health services in health insurance plans that is on par with coverage for other health concerns (i.e., mental health parity).<sup>(ref)</sup> Benefits and services covered include such things as the number of visits, co-pays, deductibles, inpatient/outpatient services, prescription drugs, and hospitalizations. If a state has a stronger mental health parity law than the federal parity law, then insurance plans regulated by the state must follow the state parity law. If a state has a weaker parity law than the federal parity law (e.g., includes coverage for some mental health conditions but not others), then the federal parity law will replace the state law. Equal coverage does not necessarily imply good coverage as health insurance plans vary in the extent to which benefits and services are offered to address various health conditions. Rather it helps to ensure that mental health services are covered on par with other health concerns.
- **Reduce provider shortages in underserved areas.** Access to effective and state-of-the-art mental health care is largely dependent upon the training and the size of the mental health care workforce. Over 85 million Americans live in areas with an insufficient number of mental health providers; this shortage is particularly severe among low-income urban and rural communities.<sup>68</sup> There are various ways to increase the number and distribution of practicing mental health providers in underserved areas including offering financial incentives through existing state and

Comment [A]: We should add a ref for MH parity law. Kristin can you find?



federal programs (e.g., loan repayment programs) and expanding the reach of health services through telephone, video and web-based technologies. Such approaches can increase the likelihood that those in need will be able to access affordable, quality care for mental health problems, which can reduce risk for suicide.

- **Safer suicide care through systems change.** Access to health and behavioral health care services is critical for people at risk of suicide; however this is just one piece of the puzzle. Care should also be *delivered* efficiently and effectively. More specifically, care should take place within a system that supports suicide prevention and patient safety through strong leadership, workforce training, systematic identification and assessment of suicide risk, implementation of evidence-based treatments (see *Identify and Support People At-Risk*), continuity of care, and continuous quality improvement. Care that is patient-centered and promotes equity for all patients is also of critical importance.<sup>69</sup>

### Potential Outcomes

- Increases in access to mental health services
- Increase in utilization of mental health services
- Reductions in symptoms of mental illnesses and suicidality
- Reductions in rates of suicide attempts
- Reductions in rates of suicide

### Evidence

There is evidence suggesting that coverage of mental health conditions in health insurance policies and improving access and the delivery of care can reduce risk factors associated with suicide and may directly impact suicide rates.

- **Coverage of mental health conditions in health insurance policies.** The *National Survey on Drug Use and Health (NSDUH)* is a nationally representative survey of the U.S. population that provides data on substance use, mental health conditions, and service utilization.<sup>70</sup> Using data from this survey, Harris, Carpenter, and Bao<sup>71</sup> found that 12 months after states enacted *mental health parity laws*, self-reported use of mental healthcare services significantly increased. Moreover, subsequent research by Lang<sup>64</sup> examined state mental health laws and suicide rates between 1990 and 2004 and found that mental health parity laws, specifically, were associated with an approximate 5% reduction in suicide rates. This reduction, in the 29 states with parity laws, equated to the prevention of 592 suicides per year.<sup>64</sup>
- **Reduce provider shortages in underserved areas.** One example of a program to improve access to mental health care providers is the *National Health Service Corps (NHSC)*, which offers

financial incentives to attract mental/behavioral health clinicians to underserved areas.<sup>72</sup> Programs such as *NHSC* encourage individuals to work in the mental health profession in locations designated as Health Professional Shortage Areas (HPSAs) in exchange for student loan debt repayment. A 2012 retention survey conducted by the Health Resources and Services Administration (HRSA), found that 61% of mental and behavioral health care providers continued to practice in designated mental health shortage areas after their four year commitment to the *NHSC*.<sup>73</sup> Although this program has not been evaluated for impact on suicide, it addresses access to care, which is a critical component to suicide prevention.

*Telemental health (TMH)* services refer to the use of telephone, video and web-based technologies for providing psychiatric or psychological care at a distance.<sup>74</sup> *TMH* can be used in a variety of settings (e.g. outpatient clinics, hospitals, military treatment facilities) to treat a wide range of mental health conditions. It can also improve access to care for patients in isolated areas, as well as reduce travel time and expenses, reduce delays in receiving care, and improve satisfaction interacting with the mental health care system. A systematic review of *TMH* services found that services rated as high or good quality were effective in treating mental health conditions such as depression, schizophrenia, substance abuse, and suicidal ideation and suicide.<sup>74</sup> Further, Mohr and colleagues<sup>75</sup> conducted a meta-analysis examining the effect of psychotherapy delivered specifically via telephone and found that it significantly reduced depressive symptoms in comparison to face-to-face psychotherapy. They also found that treatment attrition rates were significantly lower among patients receiving telephone-administered psychotherapy compared to patients receiving face-to-face therapy.<sup>75</sup> Thus, *TMH* may not only offer improved access to mental health care, but it may also ensure continuity of care, and thereby further reduce the risk for suicide.

- **Safer suicide care through systems change.** *Henry Ford Health System*, which is a large health maintenance organization (HMO) in the state of Michigan, pioneered *Perfect Depression Care*,<sup>76</sup> the pre-cursor to what is now called *Zero Suicide*. The overall goal of *Perfect Depression Care* was to eliminate suicide among HMO members. More broadly, the goal of the program was to redesign delivery of depression care to achieve “breakthrough improvement” in quality and safety by focusing on effectiveness, safety, patient centeredness, timeliness, efficiency, and equity among patients. The program screened and assessed each patient for suicide risk and implemented coordinated continuous follow-up care system wide.<sup>76</sup> An examination of the impact of the program found that there was a dramatic and statistically significant decrease in the rate of suicide between the baseline years, 1999 and 2000, prior to the intervention to the intervention years, 2002-2009. During this time period, the suicide rate fell by 82%.<sup>76,77</sup> Further, among HMO members who received mental health specialty services, the suicide rate significantly decreased over time from 1999 to 2010 (110.3 to 47.6 per 100,000 population;  $p < .04$ ) with a mean of 36.2 per 100,000 over the period. Additionally, for those HMO members



who accessed only general medical services as opposed to specialty mental health services, the suicide rate increased from 2.7 to 5.6 per 100,000 ( $p < .01$ ).<sup>77</sup> Similarly, in the state of Michigan, rates of suicide in the general population increased over the period from 9.8 to 12.5 per 100,000 ( $p < .001$ ).<sup>78</sup>

FINAL

## Create Protective Environments

### Rationale

Prevention efforts that focus not only on individual behavior change (e.g., help-seeking, treatment interventions) but on changes to the environment can increase the likelihood of positive behavioral and health outcomes.<sup>79</sup> Creating environments that address risk and protective factors where individuals live, work, and play can help prevent suicide.<sup>1,15</sup> For example, rates of suicide are high among middle-aged adults who comprise 42.6% of the workforce<sup>80</sup>; among certain occupational groups<sup>10,81</sup>; and among people in detention facilities (e.g. jail, prison),<sup>82</sup> to name a few. Thus, settings where these populations work and reside are ideal for implementing programs, practices and policies to buffer against suicide. Changes to organizational culture through the implementation of supportive policies, for instance, can change social norms, encourage help-seeking, and demonstrate that good health and mental health are valued and that stigma and other risk factors for suicide are not.<sup>83,84</sup> Similarly, modifying the characteristics of the physical environment to prevent harmful behavior such as access to lethal means can reduce suicide rates, particularly in times of crisis or transition.<sup>85-90</sup>

### Approaches

The current evidence suggests three potential approaches for creating environments that protect against suicide.

- **Reduce access to lethal means among persons at-risk of suicide.** Means of suicide such as firearms, hanging/suffocation, or jumping from heights provide little opportunity for rescue and, as such, have high case fatality rates (e.g., about 85% of people who use a firearm in a suicide attempt will die from the injury).<sup>91</sup> Research also indicates that: 1) the interval between deciding to act and attempting suicide can be as short as 5 or 10 minutes,<sup>92,93</sup> and 2) people tend *not* to substitute a different method when a highly lethal method is unavailable or difficult to access.<sup>94,95</sup> Therefore, increasing the time interval between deciding to act and the suicide attempt, for example, by making it more difficult to access lethal means, can be lifesaving. The following are examples of approaches reducing access to lethal means for persons at-risk of suicide:
  - *Intervening at Suicide Hotspots.* Suicide hotspots, or places where suicides may take place relatively easily, include tall structures (e.g., bridges, cliffs, balconies, and rooftops), railway tracks, and isolated locations such as parks. Efforts to prevent suicide at these locations include erecting barriers or limiting access to prevent jumping, and installing signs and telephones to encourage individuals who are considering suicide, to seek help.<sup>96</sup>



- *Safe Storage Practices.* Safe storage of medications, firearms, and other household products can reduce the risk for suicide by separating vulnerable individuals from easy access to lethal means. Such practices may include education and counseling around storing firearms--locked in a secure place (e.g., in a gun safe or lock box), unloaded and separate from the ammunition--and keeping medicines in a locked cabinet or other secure location away from people who may be at risk or who have made prior attempts.<sup>85,97</sup>
- **Organizational policies and culture** that promote protective environments may be implemented in places of employment, detention facilities, and other secured environments (e.g. residential settings). Such policies and cultural values encourage leadership from the top down and may promote prosocial behavior (e.g., asking for help), skill building, positive social norms, assessment, referral and access to helping services (e.g. mental health, substance abuse treatment, financial counseling), and development of crisis response plans, postvention and other measures to foster a safe physical environment. Such policies and cultural shifts can positively impact organizational climate and morale and help prevent suicide and its related risk factors (e.g. depression, social isolation).<sup>84,98</sup>
- **Community-based policies to reduce excessive alcohol use.** Research studies in the United States have found that greater alcohol availability is positively associated with alcohol-involved suicides.<sup>99-101</sup> Policies to reduce excessive alcohol use broadly include zoning to limit alcohol outlet locations and density, taxes on alcohol, and bans on the sale of alcohol for individuals under the legal drinking age.<sup>101</sup> These policies are important because acute alcohol use has been found to be associated with more than one-third of suicides and approximately 40% of suicide attempts.<sup>102</sup>

### Potential Outcomes

- Increases in safe storage of lethal means
- Reductions in rates of suicide
- Reductions in suicide attempts
- Reductions in suicide deaths
- Increases in help-seeking
- Reductions in alcohol-related suicide deaths

## Evidence

The evidence suggests that creating protective environments can reduce suicide and suicide attempts and increase protective behaviors.

- **Reduce access to lethal means among persons at-risk of suicide.** A meta-analysis examining the impact of *suicide hotspot interventions* implemented in combination or in isolation, both in the U.S. and abroad, found associated reduced rates of suicide.<sup>96,103</sup> For example, after erecting a barrier on the Jacques-Cartier bridge in Canada, the suicide rate from jumping from the bridge decreased from about 10 suicide deaths per year to about 3 deaths per year.<sup>104</sup> Moreover, the reduction in suicides by jumping was sustained even when all bridges and nearby jumping sites were considered, suggesting little to no displacement of suicides to other jumping sites.<sup>104</sup> Further evidence for the effectiveness of bridge barriers was demonstrated by a study examining the impact of the *removal* of safety barriers from the Grafton Bridge in Auckland, New Zealand. After removal of the barrier, both the number and rate of suicide increased five-fold.<sup>89,105</sup>

Another form of means reduction involves implementation of *safe storage practices*. In a case-control study of firearm-related events identified from 37 counties in Washington, Oregon, and Missouri, and from 5 trauma centers, researchers found that storing firearms unloaded, separate from ammunition, in a locked place or secured with a safety device was protective of suicide attempts among adolescents.<sup>106</sup> Further, a recent systematic review of clinic and community-based education and counseling interventions suggested that the provision of safety devices significantly increased safe firearm storage practices compared to counseling alone or compared to the provision of economic incentives to acquire safety devices on one's own.<sup>97</sup>

Another program, the *Emergency Department Counseling on Access to Lethal Means (ED CALM)*, trained psychiatric emergency clinicians in a large children's hospital to provide lethal means counseling and safe storage boxes to parents of patients under age 18 receiving care for suicidal behavior. In a pre-post quality improvement project, Runyan et al<sup>85</sup> found that at post-test 76% (of the 55% of parents followed up, n=114) reported that all medications in the home were locked up as compared to fewer than 10% at the time of the initial emergency department visit. Among parents who indicated the presence of guns in the home at pre-test (i.e. 67%), all (100%) reported guns were currently locked up at post-test.<sup>85</sup>

- **Organizational policies and culture.** *Together for Life* is a workplace program of the Montreal Police Force implemented to address suicide among officers. Policy and program components were designed to foster an organizational culture that promoted mutual support and solidarity among all members of the Force. The program included training of supervisors, managers and all units to improve competencies in identifying suicidal risk and to improve use and awareness



of existing resources. The program also included an education campaign to improve awareness and help-seeking.<sup>107</sup> Police suicides were tracked over 12 years and compared to rates in the control city of Quebec. The suicide rate in the intervention group decreased significantly by 78.9% to a rate of 6.4 suicides per 100,000 population per year compared to an 11% increase in the control city 29.0 per 100,000;<sup>107</sup>

Another example of this approach is the *United States Air Force Suicide Prevention Program*. The program included 11 policy and education initiatives and was designed to change the culture of the Air Force surrounding suicide. The program uses leaders as role models and agents of change, establishes expectations for behavior related to awareness of suicide risk, develops population skills and knowledge (i.e., education and training), and investigates every suicide (i.e., outcomes measurement). The program represents a fundamental shift from viewing suicide and mental illness solely as medical problem and instead sees them as larger service-wide problems impacting the whole community.<sup>108</sup> Using a time-series design to examine the impact of the program on various violence-related outcomes, researchers found that the program was associated with a 33% relative risk reduction in suicide.<sup>108</sup> The program was also associated with relative risk reductions in related outcomes including moderate and severe family violence (30% and 54%, respectively), homicide (51%), and accidental death (18%).<sup>108</sup> A longitudinal assessment of the program over the period 1981 to 2008 (16 years before the 1997 launch of the program and 11 years post-launch) found significantly lower rates of suicide after the program was launched than before.<sup>83</sup> These effects were sustained over time, except in 2004, which the authors found was associated with less rigorous implementation of program components in that year than in the other years.<sup>83</sup>

Finally, while the evidence is still being built for suicide prevention in correctional facilities, preliminary evidence suggests organizational policies and practices that include routine suicide prevention training for all staff, standardized intake screening and risk assessment, provision of shared information between staff members, especially in transitioning or transferring of inmates, varying levels of observation, safe physical environment, emergency response protocols, notification of suicidal behavior/suicide through the chain of command, and critical incident stress debriefing and death review can potentially reduce suicide.<sup>98</sup> When these policies and practices were implemented across 11 state prisons in Louisiana, suicide rates dropped 46%, from a rate of 23.1 per 100,000 before the intervention to 12.4 per 100,000 the following year.<sup>109</sup> Other similar programs have seen declines in suicide both in the United States and internationally.<sup>110</sup>

- **Community-based policies to reduce excessive alcohol use.** While multiple policies to limit excessive use of alcohol exist, several studies on alcohol outlet density and risk factors for suicide, such as interpersonal violence and social connectedness,<sup>111-114</sup> suggest that measures to

reduce alcohol outlet density can potentially reduce alcohol-involved suicides. Additionally, a longitudinal analysis of alcohol outlet density, suicide mortality, and hospitalizations for suicide attempts over 6 years in 581 California zip codes indicated that greater density of bars, specifically, is related to greater suicide and suicide attempts, particularly in rural areas.<sup>115</sup>

FINAL



## Promote Connectedness

### Rationale

Sociologist, Emile Durkheim theorized in 1897 that weak social bonds, i.e. lack of connectedness, are among the chief causes for suicidality.<sup>116</sup> Connectedness is the degree to which an individual or group of individuals are socially close, interrelated, or share resources with others.<sup>117</sup> Social connections can be formed within and between multiple levels of the social ecology,<sup>15</sup> for instance between individuals (e.g. peers, neighbors, co-workers), families, schools, neighborhoods, workplaces, faith communities, cultural groups, and society as a whole. Related to connectedness, social capital refers to a sense of trust in one's community and neighborhood, social integration, and also the availability and participation in social organizations.<sup>118,119</sup> Many ecological cross-sectional and longitudinal studies have examined the impact of aspects of social capital on depression symptoms, depressive disorder, mental health more generally, and suicide. While the evidence is limited, existing studies suggest a positive association between social capital (as measured by social trust and community/neighborhood engagement), and improved mental health.<sup>120,121</sup> Connectedness and social capital together may protect against suicidal behaviors by decreasing isolation, encouraging adaptive coping behaviors, and by increasing belongingness, personal value, and worth, to help build resilience in the face of adversity. Connectedness can also provide individuals with better access to formal supports and resources, mobilize communities to meet the needs of its members and provide collective primary prevention activities to the community as a whole.<sup>117</sup>

### Approaches

Promoting connectedness among individuals and within communities through modeling peer norms and enhancing community engagement may protect against suicide.

- **Peer norm programs** seek to normalize protective factors for suicide such as help-seeking, reaching out and talking to trusted adults, and promote peer connectedness. By leveraging the leadership qualities and social influence of peers, these approaches can be used to shift group-level beliefs and promote positive social and behavioral change. These approaches typically target youth and are delivered in school settings but can also be implemented in community settings.<sup>122</sup>
- **Community engagement activities.** Community engagement is an aspect of social capital.<sup>123</sup> Community engagement approaches may involve residents participating in a range of activities, including religious activities, community clean-up and greening activities, and physical exercise. These activities provide opportunities for residents to become more involved in the community and to connect with other community members, organizations, and resources, resulting in enhanced overall physical health, reduced stress, and decreased depressive symptoms, thereby reducing risk of suicide.

## Potential Outcomes

- Reductions in maladaptive coping attitudes and behaviors
- Increases in healthy coping attitudes and behaviors
- Increases in referrals for youth in distressed
- Increases help-seeking behaviors
- Increases in positive perceptions of adult support

## Evidence

Current evidence suggests a number of positive benefits of peer norm and community engagement activities, although more evaluation research is needed to examine whether these improvements in factors that protect against suicidal behavior translate into reduced suicide attempts and deaths.

- **Peer norm programs.** Evaluations show that programs such as *Sources of Strength* can improve school norms and beliefs about suicide that are created and disseminated by student peers. In a randomized controlled trial of *Sources of Strength* conducted with 18 high-schools (6 metropolitan, 12 rural), researchers found that the program improved adaptive norms regarding suicide among peer leaders, connectedness to adults, and school engagement.<sup>32</sup> Peer leaders were also more likely than controls to refer a suicidal friend to an adult. For students, the program resulted in increased perceptions of adult support for suicidal youths, particularly among those with a history of suicidal ideation, and the acceptability of help-seeking behaviors. Finally, trained peer leaders also reported a greater decrease in maladaptive coping attitudes compared with untrained leaders.<sup>32</sup>
- **Community engagement activities.** A vacant lot greening initiative was undertaken in Philadelphia between 1999 and 2008. Local residents and community members worked together to green 4,436 lots (or 7.8 million square feet) in 4 areas of the city. Researchers found significant reductions in community residents' self-reported level of stress, which is a risk factor for suicide, and engagement in more physical exercise, a protective factor for suicide, than residents in control vacant lot areas. There is some evidence for other cross-cutting benefits, including reductions in firearm assaults and vandalism.<sup>124,125</sup>



## Teach Coping and Problem-Solving Skills

### Rationale

Building life skills prepares individuals to successfully tackle every day challenges and adapt to stress and adversity. Life skills encompasses many concepts, but most often include coping and problem-solving skills, emotional regulation, conflict resolution, and critical thinking. Life skills are important in shielding individuals from suicidal behaviors.<sup>122</sup> Suicide prevention programs that focus on life and social skills training are drawn from social cognitive theories,<sup>126</sup> surmising that suicidal behavior is attributed to either direct learning and modeling or environmental and individual (e.g. hopelessness) characteristics. The inability to employ adequate strategies to cope with immediate stressors or identify and find solutions for problems has been characterized among suicide attempters.<sup>127</sup> Teaching and providing youth with the skills to tackle every day challenges and stressors is, therefore, an important developmental component to suicide prevention.

### Approaches

Social emotional learning programs and parenting skill and family relationship programs are two approaches for teaching coping and problem-solving skills.

- **Social-emotional learning programs** focus on developing and strengthening communication and problem-solving skills, emotion regulation, conflict resolution, help seeking and coping skills. These approaches address a range of risk and protective factors for suicidal behavior. They provide children and youth with skills to resolve problems in relationships, school, and with peers, and help youth to address other negative influences (e.g., substance use) associated with suicide.<sup>122</sup> These approaches are typically delivered to all students in a particular grade or school, although some programs also focus on groups of students considered to be at high risk for suicide. Opportunities to practice and reinforce skills are an important part of programs that work.<sup>128</sup>
- **Parenting skill and family relationship programs** provide caregivers with support and are designed to strengthen parenting skills, enhance positive parent-child interactions, and improve children's behavioral and emotional skills and abilities.<sup>128</sup> Programs are typically designed for parents or caregivers with children in a specific age range and can be self-directed or delivered to individual families or groups of families. Some programs have sessions primarily with parents or caregivers while others include sessions for parents or caregivers, youth, and the family. Specific program content typically varies by the age of the child but often has consistent themes of child development, parent-child communication and relationships, and youth's interpersonal and problem-solving skills.



## Potential Outcomes

- Reductions in suicide attempts and suicide ideation
- Reductions in suicide risk behaviors (i.e., depression, anxiety, conduct problems, substance abuse)
- Improvements in help-seeking behavior
- Improvements in social competence and emotional regulation skills
- Improvements in problem-solving and conflict management skills

## Evidence

Several social emotional learning and parenting and family relationship programs have been shown in rigorous evaluations to improve resilience and reduce problem behavior and risk factors for various behaviors, including ones closely related to suicide, such as depression, internalizing behaviors, and substance abuse.<sup>129</sup>

- **Social-emotional learning programs.** The *Youth Aware of Mental Health Program (YAM)* is a program developed for teenagers aged 14-16 that uses interactive dialogue and role-playing to teach adolescents about the risk and protective factors associated with suicide (including knowledge about depression and anxiety) and enhances their problem-solving skills for dealing with adverse life events, stress, school and other problems.<sup>130</sup> In a cluster-randomized controlled trial conducted across 10 European Union countries and 168 schools, students in schools randomized to *YAM* were significantly less likely to attempt suicide and have severe suicidal ideation at the 12-month follow-up compared to students in control schools which received educational materials and care as usual. Overall, the relative risk of youth suicide attempts among the *YAM* group was reduced by over 50% demonstrating that out of 1000 students, five attempted suicide in the *YAM* group compared to 11 in the control group. Additionally, related to severe suicide ideation, in the *YAM* group, relative risk fell by 49.6%.<sup>130</sup>

Another example is the *Good Behavior Game (GBG)*, which is a classroom-based program for elementary school children aged 6-10. The program uses a team-based behavior management strategy that promotes good behavior by setting clear expectations for good behavior and consequences for maladaptive behavior. The goal of the *GBG* program is to create an integrated classroom social system that is supportive of all children being able to learn with little aggressive or disruptive behavior.<sup>131</sup> Two cohorts of youths participated in the program in 1985-86 and 1986-87 school years when they were in the first and second grades. A number of proximal and distal outcomes were assessed among the two cohorts over time. With respect to distal suicide-related outcomes, an outcome evaluation of the *GBG* indicated that individuals in the first cohort who were assigned to participate in *GBG* when they were in the first grade reported half the adjusted odds of suicidal ideation and



suicide attempts when assessed approximately 15 years later, between the ages of 19 to 21, compared to peers who had been in a standard classroom setting. The beneficial effect of the program was consistent for suicidal ideation regardless of whether baseline covariates were included.<sup>131</sup> The *GBG* effect on attempts was less robust in some adjusted models including caregiver mental health. In the second cohort of *GBG* students, neither suicidal ideation nor suicide attempts were significantly different between *GBG* and the control interventions.<sup>131</sup> The researchers believed this may have been due to a lack of implementation fidelity, including less mentoring and monitoring of teachers. *GBG* was also found to be associated with reduced risk of later substance abuse and other suicide risk factors among the first cohort of students. Results for the second cohort were generally smaller but in the desired direction.<sup>132</sup>

- **Parenting skill and family relationship programs.** Parenting and family skills training approaches have shown promising impacts in preventing key risk factors associated with suicide. For example, the *Incredible Years (IY)* is a comprehensive group training program for parents, teachers and children designed to reduce conduct and substance abuse problems, two important suicide risk factors in youth by improving protective factors such as responsive and positive parent-teacher-child interactions and relationships, emotion self-regulation and social competence (all protective factors for suicide).<sup>128</sup> The program includes 9-20 sessions offered in community-based settings (e.g., religious, recreation centers, mental health treatment centers, and hospitals). Several studies have demonstrated the effect of the *IY* program on reducing internalizing symptoms, such as anxiety and depression, and child conduct problems.<sup>133,134</sup> The program is also associated with improved problem-solving and conflict management; these skills were maintained at 1-year follow-up.<sup>135-137</sup> Additionally, the program demonstrated greater benefits in mother-rated child internalizing symptoms, compared to the waitlisted control group, when parent, child, and teacher components were included.<sup>128</sup>

Additionally, *Strengthening Families: For Parents and Youth 10-14* is a program that involves sessions for parents, youth, and family with the goal of improving parents' skills for disciplining, managing emotions and conflict, and communicating with their children; promoting youths' interpersonal and problem-solving skills; and creating family activities to build cohesion and positive parent-child interactions. The premise of the program is that developing these skills for both parents and children will reduce internalizing behavior and adolescent substance abuse, two important risk factors for suicide.<sup>138</sup> *Strengthening Families* has been shown to significantly decrease externalizing behaviors, such as aggression, alcohol use, and drug use among youth participants, as well as reduce depression, alcohol use, and drug use among participating families.<sup>138</sup>

## Identify and Support People At-Risk

### Rationale

In order to decrease suicide, care of, and attention to, vulnerable populations is necessary, as these groups tend to experience suicidal behavior at higher than average rates. Such vulnerable populations include, but are not limited to, individuals with lower socio-economic status or who are living with a mental health problem; people who have previously attempted suicide; Veterans and active duty military personnel; individuals who are institutionalized, have been victims of violence, or are homeless; individuals of sexual minority status; and members of certain racial and ethnic minority groups.<sup>8,9,11,12,139</sup> Supporting people at-risk requires proactive case finding and effective response, crisis intervention, and evidence-based treatment. Finding optimal ways of identifying at-risk individuals, customizing services to make them more accessible (e.g., Internet-based services when appropriate) and engaging people in evidence-based care (e.g. through such measures as collaborative treatment), remain key challenges.<sup>76,140,141</sup> Simply improving or expanding services does not guarantee that those services will be used by people most in need, nor will it necessarily increase the number of people who follow recommended referrals or treatment. For example, some people living in disadvantaged communities may face social and economic issues that can adversely affect their ability to access supportive services.<sup>65</sup>

### Approaches

The following approaches focus on identifying and supporting people at increased risk of suicide.

- **Gatekeeper training** is designed to train teachers, coaches, clergy, emergency responders, primary and urgent care providers, and others in the community to identify people who may be at risk of suicide and to respond effectively, including facilitating treatment seeking and support services. Gatekeeper training may be implemented in a variety of settings to identify and support people at risk.<sup>142</sup>
- **Crisis intervention.** These approaches provide support and referral services, typically by connecting a person in crisis (or a friend or family member of someone at-risk) to trained volunteers or professional staff via telephone hotline, online chat, text messaging, or in-person. Crisis intervention approaches are intended to impact key risk factors for suicide, including feelings of depression, hopelessness, and subsequent mental health care utilization.<sup>143</sup> Similar to means reduction, crisis interventions can put space or time between an individual who may be considering suicide and harmful behavior.
- **Treatment for people at-risk of suicide** can include various forms of psychotherapy delivered by licensed providers to help individuals with mental health problems and other suicide risk factors with problem-solving and emotion regulation. Treatment usually takes place in a one-on-one or



group format between patients and clinicians and can vary in duration from several weeks to ongoing therapy, as needed. Treatment that employs collaborative (i.e., between patient and therapist or care manager) and/or integrated care (e.g., linkage between primary care and behavioral health care) can help engage and motivate patients, thereby increasing retention in therapy and decreasing suicide risk.<sup>144-146</sup>

- **Treatment to prevent re-attempts.** These approaches typically include follow-up contact and use diverse modalities (e.g., home visits, mail, telephone, e-mail) to engage recent suicide attempt survivors in continued treatment to prevent re-attempts.<sup>147</sup> Treatment may focus on improved coping skills, mindfulness, and other emotional regulation skills, and may include case management home visits to increase adherence to treatment and continuity of care; and one-on-one interpersonal therapy and/or group therapy. Approaches that engage and connect attempters to peers and providers are especially important because many attempters do not present to aftercare; 12%-25% reattempt within a year, and 3%-9% of attempt survivors die by suicide within 1 to 5 years of their initial attempt.<sup>147</sup>

### Potential Outcomes

- Reductions in suicide attempts
- Reductions in suicide rates
- Reductions in suicide deaths
- Reductions in symptoms of mental illnesses
- Reductions in suicidal ideation
- Reductions in mental health-related sequelae
- Reductions in re-attempts
- Increases in connectedness
- Improvements in coping skills
- Increases in identification of individuals at-risk for suicidal behavior
- Increases in treatment engagement and compliance by at-risk individuals
- Increases in community members trained to identify at-risk individuals
- Increases in referrals for health care

### Evidence

The current evidence suggests that identifying people at risk of suicide and the continued provision of treatment and support for these individuals can positively impact suicide and its associated risk factors.

- **Gatekeeper training.** *Applied Suicide Intervention Skills Training (ASIST)* is a widely implemented training program that helps hotline counselors, emergency workers, and other gatekeepers to

identify and connect with suicidal individuals, understand their reasoning for living and dying, and assist with safely connecting those in need to available resources. In a study employing a randomized controlled trial, Gould, Cross, Pisani, Munfakh, & Kleinman<sup>148</sup> evaluated the training across the *National Suicide Prevention Lifeline* network of hotlines over the period 2008-2009. Using data from 1,410 suicidal individuals who called 17 Lifeline centers, the researchers found that callers who spoke with *ASIST*-trained counselors were significantly more likely to feel less depressed, less suicidal, less overwhelmed, and more hopeful by the end of their call, compared to callers who spoke to non-*ASIST* trained counselors. Counselors trained in *ASIST* were also more skilled at keeping callers on the phone longer and establishing a connection with them. However, training in *ASIST* did not result in more comprehensive suicide risk assessments than usual care training.<sup>148</sup>

Gatekeeper training has also been a primary component of the *Garret Lee Smith (GLS) Suicide Prevention Program*, which is in place in 49 states and 48 tribes. A multi-site evaluation assessed the impact of community gatekeeper training on suicide attempts and deaths by comparing the change in suicide rates and nonfatal suicidal behavior among young people aged 10-24 in counties implementing *GLS* trainings, with the trajectory observed in similar counties that did not implement these trainings. Counties that implemented *GLS* trainings had significantly lower youth suicide rates one year following the training implementation.<sup>149</sup> This finding equates to a decrease of 1 suicide death per 100,000 among youth ages 10 to 24, or the prevention of approximately 237 deaths in the age group, between 2007 and 2010. Counties implementing *GLS* program activities also had significantly lower suicide attempt rates among youth ages 16 to 23 in the year following implementation of the *GLS* program than did similar counties that did not implement *GLS* activities (4.9 fewer attempts per 1000 youths).<sup>150</sup> More than 79,000 suicide attempts may have been prevented during the period examined.

- **Crisis intervention.** Suicide prevention hotlines are one way to provide crisis intervention. In an evaluation of the effectiveness of the *National Suicide Prevention Lifeline* to prevent suicide, 1,085 suicidal individuals who called the hotline completed a standard risk assessment for suicide, and 380 of those completed a follow-up assessment between 1 and 52 days (mean=13.5 days) after the initial assessment. Researchers found that over half of the initial sample were seriously considering suicide when they called, and they had a plan for their suicide. Researchers also found that among follow-up participants, there was a significant decrease in psychological pain, hopelessness, and intent to die between initiation of the call (time 1) to follow-up (time 3).<sup>151</sup> Between time 2 (end of the call) to time 3, the effect remained for psychological pain and hopelessness, but was not significant for intent to die, suggesting that greater effort at outreach during and following the call is needed for the callers with high levels of suicide intent.<sup>151</sup>



- **Treatment for people at-risk of suicide.** The *Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)* program aims to prevent suicide among older primary care patients by reducing suicide ideation and depression. *IMPACT* facilitates the development of a therapeutic alliance, a personalized treatment plan that includes patient preferences, as well as proactive follow-up (biweekly during an acute phase and monthly during continuation phase) by a depression care manager.<sup>152</sup> The program has been shown to significantly improve quality of life, and to reduce functional impairment, depression and suicidal ideation over 24-months of follow-up<sup>152,153</sup> relative to patients who received care as usual.

*Collaborative Assessment and Management of Suicidality (CAMS)*, is a therapeutic approach for suicide-specific assessment and treatment. The program's flexible approach can be used across treatment settings and clinician theoretical orientations and involves the clinician and patient working together in an interactive assessment process to develop patient-specific treatment plans. Sessions are collaborative and involve constant patient input about what is and is not working with the ultimate goal of enhancing the therapeutic alliance and increasing treatment motivation in the suicidal patient. *CAMS* has been tested and supported in 6 correlational studies,<sup>140</sup> in a variety of inpatient and outpatient settings, and in one RCT with several additional RCTs under way. A feasibility trial with a community-based sample of suicidal outpatients randomly assigned to *CAMS* or enhanced care as usual (intake with a psychiatrist or psychiatric nurse practitioner followed by 1-11 visits with a case manager and medication as needed) found better treatment retention among the *CAMS* group and significant improvements in suicidal ideation, overall symptom distress, and feelings of hopelessness at the 12 month follow-up.<sup>154</sup>

Other examples include *Dialectical Behavioral Therapy (DBT)* and *Attachment-Based Family Therapy (ABFT)*. *DBT* is a multicomponent therapy for individuals at high risk for suicide and who may struggle with impulsivity and emotional regulation issues. The components of *DBT* include individual therapy, group skills training, between-session telephone coaching and a therapist consultation team. In a randomized controlled trial of women with recent suicidal or self-injurious behavior, those receiving *DBT* were half as likely to make a suicide attempt at two-year follow-up than women receiving community treatment (23% vs 46%), required less hospitalization for suicide ideation, and had lower medical risk across all suicide attempts and self-injurious acts combined.<sup>155</sup>

*ABFT* is a program for adolescents aged 12-18 and is designed to treat clinically diagnosed major depressive disorder, eliminate suicidal ideation, and reduce dispositional anxiety.<sup>156</sup> A randomized controlled trial of *ABFT* found that suicidal adolescents assigned to *ABFT* experienced significantly greater improvement in suicidal ideation over 24 weeks of follow-up than did adolescents assigned to enhanced usual care. Additionally, a significantly higher percentage of *ABFT* participants reported no suicidal ideation in the week prior to assessment at 12 weeks than

did adolescents receiving enhanced usual care (69.2% vs. 34.6%) and at 24 weeks (82.1% vs. 46.2%).<sup>156</sup>

The Veterans Affairs *Translating Initiatives for Depression into Effective Solutions* project (*TIDES*) uses a depression care liaison to link primary care and mental health services. The depression care liaison assesses and educates patients and follows up with both patients and providers between primary care visits to optimize treatment. This collaborative care increases the efficiency of providing mental health services by bringing mental health care to the primary care setting, where most patients are first detected and subsequently treated for many mental health conditions. An evaluation of *TIDES* found significant decreases in depression severity scores among 70% of primary care patients.<sup>157</sup> *TIDES* also demonstrated 85% and 95% compliance with medication and follow-up visits, respectively.<sup>157</sup>

- **Treatment to prevent re-attempts.** Several strategies that aim to prevent re-attempts have demonstrated impact on reducing suicide deaths. For example, *Emergency Department Brief Intervention with Follow-up Visits* is a program that involves a one-hour discharge information session that addresses suicidal ideation and attempts, distress, risk and protective factors, alternatives to self-harm, and referral options, combined with nine follow-up contacts over 18 months (at 1, 2, 4, 7, 11 weeks and 4, 6, 12, 18 months). Follow-up contacts are either conducted by phone or through home visits according to a specific timeline for up to 18 months. A randomized controlled trial that enrolled suicide attempters from eight hospital emergency departments in five countries (Brazil, India, Sri Lanka, Iran, and China) found that a brief intervention combined with nine follow-up visits over 18 months was associated with significantly fewer deaths from suicide relative to a treatment-as-usual group (0.2% versus 2.2%, respectively).<sup>158</sup>

Another example of treatment to prevent re-attempts involves *active follow-up contact approaches* such as postcards, letters, and telephone calls intended to increase a patient's sense of connectedness with health care providers and decrease isolation.<sup>147</sup> These approaches include expression of care and support and typically invite patients to reconnect with their provider. Contacts are made periodically (e.g., monthly or every few months in the first 12 months post-discharge with some programs continuing contact for two or more years). In a meta-analysis conducted by Inagaki et al<sup>147</sup> interventions to prevent repeat suicide attempts in patients admitted to an emergency department for suicide attempt were found to reduce reattempts by approximately 17% for up to 12 months post-discharge; however, the effects of these approaches beyond 12 months on reattempts has not yet been demonstrated.<sup>147</sup> Also, because the number of trials and associated sample sizes included in this meta-analysis were small, it was not possible to determine the effect of active contact and follow-up approaches on death by suicide.



In a randomized controlled trial of the post-crisis suicide prevention long-term follow-up contact approach, Motto, Bostrom <sup>159</sup> found that patients who refused ongoing care but who were randomized to be contacted by letter four times per year had a lower rate of suicide over two years of follow-up than did patients in the control group who received no further contact. Other studies have also shown post-crisis letters and coping cards to be protective against suicide ideation and attempts.<sup>160,161</sup>

Finally, *Cognitive Behavior Therapy for Suicide Prevention (CBT-SP)* is an example of a therapeutic approach to prevent re-attempts. It uses a risk-reduction, relapse prevention approach that includes an analysis of proximal risk factors and stressors (e.g., relationship problems, school or work-related difficulties) leading up to and following the suicidal event; safety plan development; skill building; and psychoeducation. *CBT-SP* also has family skill modules focused on family support and communication patterns as well as improving the family's problem solving skills. A randomized controlled trial of *CBT-SP* found that 10-session outpatient cognitive therapy designed to prevent repeat suicide attempts resulted in a 50% reduction in the likelihood of a suicide reattempt among adults who had been admitted to an emergency department for a suicide attempt relative to treatment as usual.<sup>162</sup>

## Lessen Harms and Prevent Future Risk

### Rationale

Millions of people are bereaved by suicide every year in the United States and throughout the world.<sup>5</sup> Risk of suicide and suicide risk factors has been shown to increase among people who have lost a friend/peer, family member, co-worker, or other close contact to suicide.<sup>163</sup> Care and attention to the bereaved is therefore of high importance. Despite often good intentions, media and others responding to suicide may add to this risk. For example, research suggests that exposure to sensationalized or otherwise uninformed reporting on suicide may heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to what is known as suicide contagion.<sup>164,165</sup> While the evidence is still being built in this area, particularly with regard to the impact of policy and practices on suicide and suicide attempts in the United States, measures to care for the bereaved population through such means as postvention interventions (e.g. counseling, support groups and debriefing sessions) and safe reporting on suicide have shown impacts in other countries.

### Approaches

Some approaches that can be used to lessen harms and reduce future risk of suicide include caring for the bereaved and safe reporting following a suicide.

- **Postvention** approaches are implemented *after* a suicide has taken place and may include debriefing sessions, counseling, and/or bereavement support groups for surviving friends and family members/loved ones. These programs have not typically been evaluated for their impact on suicide or suicidal behavior but may reduce survivors' guilt, feelings of depression, and complicated grief.<sup>166</sup>
- **Safe reporting and messaging about suicide.** The manner in which information on a recent suicide is communicated to the public (e.g. school assemblies, mass media, social media) can heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to suicide contagion. Reports that are inclusive of suicide prevention messages, stories of hope and resilience, risk and protective factors, and links to helping resources (e.g., hotline), and that avoid sensationalizing events or reducing suicide to one cause, can help reduce the likelihood of suicide contagion.<sup>167</sup>

### Potential Outcomes

- Reductions in suicidal ideation
- Reductions in suicide attempts



- Reductions in psychological distress
- Increases in treatment seeking and engagement
- Improvements in reporting following suicide
- Reductions in contagion effects related to suicide

## Evidence

Current evidence suggests that lessening harm through postvention and safe reporting and messaging can impact risk and protective factors for suicide.

- **Postvention** programs are implemented with the goal of providing support to survivors of others' suicide to reduce their own risk of suicide. One example of a postvention program, *StandBy Response Service (StandBy)*, provides clients with face-to-face outreach and telephone support through a professional crisis response team. Site coordinators develop customized case management plans, referring clients to other existing community services matched to their needs.<sup>168</sup> In a study by Visser, Comans, Scuffham <sup>168</sup> *StandBy* clients were significantly less likely to be at high risk for suicidality (suicide ideation and attempts) and had less psychological distress than a suicide bereaved comparison group who had not had contact with the *StandBy* program (48% and 64% respectively). Additionally, research suggests that active postvention approaches in which outreach to suicide survivors occurs at the scene of a suicide is associated with intake into treatment sooner, greater attendance at support group meetings, and attendance at more meetings compared to passive postvention (versus passive approaches where survivors self-refer for services).<sup>169</sup>
- **Safe reporting and messaging about suicide.** One way to ensure safe reporting and messaging about suicide is to encourage news media adhere to *Recommendations for Reporting on Suicide* (<http://www.reportingonsuicide.org>). The most compelling evidence supporting these recommendations for reporting comes from Austria. After a sharp increase in suicides on the Viennese subway, media guidelines were introduced and an interrupted time series design was used to evaluate the national impact of the guidelines on subsequent suicides. Changes in the quality and quantity of media reporting resulted in a nationwide significant reduction of 81 suicides annually.<sup>165</sup> Finally, research suggests that not only does reporting on suicide in a negative way (e.g., reporting on suicide myths and repetition) have harmful effects on suicide, but reporting on positive coping skills in the face of adversity can also demonstrate protective effects against suicide.<sup>170</sup> Reports of individual suicidal ideation not accompanied by reports of suicide or suicide attempts, along with reports describing a “mastery” of a crisis situation where adversities were overcome, was associated with significant decreases in suicide rates in the time period immediately following such reports.<sup>170</sup>



## Sector Involvement

Public health can play an important and unique role in addressing suicide. Public health agencies, which typically place prevention at the forefront of efforts and work to create broad population-level impact, can bring critical leadership and resources to bear on this problem. For example, these agencies can serve as a convener, bringing together partners and stakeholders to plan, prioritize, and coordinate suicide prevention efforts. Public health agencies are also well positioned to collect and disseminate data, implement preventive measures, evaluate programs, and track progress. Although public health can play a leadership role in preventing suicide, the strategies and approaches outlined in this technical package cannot be accomplished by the public health sector alone. As noted in the *National Strategy for Suicide Prevention*,<sup>1</sup> the integration and coordination of prevention activities across sectors and settings is critical for expanding the reach and impact of suicide prevention efforts.

Other sectors vital to implementing this package include, but are not limited to, education, government (local, state, and federal), social services, health services, business, labor, justice, housing, media, and organizations that comprise the civil society sector such as faith-based organizations, youth-serving organizations, foundations, and other non-governmental organizations. Collectively, these sectors can make a difference in preventing suicide by impacting the various contexts and underlying risks that contribute to suicide.

The strategies and approaches described in this technical package are summarized in Appendix A along with the relevant sectors that are well positioned to lead implementation efforts. For example, business and labor, the health sector (including insurers, providers, and health systems), and government entities are in the best position to implement programs and policies that *Strengthen Economic Supports* and *Strengthen Access and Delivery of Suicide Care*. These types of supports go beyond individual behavior change and require commitment and support from those sectors that can directly address some of the underlying risks and the environmental contexts that increase the risk for suicide. Public health entities can play an important role by gathering and synthesizing information to inform policy, raise awareness, and evaluate the effectiveness of various policies. Moreover, partnerships with non-governmental and community organizations can be instrumental in increasing awareness of and garnering support for policies affecting individuals and families.

The public health sector has been at the forefront of many community-based prevention efforts, working collaboratively with schools and community-based organizations, to change social norms and positively impact health behavior. Public health is well suited to take on a similar leadership role in *Promoting Connectedness* through peer norm and community engagement activities and supporting the development, evaluation, and adoption of effective programs that *Teach Coping and Problem-Solving Skills* to prevent suicide from happening in the first place. These programs are often delivered in school and community settings, making education and non-governmental organizations vital partners in prevention.



Businesses, workplaces, and local and state government entities, on the other hand, are in the best position to establish policies and support practices that *Create Protective Environments* where people live, work, and play. Public health entities can play an important role by gathering and synthesizing information, working with other governmental agencies (e.g., criminal justice, defense) and agencies within the executive branch of their state or local government in support of policy and other approaches, and evaluating the effectiveness of measures taken. In a similar fashion, public health entities can partner with schools, workplaces, and community organizations to implement and evaluate prevention programs, policies and practices geared toward creating safe, healthy, and supportive environments.

Finally, this technical package includes a number of interventions delivered in hospital, primary care, behavioral health care, and community settings designed to *Identify and Support People At-Risk*. The intensity and activities for many of these interventions require the expertise of professionals who are licensed and trained to deliver critical intervention support. The health, social services, and justice sectors can work collaboratively to support individuals at high-risk for suicide and their families. These activities also require coordination of supports across various service providers and community organizations.

Regardless of strategy, action by many sectors will be necessary for the successful implementation of this package. In this regard, all sectors can play an important and influential role in preventing suicide from happening in the first place and lessening the immediate and long-term harms of suicidal behavior by helping those in times of crisis get the services and support they need.

## Monitoring and Evaluation

Monitoring and evaluation are necessary components of the public health approach to prevention. It is important to have timely and reliable data to monitor the extent of the problem and to evaluate the impact of prevention efforts. Data are also necessary for prevention planning and implementation.

Gathering ongoing and systematic data is important for prevention efforts. However, it is also important to gather data that are uniform and consistent across systems. Consistent data allow public health and other entities to better gauge the scope of the problem, identify high-risk groups, and monitor the effects of prevention programs and policies. Currently, it is common for different sectors, agencies, and organizations to employ varying definitions of suicidal ideation, behavior, and death that can make it difficult to consistently monitor specific outcomes across sectors and over time. For example, the manner in which deaths are classified can change from one jurisdiction to another, and can change based on local medical and/or medicolegal standards.<sup>4</sup> CDC's uniform definitions and recommended data elements for self-directed violence provide a useful framework to help ensure that data are collected in a consistent manner across surveillance systems.<sup>4</sup>

Surveillance systems exist at the federal, state, and local levels. It is important to assess the availability of surveillance data and data systems across these levels to identify and address gaps in the systems. CDC's *National Vital Statistics System (NVSS)*<sup>7</sup> and the *National Violent Death Reporting System (NVDRS)*<sup>171</sup> are examples of surveillance systems that provide data on deaths from suicide. NVSS is a nationwide surveillance system that collects demographic, geographic, and cause-of-death data from death certificates.<sup>7</sup> NVDRS is a state-based surveillance system (currently in 40 states, the District of Columbia, and Puerto Rico) that combines data from death certificates, law enforcement reports, and coroner or medical examiner reports to provide detailed information on the circumstances of violent deaths, including suicide, which can assist communities in guiding prevention approaches.<sup>171</sup> Data from state and local Child Death Review teams<sup>172</sup> and Suicide Death Review Teams (which are in a few states) offer another source to identify deaths and obtain insight into the gaps in services, systems, and modifiable risk factors for suicide.

The *National Electronic Injury Surveillance System-All Injury Program (NEISS-AIP)* provides nationally representative data about all types and causes of nonfatal injuries treated in U.S. hospital emergency departments, and can be used to assess national rates of, and trends in, self-harm injuries by cause (e.g., falls, poisoning, etc.), age, race/ethnicity, sex, disposition (where the injured person goes when released from the Emergency Department).<sup>6</sup>

In addition to information on deaths and nonfatal injuries, there are also surveillance systems that provide national, state, and some local estimates of suicidal behavior. The *Youth Risk Behavior Surveillance System (YRBSS)* collects information from a nationally representative sample of 9-12 grade students and is a key resource in monitoring health-risk behaviors among youth, including whether youth



have seriously considered attempting suicide, attempted suicide, made a plan, or required treatment by a doctor or nurse for a suicide attempt that resulted in an injury, poisoning, or overdose.<sup>173</sup> The YRBSS data are obtained from a national school-based survey conducted by CDC as well as from state, territorial, tribal, and large urban school district surveys conducted by education and health agencies.<sup>173</sup> The *National Survey on Drug Use and Health (NSDUH)*<sup>70</sup> is an annual survey of the civilian, non-institutionalized population aged 12 years and older. *NSDUH* provides both national and state-level estimates of substance use (alcohol, tobacco, illicit drugs, and non-medical use of prescription drugs); mental health (past year mental illness, co-occurring illnesses); and service utilization, along with suicide ideation, suicide plans, and suicide attempts. *NSDUH* is a key resource to track trends in suicide-related risk factors in the population and to help identify groups at increased risk.<sup>70</sup>

It is also important at all levels (local, state, and federal) to address gaps in responses, track progress of prevention efforts and evaluate the impact of those efforts, including the impact of this technical package. Evaluation data, produced through program implementation and monitoring, is essential to provide information on what does and does not work to reduce rates of suicide and its associated risk and protective factors. Theories of change and logic models that identify short, intermediate, and long-term outcomes are an important part of program evaluation.

The evidence-base for suicide prevention has advanced greatly over the last few decades. However, additional research is needed to understand the impact of programs, policies, and practices on suicide (and suicide attempts, at a minimum), as opposed to merely examining their effectiveness on risk factors. More research is also needed to examine the effectiveness of primary prevention strategies (before risk occurs) and community-level strategies to prevent suicide at the population level. It will be important for researchers to test the effectiveness of combinations of the strategies and approaches included in this package. Most existing evaluations focus on approaches implemented in isolation, but there is potential to understand the synergistic effects within a comprehensive prevention approach. Lastly, there are also many potential opportunities to build and strengthen partnerships across program areas (e.g., violence prevention, substance abuse prevention) to evaluate the impact of different approaches on multiple outcomes.

## Conclusion

Suicide is a serious public health problem whose rates have been on the rise for more than a decade and whose costs stretch well into the billions of dollars each year. While suicide is a rare outcome statistically, its human impact has a ripple effect that is far-reaching. Each of us likely interacts with suicide survivors, those with lived experience, and those with thoughts of suicide on a daily basis – at home, at work, and in our communities. Suicide and suicide attempts are public health issues of societal concern. There are a number of barriers that have impeded progress, including, for example, stigma related to help-seeking, mental illness, being a survivor and fear related to asking someone about suicidal thoughts. Fortunately,

like many public health problems, suicide is preventable,<sup>1,5</sup> and more is being done to prevent suicide than ever before, as evidenced by the work of the National Action Alliance for Suicide Prevention,<sup>35,36,69,84</sup> the release of the first world report on suicide,<sup>5</sup> and more timely surveillance data, to name just a few examples.

In an effort to continue pushing the field and society further towards prevention, this technical package includes strategies and approaches that ideally would be used in a comprehensive, multi-level and multi-sectoral way. It includes strategies and approaches to prevent suicide from occurring in the first place, as well as strategies focused on lessening the immediate and long-term harms of suicidal behavior. It includes strategies that range from a focus on the whole population regardless of risk to strategies designed to support people at highest risk. Importantly, this technical package extends the bounds of the typical prevention strategies to consider approaches that go beyond individual behavior change to better address risk factors impacting communities and populations more broadly (e.g., economic policies to strengthen housing and financial security).

While the evidence base continues to emerge, the collection of programs, policies, and practices laid out here are available for implementation now. In keeping with good public health practice, the intent is that monitoring and evaluation will play a key role in that implementation. Moreover, as new evidence becomes available, this technical package can be refined to reflect the current state of the science.

In closing, and in keeping with a message of resilience as spoken by those with lived experience, ‘hope, help, and healing is possible.’



## References

1. U.S. Office of the Surgeon General, National Action Alliance for Suicide Prevention. 2012 National Strategy for Suicide Prevention: Goals and Objectives for Action. Washington, D.C.: HHS; 2012.
2. National Action Alliance for Suicide Prevention. Action Alliance Priorities. 2017; <http://actionallianceforsuicideprevention.org/priorities>.
3. Frieden TR. Six components necessary for effective public health program implementation. *Am J Public Health*. 2014;104(1):17-22.
4. Crosby AE, Ortega L, Melanson C. Self-directed Violence Surveillance: Uniform Definitions and Recommended Data Elements, Version 1.0. Atlanta, GA: Centers for Disease Control and Prevention, National Center for Injury Prevention and Control; 2011.
5. World Health Organization. Suicide Prevention: A Global Imperative. Geneva, Switzerland: WHO Press; 2014.
6. Web-Based Injury Statistics Query and Reporting System (WISQARS). National Center for Injury Prevention and Control. Available at: <http://www.cdc.gov/injury/wisqars/index.html>. Accessed January 3, 2017.
7. Centers for Disease Control and Prevention, National Center for Health Statistics. National Vital Statistics System. <https://www.cdc.gov/nchs/nvss/deaths.htm>.
8. Bachynski KE, Canham-Chervak M, Black SA, Dada EO, Millikan AM, Jones BH. Mental health risk factors for suicides in the US Army, 2007–8. *Inj Prev*. 2012;18(6):405-412.
9. Lineberry TW, O'Connor SS. Suicide in the US Army. *Mayo Clinic Proceedings*. 2012;87(9):871-878.
10. McIntosh WL, Spies E, Stone DM, Lokey CN, Trudeau AR, Bartholow B. Suicide Rates by Occupational Group - 17 States, 2012. *MMWR Morb Mortal Wkly Rep*. 2016;65(25):641-645.
11. Kann L, McManus T, Harris WA, et al. Youth Risk Behavior Surveillance - United States, 2015. *Morbidity and mortality weekly report. Surveillance summaries (Washington, D.C. : 2002)*. 2016;65(6):1-174.
12. Russell ST, Joyner K. Adolescent sexual orientation and suicide risk: Evidence from a national study. *Am J Public Health*. 2001;91(8):1276-1281.
13. Crosby AE, Han B, Ortega LA, Parks SE, Gfroerer J. Suicidal thoughts and behaviors among adults aged  $\geq 18$  years--United States, 2008-2009. *Morbidity and mortality weekly report. Surveillance summaries (Washington, D.C. : 2002)*. 2011;60(13):1-22.
14. Lipari R, Piscopo K, Kroutil LA, Kilmer Miller G. Suicidal thoughts and behavior among adults: Results from the 2014 National Survey on Drug Use and Health. *NSDUH Data Review 2015*; <https://www.samhsa.gov/data/sites/default/files/NSDUH-FRR2-2014/NSDUH-FRR2-2014.pdf>.
15. Dahlberg LL, Krug EG. Violence-a global public health problem. In: Krug E, Dahlberg LL, Mercy JA, Zwi AB, Lozano R, eds. *World Report on Violence and Health*. Geneva, Switzerland: World Health Organization; 2002:1-56.
16. Bossarte RM, Karras E, Lu N, et al. Associations between the Department of Veterans Affairs' suicide prevention campaign and calls to related crisis lines. *Public health reports (Washington, D.C. : 1974)*. 2014;129(6):516-525.
17. Chapman DP, Whitfield CL, Felitti VJ, Dube SR, Edwards VJ, Anda RF. Adverse childhood experiences and the risk of depressive disorders in adulthood. *Journal of affective disorders*. 2004;82(2):217-225.
18. Dube SR, Anda RF, Felitti VJ, Chapman DP, Williamson DF, Giles WH. Childhood abuse, household dysfunction, and the risk of attempted suicide throughout the life span: findings from the Adverse Childhood Experiences Study. *Jama*. 2001;286(24):3089-3096.
19. Felitti VJ, Anda RF, Nordenberg D, et al. Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: The Adverse Childhood Experiences (ACE) Study. *Am J Prev Med*. 1998;14(4):245-258.

20. Klomek AB, Sourander A, Gould M. The association of suicide and bullying in childhood to young adulthood: a review of cross-sectional and longitudinal research findings. *The Canadian Journal of Psychiatry*. 2010;55(5):282-288.
21. Leeb RT, Lewis T, Zolotor AJ. A review of physical and mental health consequences of child abuse and neglect and implications for practice. *American Journal of Lifestyle Medicine*. 2011;5(5):454-468.
22. World Health Organization. Global and Regional Estimates of Violence Against Women: Prevalence and Health Effects of Intimate Partner Violence and Non-Partner Sexual Violence. Geneva: World Health Organization; 2013.
23. Bellis MA, Hughes K, Leckenby N, et al. Adverse childhood experiences and associations with health-harming behaviours in young adults: surveys in eight eastern European countries. *Bull World Health Organ*. 2014;92(9):641-655.
24. Haegerich TM, Dahlberg LL. Violence as a public health risk. *American Journal of Lifestyle Medicine*. 2011;1559827611409127.
25. Wilkins N, Tsao B, Hertz M, Davis R, Klevens J. In: violence Ctdaootlamfo, ed. Atlanta, GA: National Center for Injury Prevention and Control, Centers for Disease Control and Prevention; 2014.
26. Hamby S, Grych J. The web of violence: exploring connections among different forms of interpersonal violence and abuse. *Briefs in Sociology*. New York, NY: Springer; 2013.
27. Kleiman EM, Riskind JH, Schaefer KE, Weingarden H. The moderating role of social support on the relationship between impulsivity and suicide risk. *Crisis*. 2012;33(5):273-279.
28. Carter M, McGee R, Taylor B, Williams S. Health outcomes in adolescence: associations with family, friends and school engagement. *J Adolesc*. 2007;30(1):51-62.
29. Maimon D, Browning CR, Brooks-Gunn J. Collective efficacy, family attachment, and urban adolescent suicide attempts. *J Health Soc Behav*. 2010;51(3):307-324.
30. Capaldi DM, Knoble NB, Shortt JW, Kim HK. A Systematic Review of Risk Factors for Intimate Partner Violence. *Partner Abuse*. 2012;3(2):231-280.
31. Losel F, Farrington DP. Direct protective and buffering protective factors in the development of youth violence. *Am J Prev Med*. 2012;43(2 Suppl 1):S8-S23.
32. Wyman PA, Brown CH, LoMurray M, et al. An outcome evaluation of the Sources of Strength suicide prevention program delivered by adolescent peer leaders in high schools. *Am J Public Health*. 2010;100(9):1653-1661.
33. Dunne EJ, McIntosh JL, Dunne-Maxim K, eds. *Suicide and its aftermath: Understanding and counseling the survivors*. New York: Norton; 1987.
34. Mishara BL, ed *The Impact of Suicide*. New York: Springer; 1995.
35. National Action Alliance for Suicide Prevention: Suicide Attempt Survivors Task Force. *The Way Forward: Pathways to hope, recovery, and wellness with insights from lived experience*. Washington, D.C. : Author; 2014.
36. National Action Alliance for Suicide Prevention: Survivors of Suicide Loss Task Force. *Responding to Grief, Trauma, and Distress After a Suicide: U.S. National Guidelines*. Washington, D.C. : Author; 2015.
37. Crosby AE, Sacks JJ. Exposure to suicide: incidence and association with suicidal ideation and behavior: United States, 1994. *Suicide Life Threat Behav*. 2002;32(3):321-328.
38. Cerel J, Maple M, De Venne A, Moore M, Flaherty C, Brown M. Exposure to Suicide in the Community: Prevalence and Correlates in One US State. *Public health reports (Washington, D.C. : 1974)*. 2016;131(1).
39. Chapman AL, Dixon-Gordon KL. Emotional antecedents and consequences of deliberate self-harm and suicide attempts. *Suicide Life Threat Behav*. 2007;37(5):543-552.
40. Mitchell AM, Kim Y, Prigerson HG, Mortimer-Stephens M. Complicated grief in survivors of suicide. *Crisis*. 2004;25(1):12-18.
41. Sudak H, Maxim K, Carpenter M. Suicide and stigma: a review of the literature and personal reflections. *Acad Psychiatry*. 2008;32(2):136-142.



42. Cerel J, McIntosh JL, Neimeyer RA, Maple M, Marshall D. The Continuum of "Survivorship": Definitional Issues in the Aftermath of Suicide. *Suicide Life Threat Behav.* 2014;44(6):591-600.
43. Florence C, Simon T, Haegerich T, Luo F, Zhou C. Estimated lifetime medical and work-loss costs of fatal injuries-United States, 2013. *MMWR: Morbidity and mortality weekly report.* 2015;64(38):1074-1077.
44. Shepard DS, Gurewicz D, Lwin AK, Reed GA, Jr., Silverman MM. Suicide and Suicidal Attempts in the United States: Costs and Policy Implications. *Suicide Life Threat Behav.* 2016;46(3):352-362.
45. Silverman MM, Maris RW. The prevention of suicidal behaviors: An overview. *Suicide Life Threat Behav.* 1995;25(1):10-21.
46. Turecki G. Epigenetics and suicidal behavior research pathways. *Am J Prev Med.* 2014;47(3):S144-S151.
47. Edwards RW, Jumper-Thurman P, Plested BA, Oetting ER, Swanson L. Community readiness: Research to practice. *Journal of community psychology.* 2000;28(3):291-307.
48. Hawkins JD, Catalano RF, Kuklinski MR. Communities that care. *Encyclopedia of Criminology and Criminal Justice*: Springer; 2014:393-408.
49. Plested BA, Edwards RW, Jumper-Thurman P. Community readiness: A handbook for successful change. Fort Collins, CO: Tri-Ethnic Center for Prevention Research. 2006.
50. Luo F, Florence CS, Quispe-Agnoli M, Ouyang L, Crosby AE. Impact of business cycles on US suicide rates, 1928-2007. *Am J Public Health.* 2011;101(6):1139-1146.
51. Fowler KA, Gladden RM, Vagi KJ, Barnes J, Frazier L. Increase in suicides associated with home eviction and foreclosure during the US housing crisis: findings from 16 National Violent Death Reporting System States, 2005-2010. *Am J Public Health.* 2015;105(2):311-316.
52. Stack S, Wasserman I. Economic strain and suicide risk: a qualitative analysis. *Suicide and life-threatening behavior.* 2007;37(1):103-112.
53. Cylus J, Glymour MM, Avendano M. Do generous unemployment benefit programs reduce suicide rates? A state fixed-effect analysis covering 1968-2008. *Am J Epidemiol.* 2014;180(1):45-52.
54. Classen TJ, Dunn RA. The effect of job loss and unemployment duration on suicide risk in the United States: a new look using mass-layoffs and unemployment duration. *Health Econ.* 2012;21(3):338-350.
55. Flavin P, Radcliff B. Public policies and suicide rates in the American states. *Social Indicators Research.* 2009;90(2):195-209.
56. Houle JN, Light MT. The home foreclosure crisis and rising suicide rates, 2005 to 2010. *Am J Public Health.* 2014;104(6):1073-1079.
57. Owens D. Fatal and non-fatal repetition of self-harm: Systematic review. *British journal of psychiatry.* 2002;181(3):193-199.
58. Olfson M, Gerhard T, Huang C, Crystal S, Stroup TS. Premature Mortality Among Adults With Schizophrenia in the United States. *JAMA psychiatry.* 2015;72(12):1172-1181.
59. Arsenault-Lapierre G, Kim C, Turecki G. Psychiatric diagnoses in 3275 suicides: a meta-analysis. *BMC Psychiatry.* 2004;4:37.
60. Harris EC, Barraclough B. Suicide as an outcome for mental disorders. A meta-analysis. *Br J Psychiatry.* 1997;170:205-228.
61. Tyrer P, Reed GM, Crawford MJ. Classification, assessment, prevalence, and effect of personality disorder. *Lancet.* 2015;385(9969):717-726.
62. Harris EC, Barraclough B. Excess mortality of mental disorder. *Br J Psychiatry.* 1998;173:11-53.
63. Mark TL, Shern DL, Bagalman JE, Cao Z. Ranking America's mental health: An analysis of depression across the states. Alexandria, VA: Mental Health America. 2007.
64. Lang M. The impact of mental health insurance laws on state suicide rates. *Health Econ.* 2013;22(1):73-88.
65. Wang PS, Demler O, Kessler RC. Adequacy of treatment for serious mental illness in the United States. *Am J Public Health.* 2002;92(1):92-98.

66. Cunningham PJ. Beyond parity: primary care physicians' perspectives on access to mental health care. *Health Aff (Millwood)*. 2009;28(3):w490-501.
67. Coffey CE. Building a system of perfect depression care in behavioral health. *Jt Comm J Qual Patient Saf*. 2007;33(4):193-199.
68. U.S. Department of Health and Human Services Health Resources and Services Administrations. Designated Health Professional Shortage Areas Statistics, As of November 4, 2016. 2016.
69. National Action Alliance for Suicide Prevention: Clinical Workforce Preparedness Task Force. *Suicide prevention and the clinical workforce: Guidelines for training*. Washington, D.C.: Author; 2014.
70. Substance Abuse and Mental Health Services Administration, Center for Behavioral Health Statistics and Quality. National Survey on Drug Use and Health. 2016; [https://nsduhwebesn.rti.org/respweb/project\\_description.html](https://nsduhwebesn.rti.org/respweb/project_description.html).
71. Harris KM, Carpenter C, Bao Y. The effects of state parity laws on the use of mental health care. *Med Care*. 2006;44(6):499-505.
72. Health Resources & Services Administration. National Health Service Corps. 2017; <https://www.nhsc.hrsa.gov/>.
73. U.S. Department of Health and Human Services Health Resources and Services Administrations. NHSC Clinician Retention: A Story of Dedication and Commitment. 2016.
74. Hailey D, Roine R, Ohinmaa A. The effectiveness of telemental health applications: a review. *The Canadian Journal of Psychiatry*. 2008;53(11):769-778.
75. Mohr DC, Vella L, Hart S, Heckman T, Simon G. The effect of telephone-administered psychotherapy on symptoms of depression and attrition: A meta-analysis. *Clinical Psychology: Science and Practice*. 2008;15(3):243-253.
76. Coffey CE. Pursuing perfect depression care. *Psychiatr Serv*. 2006;57(10):1524-1526.
77. Coffey CE, Coffey MJ, Ahmedani BK. An update on perfect depression care. *Psychiatr Serv*. 2013;64(4):396.
78. Coffey M, Coffey C, Ahmedani BK. Suicide in a health maintenance organization population. *JAMA psychiatry*. 2015;72(3):294-296.
79. Haddon W. Advances in the epidemiology of injuries as a basis for public policy. *Public Health Reports*. 1980;95(5):411-421.
80. Toosi M. Labor force projections to 2024: The labor force is growing, but slowly. In: Statistics BoL, ed. Washington, D.C.: Bureau of Labor Statistics; 2015:1-33.
81. Han B, Crosby AE, Ortega LA, Parks SE, Compton WM, Gfroerer J. Suicidal ideation, suicide attempt, and occupations among employed adults aged 18–64years in the United States. *Comprehensive psychiatry*. 2016;66:176-186.
82. Noonan ME. Mortality in State Prisons, 2001-2014 *Bureau of Justice Statistical Tables*. 2016;250150(December).
83. Knox KL, Pflanz S, Talcott GW, et al. The US Air Force suicide prevention program: implications for public health policy. *Am J Public Health*. 2010;100(12):2457-2463.
84. National Action Alliance for Suicide Prevention Workplace Task Force. *Comprehensive Blueprint for Workplace Suicide Prevention*. Washington, D.C. : Author; 2015.
85. Runyan CW, Becker A, Brandspigel S, Barber C, Trudeau A, Novins D. Lethal Means Counseling for Parents of Youth Seeking Emergency Care for Suicidality. *West J Emerg Med*. 2016;17(1):8-14.
86. Miller M, Warren M, Hemenway D, Azrael D. Firearms and suicide in US cities. *Inj Prev*. 2015;21(e1):e116-119.
87. Crosby AE, Espitia-Hardeman V, Ortega L, Lozano B. Alcohol and suicide. *Alcohol: Science, Policy and Public Health*. 2013:190.
88. Kaplan MS, McFarland BH, Huguette N, et al. Acute alcohol intoxication and suicide: a gender-stratified analysis of the National Violent Death Reporting System. *Inj Prev*. 2013;19(1):38-43.



89. Beautrais AL, Gibb SJ, Fergusson DM, Horwood LJ, Larkin GL. Removing bridge barriers stimulates suicides: An unfortunate natural experiment. *Aust NZ J Psychiat*. 2009;43.
90. Stokes ML, McCoy KP, Abram KM, Byck GR, Teplin LA. Suicidal Ideation and Behavior in Youth in the Juvenile Justice System: A Review of the Literature. *Journal of correctional health care : the official journal of the National Commission on Correctional Health Care*. 2015;21(3):222-242.
91. Elnour AA, Harrison J. Lethality of suicide methods. *Inj Prev*. 2008;14(1):39-45.
92. Simon OR, Swann AC, Powell KE, Potter LB, Kresnow MJ, O'Carroll PW. Characteristics of impulsive suicide attempts and attempters. *Suicide Life Threat Behav*. 2001;32(1 Suppl):49-59.
93. Deisenhammer EA, Ing CM, Strauss R, Kemmler G, Hinterhuber H, Weiss EM. The duration of the suicidal process: how much time is left for intervention between consideration and accomplishment of a suicide attempt? *J Clin Psychiatry*. 2009;70(1):19-24.
94. Hawton K. Restricting access to methods of suicide: Rationale and evaluation of this approach to suicide prevention. *Crisis*. 2007;28.
95. Yip P, Caine E, Yousuf S, Chang S-S, Wu K, Chen Y-Y. Means restriction for suicide prevention. *Lancet*. 2012;379.
96. Cox GR, Owens C, Robinson J, et al. Interventions to reduce suicides at suicide hotspots: a systematic review. *BMC Public Health*. 2013;13(1):1-12.
97. Rowhani-Rahbar A, Simonetti JA, Rivara FP. Effectiveness of Interventions to Promote Safe Firearm Storage. *Epidemiol Rev*. 2016;38(1):111-124.
98. Hayes LM. Suicide prevention in correctional facilities: reflections and next steps. *International journal of law and psychiatry*. 2013;36(3-4):188-194.
99. Giesbrecht N, Huguot N, Ogden L, et al. Acute alcohol use among suicide decedents in 14 US states: impacts of off-premise and on-premise alcohol outlet density. *Addiction*. 2015;110(2):300-307.
100. Escobedo LG, Ortiz M. The relationship between liquor outlet density and injury and violence in New Mexico. *Accid Anal Prev*. 2002;34(5):689-694.
101. Xuan Z, Naimi TS, Kaplan MS, et al. Alcohol Policies and Suicide: A Review of the Literature. *Alcohol Clin Exp Res*. 2016;40(10):2043-2055.
102. Cherpitel CJ, Borges GLG, Wilcox HC. Acute alcohol use and suicidal behavior: A review of the literature. *Alcoholism: Clinical and Experimental Research*. 2004;28(5 SUPPL.):18S-28S.
103. Pirkis J, Too LS, Spittal MJ, Kryszinska K, Robinson J, Cheung YTD. Interventions to reduce suicides at suicide hotspots: a systematic review and meta-analysis. *The Lancet Psychiatry*. 2015;2(11):994-1001.
104. Perron S, Burrows S, Fournier M, Perron PA, Ouellet F. Installation of a bridge barrier as a suicide prevention strategy in Montreal, Quebec, Canada. *Am J Public Health*. 2013;103(7):1235-1239.
105. Beautrais AL. Effectiveness of barriers at suicide jumping sites: A case study. *Aust NZ J Psychiat*. 2001;35.
106. Grossman DC, Mueller BA, Riedy C, et al. Gun storage practices and risk of youth suicide and unintentional firearm injuries. *JAMA*. 2005;293(6):707-714.
107. Mishara BL, Martin N. Effects of a comprehensive police suicide prevention program. *Crisis: Journal of Crisis Intervention & Suicide*. 2012;33(3):162-168.
108. Knox KL, Litts DA, Talcott GW, Feig JC, Caine ED. Risk of suicide and related adverse outcomes after exposure to a suicide prevention programme in the US Air Force: cohort study. *BMJ*. 2003;327(7428):1376.
109. Hayes LM. Prison Suicide: An Overview and a Guide to Prevention. *The Prison Journal*. 1995;75(4):431-456.
110. Barker E, Kölves K, De Leo D. Management of Suicidal and Self-Harming Behaviors in Prisons: Systematic Literature Review of Evidence-Based Activities. *Archives of Suicide Research*. 2014;18(3):227-240.
111. Rush BR, Gliksman L, Brook R. Alcohol availability, alcohol consumption and alcohol-related damage. I. The distribution of consumption model. *J Stud Alcohol*. 1986;47(1):1-10.

112. Gruenewald PJ, Remer L. Changes in outlet densities affect violence rates. *Alcohol Clin Exp Res*. 2006;30(7):1184-1193.
113. Lipton R, Gruenewald P. The spatial dynamics of violence and alcohol outlets. *J Stud Alcohol*. 2002;63(2):187-195.
114. Lippy C, DeGue S. Exploring alcohol policy approaches to prevent sexual violence perpetration. *Trauma, Violence, & Abuse*. 2014;1524838014557291.
115. Johnson FW, Gruenewald PJ, Remer LG. Suicide and alcohol: do outlets play a role? *Alcohol Clin Exp Res*. 2009;33(12):2124-2133.
116. Durkheim E. Suicide: A study in sociology (JA Spaulding & G. Simpson, trans.). Glencoe, IL: Free Press.(Original work published 1897). 1897/1951.
117. Centers for Disease Control and Prevention. Strategic direction for the prevention of suicidal behavior: Promoting individual, family, and community connectedness to prevent suicidal behavior. 2009; Available at: [http://www.cdc.gov/ViolencePrevention/pdf/Suicide\\_Strategic\\_Direction\\_Full\\_version-a.pdf](http://www.cdc.gov/ViolencePrevention/pdf/Suicide_Strategic_Direction_Full_version-a.pdf).
118. Muennig P, Cohen AK, Palmer A, Zhu W. The relationship between five different measures of structural social capital, medical examination outcomes, and mortality. *Social science & medicine* (1982). 2013;85:18-26.
119. Beyer KM, Layde PM, Hamberger LK, Laud PW. Does neighborhood environment differentiate intimate partner femicides from other femicides? *Violence Against Women*. 2015;21(1):49-64.
120. Whitley R, McKenzie K. Social capital and psychiatry: review of the literature. *Harvard review of psychiatry*. 2005;13(2):71-84.
121. De Silva MJ, McKenzie K, Harpham T, Huttly SR. Social capital and mental illness: a systematic review. *Journal of epidemiology and community health*. 2005;59(8):619-627.
122. Wyman PA. Developmental approach to prevent adolescent suicides: research pathways to effective upstream preventive interventions. *Am J Prev Med*. 2014;47(3 Suppl 2):S251-256.
123. Centers for Disease Control and Prevention. Principles of community engagement. *CDC/ATSDR Committee on Community Engagement*. 1997.
124. Branas CC, Cheney RA, MacDonald JM, Tam VW, Jackson TD, Ten Have TR. A difference-in-differences analysis of health, safety, and greening vacant urban space. *Am J Epidemiol*. 2011;174(11):1296-1306.
125. Branas CC, Kondo MC, Murphy SM, South EC, Polsky D, MacDonald JM. Urban blight remediation as a cost-beneficial solution to firearm violence. *Am J Public Health*. 2016;106(12):2158-2164.
126. Bandura A. *Social foundations of thought and action: A social cognitive theory*. Prentice-Hall, Inc; 1986.
127. Pollock LR, Williams JM. Problem-solving in suicide attempters. *Psychol Med*. 2004;34(1):163-167.
128. Herman KC, Borden LA, Reinke WM, Webster-Stratton C. The Impact of the Incredible Years Parent, Child, and Teacher Training Programs on Children's Co-Occurring Internalizing Symptoms. *Sch Psychol Q*. 2011;26(3):189-201.
129. Knox MS, Burkhart K, Hunter KE. ACT against violence parents raising safe kids program: Effects on maltreatment-related parenting behaviors and beliefs. *Journal of Family Issues*. 2010.
130. Wasserman D, Hoven CW, Wasserman C, et al. School-based suicide prevention programmes: The SEYLE cluster-randomised, controlled trial. *The Lancet*. 2014;385(9977):1536-1544.
131. Wilcox HC, Kellam SG, Brown CH, et al. The impact of two universal randomized first- and second-grade classroom interventions on young adult suicide ideation and attempts. *Drug Alcohol Depend*. 2008;95 Suppl 1:S60-73.
132. Kellam SG, Brown CH, Poduska JM, et al. Effects of a universal classroom behavior management program in first and second grades on young adult behavioral, psychiatric, and social outcomes. *Drug Alcohol Depend*. 2008;95 Suppl 1:S5-S28.



133. Webster-Stratton C, Jamila Reid M, Stoolmiller M. Preventing conduct problems and improving school readiness: evaluation of the incredible years teacher and child training programs in high-risk schools. *Journal of child psychology and psychiatry*. 2008;49(5):471-488.
134. Webster-Stratton CH, Reid MJ, Beauchaine T. Combining parent and child training for young children with ADHD. *Journal of Clinical Child & Adolescent Psychology*. 2011;40(2):191-203.
135. Reid MJ, Webster-Stratton C, Hammond M. Follow-up of children who received the Incredible Years intervention for oppositional-defiant disorder: Maintenance and prediction of 2-year outcome. *Behavior Therapy*. 2003;34(4):471-491.
136. Webster-Stratton C, Hammond M. Treating children with early-onset conduct problems: a comparison of child and parent training interventions. *J Consult Clin Psychol*. 1997;65(1):93-109.
137. Webster-Stratton C, Reid MJ, Hammond M. Preventing conduct problems, promoting social competence: a parent and teacher training partnership in head start. *J Clin Child Psychol*. 2001;30(3):283-302.
138. Spoth RL, Guyll M, Day SX. Universal family-focused interventions in alcohol-use disorder prevention: cost-effectiveness and cost-benefit analyses of two interventions. *J Stud Alcohol*. 2002;63(2):219-228.
139. Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999-2014. *NCHS Data Brief*. Hyattsville, MD: National Center for Health Statistics; 2016.
140. Jobes DA. The Collaborative Assessment and Management of Suicidality (CAMS): an evolving evidence-based clinical approach to suicidal risk. *Suicide Life Threat Behav*. 2012;42(6):640-653.
141. Wilcox HC, Wyman PA. Suicide Prevention Strategies for Improving Population Health. *Child and adolescent psychiatric clinics of North America*. 2016.
142. Isaac M, Elias B, Katz LY, et al. Gatekeeper training as a preventative intervention for suicide: a systematic review. *Canadian journal of psychiatry. Revue canadienne de psychiatrie*. 2009;54(4):260-268.
143. Gould MS, Munfakh JL, Kleinman M, Lake AM. National suicide prevention lifeline: enhancing mental health care for suicidal individuals and other people in crisis. *Suicide Life Threat Behav*. 2012;42(1):22-35.
144. Gilbody S, Bower P, Fletcher J, Richards D, Sutton AJ. Collaborative care for depression: a cumulative meta-analysis and review of longer-term outcomes. *Archives of internal medicine*. 2006;166(21):2314-2321.
145. Archer J, Bower P, Gilbody S, et al. Collaborative care for depression and anxiety problems. *The Cochrane Library*. 2012.
146. Bruce ML, Ten Have TR, Reynolds III CF, et al. Reducing suicidal ideation and depressive symptoms in depressed older primary care patients: a randomized controlled trial. *Jama*. 2004;291(9):1081-1091.
147. Inagaki M, Kawashima Y, Kawanishi C, et al. Interventions to prevent repeat suicidal behavior in patients admitted to an emergency department for a suicide attempt: a meta-analysis. *Journal of affective disorders*. 2015;175:66-78.
148. Gould MS, Cross W, Pisani AR, Munfakh JL, Kleinman M. Impact of Applied Suicide Intervention Skills Training on the National Suicide Prevention Lifeline. *Suicide Life Threat Behav*. 2013;43(6):676-691.
149. Walrath C, Garraza LG, Reid H, Goldston DB, McKeon R. Impact of the Garrett Lee Smith youth suicide prevention program on suicide mortality. *Am J Public Health*. 2015;105(5):986-993.
150. Godoy Garraza L, Walrath C, Goldston DB, Reid H, McKeon R. Effect of the Garrett Lee Smith Memorial Suicide Prevention Program on Suicide Attempts Among Youths. *JAMA psychiatry*. 2015;72(11):1143-1149.
151. Gould MS, Kalafat J, Harrismunfakh JL, Kleinman M. An evaluation of crisis hotline outcomes. Part 2: Suicidal callers. *Suicide Life Threat Behav*. 2007;37(3):338-352.
152. Hunkeler EM, Katon W, Tang L, et al. Long term outcomes from the IMPACT randomised trial for depressed elderly patients in primary care. *BMJ*. 2006;332(7536):259-263.

153. Unutzer J, Tang L, Oishi S, et al. Reducing suicidal ideation in depressed older primary care patients. *J Am Geriatr Soc*. 2006;54(10):1550-1556.
154. Comtois KA, Jobes DA, S. O'Connor S, et al. Collaborative assessment and management of suicidality (CAMS): feasibility trial for next-day appointment services. *Depression and anxiety*. 2011;28(11):963-972.
155. Linehan MM, Comtois KA, Murray AM, et al. Two-year randomized controlled trial and follow-up of dialectical behavior therapy vs therapy by experts for suicidal behaviors and borderline personality disorder. *Arch Gen Psychiatry*. 2006;63(7):757-766.
156. Diamond GS, Wintersteen MB, Brown GK, et al. Attachment-based family therapy for adolescents with suicidal ideation: a randomized controlled trial. *J Am Acad Child Adolesc Psychiatry*. 2010;49(2):122-131.
157. Rubenstein LV, Chaney EF, Ober S, et al. Using evidence-based quality improvement methods for translating depression collaborative care research into practice. *Families, Systems, & Health*. 2010;28(2):91.
158. Fleischmann A, Bertolote JM, Wasserman D, et al. Effectiveness of brief intervention and contact for suicide attempters: a randomized controlled trial in five countries. *Bull World Health Organ*. 2008;86(9):703-709.
159. Motto JA, Bostrom AG. A randomized controlled trial of postcrisis suicide prevention. *Psychiatr Serv*. 2001;52(6):828-833.
160. Hassanian-Moghaddam H, Sarjami S, Kolahi AA, Carter GL. Postcards in Persia: randomised controlled trial to reduce suicidal behaviours 12 months after hospital-treated self-poisoning. *British Journal of Psychiatry*. 2011;198(4):309-316.
161. Wang YC, Hsieh LY, Wang MY, Chou CH, Huang MW, Ko HC. Coping Card Usage can Further Reduce Suicide Reattempt in Suicide Attempter Case Management Within 3-Month Intervention. *Suicide Life Threat Behav*. 2016;46(1):106-120.
162. Brown GK, Ten Have T, Henriques GR, Xie SX, Hollander JE, Beck AT. Cognitive therapy for the prevention of suicide attempts: a randomized controlled trial. *JAMA*. 2005;294(5):563-570.
163. Pitman A, Osborn D, King M, Erlangsen A. Effects of suicide bereavement on mental health and suicide risk. *Lancet Psychiatry*. 2014;1:86-94.
164. Etzersdorfer E, Sonneck G. Preventing suicide by influencing mass-media reporting: The Viennese experience, 1980–1996. *Arch Suicide Res*. 1998;4.
165. Niederkrotenthaler T, Sonneck G. Assessing the impact of media guidelines for reporting on suicides in Austria: Interrupted time series analysis. *Aust N Z J Psychiatry*. 2007;41.
166. Szumilas M, Kutcher S. Post-suicide intervention programs: a systematic review. *Can J Public Health*. 2011;102(1):18-29.
167. Bohanna I, Wang X. Media guidelines for the responsible reporting of suicide: a review of effectiveness. *Crisis*. 2012;33(4):190-198.
168. Visser VS, Comans TA, Scuffham PA. Evaluation Of The Effectiveness Of A Community-Based Crisis Intervention Program For People Bereaved By Suicide. *Journal of Community Psychology*. 2014;42(1):19-28.
169. Cerel J, Campbell FR. Suicide survivors seeking mental health services: a preliminary examination of the role of an active postvention model. *Suicide Life Threat Behav*. 2008;38(1):30-34.
170. Niederkrotenthaler T, Voracek M, Herberth A, et al. Media and suicide. Papageno v Werther effect. *BMJ*. 2010;341:c5841.
171. National Violent Death Reporting System. Centers for Disease Control and Prevention, National Center for Injury Prevention and Control; 2017. Available at: <https://www.cdc.gov/injury/wisqars/nvdrs.html>.
172. The National Center for the Review & Prevention of Child Deaths. U.S. Child Death Review Programs. <https://www.childdeathreview.org/cdr-programs/u-s-cdr-programs/>.



173. Centers for Disease Control and Prevention, Brener ND, Kann L, et al. Methodology of the Youth Risk Behavior Surveillance System--2013. *MMWR Recomm Rep*. 2013;62(RR-1):1-20.

FINAL

## Appendix A: Summary of Strategies and Approaches to Prevent Suicide

Strategy	Approach/Program, Practice or Policy	Best Available Evidence			Lead Sectors <sup>1</sup>
		Suicide	Suicide Attempts or Ideation	Other Risk/Protective Factors for Suicide	
Strengthen economic supports	<b>Strengthen household financial security</b>				Government (local, state, Federal)
	<i>Unemployment benefit programs</i>	✓		✓	Business/labor
	<i>Other income supports</i>	✓			
	<b>Housing stabilization policies</b>				Government (local, state, Federal)
	<i>The National Neighborhood Stabilization Program</i>			✓	
Strengthen access and delivery of suicide care	<b>Coverage of mental health conditions in health insurance policies</b>				Government (local, state, Federal)  Healthcare  Social services
	<i>Mental Health Parity Laws</i>	✓		✓	
	<b>Reduce provider shortages in underserved areas</b>				
	<i>National Health Service Corps (NHSC)</i>			✓	
	<i>Telemental health (TMH)</i>			✓	
	<b>Safer suicide care through systems change</b>				
	<i>Henry Ford Perfect Depression Care (Precursor to Zero Suicide)</i>	✓		✓	
Create protective environments	<b>Reduce access to lethal means among persons at-risk</b>				Government (local, state)  Public Health  Healthcare
	<i>Intervening at suicide hot spots</i>	✓			
	<i>Safe storage practices</i>		✓	✓	
	<i>Emergency Department Counseling on Access to Lethal Means (ED CALM)</i>			✓	



		Best Available Evidence			
	Organizational policies and culture				
	Together for Life	✓			Business/Labor
	US Air Force Suicide Prevention Program	✓		✓	Justice
	Correctional suicide prevention	✓			Government (local, state, Federal)
	Community-based policies to reduce excessive alcohol use				Government (local, state)
	Alcohol outlet density	✓		✓	Business/labor
Promote connectedness	Peer norm programs				Public Health
	Sources of Strength			✓	Education
	Community engagement activities				Public Health
	Greening vacant urban spaces			✓	Government (local)
Teach coping and problem-solving skills	Social emotional learning programs				
	Youth Aware of Mental Health Program		✓	✓	Public Health
	Good Behavior Game		✓	✓	Education
	Parenting skill and family relationship approaches				
	The Incredible Years			✓	Public Health
				Education	

		Best Available Evidence			
	<i>Strengthening Families: For Parents and Youth 10-14</i>			✓	
Identify and support people at-risk	<b>Gatekeeper training</b>				Public Health
	<i>Applied Suicide Intervention Skills Training</i>			✓	Healthcare
	<i>Garret Lee Smith Federal Grant Program</i>	✓	✓		
	<b>Crisis Intervention</b>				Public Health
	<i>National Suicide Prevention Lifeline</i>		✓	✓	Social Services
	<b>Treatment for people at risk of suicide</b>				
	<i>Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)</i>		✓	✓	
	<i>Collaborative Assessment and Management of Suicidality (CAMS)</i>		✓	✓	Healthcare
	<i>Dialectical Behavioral Therapy (DBT)</i>		✓	✓	Social Services
	<i>Attachment-Based Family Therapy (ABFT)</i>		✓		Justice
	<i>Translating Initiatives for Depression into Effective Solutions project (TIDES)</i>			✓	
	<b>Treatment to prevent re-attempts</b>				
	<i>ED Brief Intervention with Follow-up Visits</i>	✓			Healthcare
	<i>Active follow-up contact approaches</i>	✓	✓		Social services
	<i>CBT for Suicide Prevention</i>		✓		



		Best Available Evidence			
Lessen harms and prevent future risk	<b>Postvention</b>				Healthcare
	<i>StandBy Response Service</i>		✓	✓	
	<b>Safe reporting and message about suicide</b>				Public Health
	<i>Media Guidelines</i>	✓			Media

<sup>1</sup>This column refers to the lead sectors well positioned to bring leadership and resources to implementation efforts. For each strategy, there are many other sectors such as non-governmental organizations that are instrumental to prevention planning and implementing specific activities.



# Preventing Suicide:

## A Technical Package of Policy, Programs, and Practices

National Center for Injury Prevention and Control  
Division of Violence Prevention









# Preventing Suicide:

## A Technical Package of Policy, Programs, and Practices

**Developed by:**

Deb Stone, ScD, MSW, MPH

Kristin Holland, PhD, MPH

Brad Bartholow, PhD

Alex Crosby, MD, MPH

Shane Davis, PhD

Natalie Wilkins, PhD

2017

Division of Violence Prevention  
National Center for Injury Prevention and Control  
Centers for Disease Control and Prevention  
Atlanta, Georgia





**Centers for Disease Control and Prevention**  
Anne Schuchat, MD (RADM, USPHS), Acting Director

**National Center for Injury Prevention and Control**  
Debra E. Houry, MD, MPH, Director

**Division of Violence Prevention**  
James A. Mercy, PhD, Director

---

**Suggested citation:**

Stone, D.M., Holland, K.M., Bartholow, B., Crosby, A.E., Davis, S., and Wilkins, N. *Preventing Suicide: A Technical Package of Policies, Programs, and Practices*. Atlanta, GA: National Center for Injury Prevention and Control, Centers for Disease Control and Prevention, 2017.



# Contents

Acknowledgements .....	5
External Reviewers.....	5
Overview .....	7
Strengthen Economic Supports for Families.....	15
Strengthen Access and Delivery of Suicide Care .....	19
Create Protective Environments .....	23
Promote Connectedness .....	27
Teach Coping and Problem-Solving Skills.....	31
Identify and Support People At-Risk .....	35
Lessen Harms and Prevent Future Risk .....	41
Sector Involvement .....	43
Monitoring and Evaluation .....	45
Conclusion .....	47
References.....	49
Appendix: Summary of Strategies and Approaches to Prevent Suicide .....	58







# Acknowledgements

We would like to thank the following individuals who contributed in specific ways to the development of this technical package. We give special thanks to Linda Dahlberg for her vision, guidance, and support throughout the development of this package. We thank Division, Center, and CDC leadership for their careful review and helpful feedback on earlier iterations of this document. We thank Alida Knuth for her formatting and design expertise. Last but definitely not least, we extend our thanks and gratitude to all the external reviewers for their helpful feedback, support and encouragement for this resource.

## External Reviewers

Casey Castaldi  
Prevention Institute

Carmen Clelland  
Office for State, Tribal, Local and Territorial Support,  
Centers for Disease Control and Prevention

Amalia Corby-Edwards  
American Psychological Association

Rachel Davis  
Prevention Institute

Pamela End of Horn  
Indian Health Service Headquarters

Craig Fisher  
American Psychological Association

Keita Franklin  
Department of Defense

Jill M. Harkavy Friedman  
American Foundation for Suicide Prevention

Jarrod Hindman  
Colorado Department of Public Health and Environment

Linda Langford  
Education Development Center, Inc.

Richard McKeon  
Substance Abuse and Mental Health Services Administration

Doreen S. Marshall  
American Foundation for Suicide Prevention

Christine Moutier  
American Foundation for Suicide Prevention

Jason H. Padgett  
Education Development Center, Inc.

Jerry Reed  
Education Development Center, Inc.

Dan Reidenberg  
Suicide Awareness Voices for Education (SAVE)

Christine Schuler  
National Institute for Occupational Safety and Health,  
Centers for Disease Control and Prevention

Morton Silverman  
Education Development Center, Inc.

Ellyson Stout  
Education Development Center, Inc.

Hope M. Tiesman  
National Institute for Occupational Safety and Health,  
Centers for Disease Control and Prevention









# Overview

This technical package represents a select group of strategies based on the best available evidence to help communities and states sharpen their focus on prevention activities with the greatest potential to prevent suicide. These strategies include: strengthening economic supports; strengthening access and delivery of suicide care; creating protective environments; promoting connectedness; teaching coping and problem-solving skills; identifying and supporting people at-risk; and lessening harms and preventing future risk. The strategies represented in this package include those with a focus on preventing suicide from happening in the first place as well as approaches to lessen the immediate and long-term harms of suicidal behavior for individuals, families, communities, and society. The strategies in the technical package support the goals and objectives of the *National Strategy for Suicide Prevention*<sup>1</sup> and the National Action Alliance for Suicide Prevention's priority to strengthen community-based prevention.<sup>2</sup> Commitment, cooperation, and leadership from numerous sectors, including public health, education, justice, health care, social services, business, labor, and government can bring about the successful implementation of this package.

## What is a Technical Package?

A technical package is a compilation of a core set of strategies to achieve and sustain substantial reductions in a specific risk factor or outcome.<sup>3</sup> Technical packages help communities and states prioritize prevention activities based on the best available evidence. This technical package has three components. The first component is the **strategy** or the preventive direction or actions to achieve the goal of preventing suicide. The second component is the **approach**. The approach includes the specific ways to advance the strategy. This can be accomplished through *programs, policies, and practices*. The **evidence** for each of the approaches in preventing suicide or its associated risk factors is included as the third component. This package is intended as a resource to guide and inform prevention decision-making in communities and states.

## Preventing Suicide is a Priority

Suicide, as defined by the Centers for Disease Control and Prevention (CDC), is part of a broader class of behavior called *self-directed violence*. Self-directed violence refers to behavior directed at oneself that deliberately results in injury or the *potential* for injury.<sup>4</sup> Self-directed violence may be *suicidal* or *non-suicidal* in nature. For the purposes of this document, we refer only to behavior where suicide is intended:

- **Suicide** is a death caused by self-directed injurious behavior with any intent to die as a result of the behavior.
- **Suicide attempt** is defined as a *non-fatal* self-directed and potentially injurious behavior with any intent to die as a result of the behavior. A suicide attempt may or may not result in injury.

**Suicide is highly prevalent.** Suicide presents a major challenge to public health in the United States and worldwide. It contributes to premature death, morbidity, lost productivity, and health care costs.<sup>1,5</sup> In 2015 (the most recent year of available death data), suicide was responsible for 44,193 deaths in the U.S., which is approximately one suicide every 12 minutes.<sup>6</sup> In 2015, suicide ranked as the 10th leading cause of death and has been among the top 12 leading causes of death since 1975 in the U.S.<sup>7</sup> Overall suicide rates increased 28% from 2000 to 2015.<sup>6</sup> Suicide is a problem throughout the life span; it is the third leading cause of death for youth 10-14 years of age, the second leading cause of death among people 15-24 and 25-34 years of age; the fourth leading cause among people 35 to 44 years of age, the fifth leading cause among people ages 45-54 and eighth leading cause among people 55-64 years of age.<sup>6</sup>





Suicide rates vary by race/ethnicity, age, and other population characteristics, with the highest rates across the life span occurring among non-Hispanic American Indian/Alaska Native (AI/AN) and non-Hispanic White population groups. In 2015, the rates for these groups were 19.9 and 16.9 per 100,000 population, respectively.<sup>6</sup> Other population groups disproportionately impacted by suicide include middle-aged adults (whose rates increased 35% from 2000 to 2015, with steep increases seen among both males (29%) and females (53%) aged 35-64 years<sup>6</sup>; Veterans and other military personnel (whose suicide rate nearly doubled from 2003 to 2008, surpassing the rate of suicide among civilians for the first time in decades)<sup>8,9</sup>; workers in certain occupational groups,<sup>10,11</sup> and sexual minority youth, who experience increased suicidal ideation and behavior compared to their non-sexual minority peers.<sup>12-14</sup>

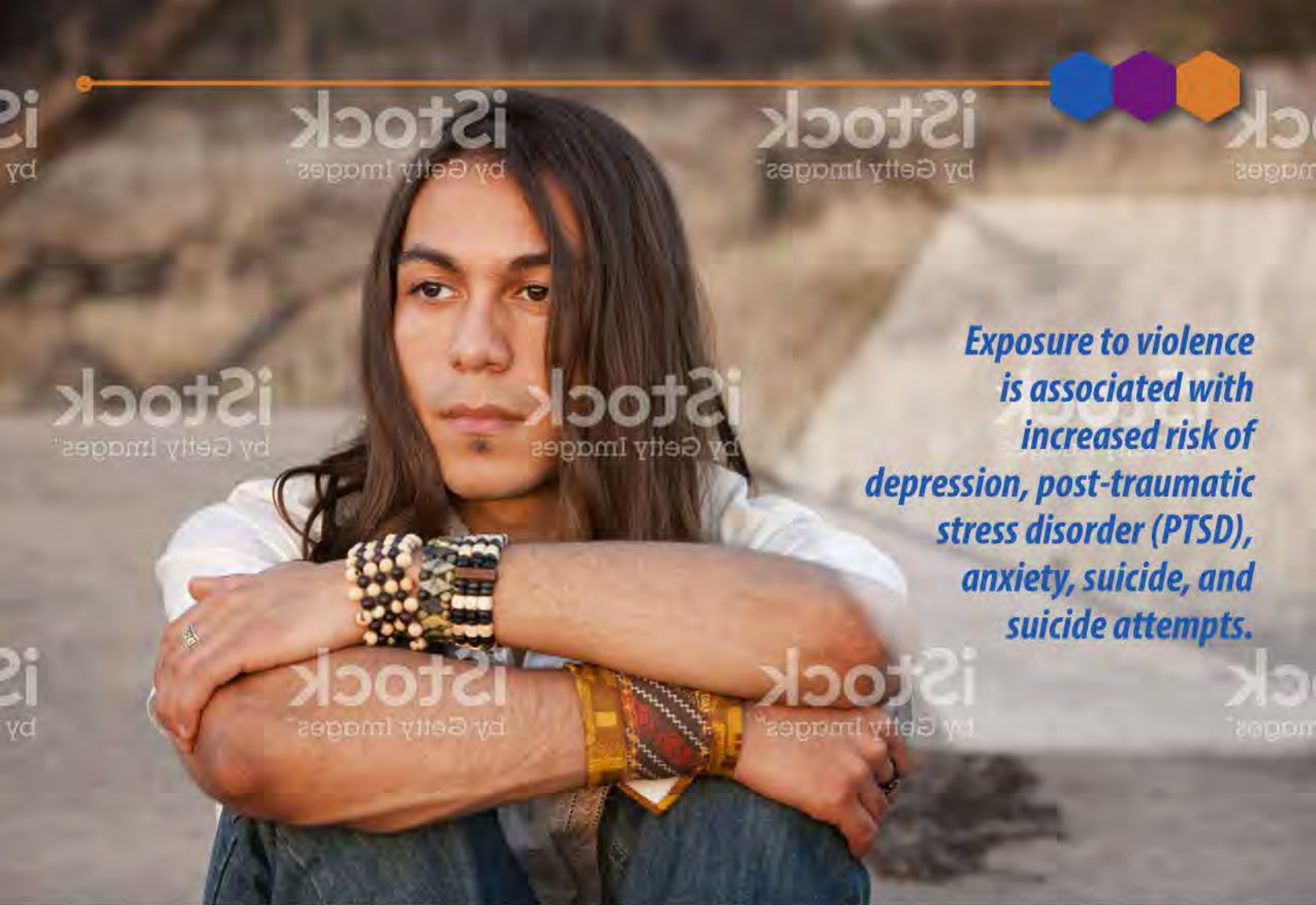
Suicides reflect only a portion of the problem.<sup>15</sup> Substantially more people are hospitalized as a result of nonfatal suicidal behavior (i.e. suicide attempts) than are fatally injured, and an even greater number are either treated in ambulatory settings (e.g., emergency departments) or not treated at all.<sup>15</sup> For example, during 2014, among adults aged 18 years and older, for every one suicide there were 9 adults treated in hospital emergency departments for self-harm injuries, 27 who reported making a suicide attempt, and over 227 who reported seriously considering suicide.<sup>6,16</sup>

**Suicide is associated with several risk and protective factors.** Suicide, like other human behaviors, has no single determining cause. Instead, suicide occurs in response to multiple biological, psychological, interpersonal, environmental and societal influences that interact with one another, often over time.<sup>1,5</sup> The social ecological model—encompassing multiple levels of focus from the individual, relationship, community, and societal—is a useful framework for viewing and understanding suicide risk and protective factors identified in the literature.<sup>17</sup> Risk and protective factors for suicide exist at each level. For example, risk factors include:

- **Individual level:** history of depression and other mental illnesses, hopelessness, substance abuse, certain health conditions, previous suicide attempt, violence victimization and perpetration, and genetic and biological determinants
- **Relationship level:** high conflict or violent relationships, sense of isolation and lack of social support, family/loved one's history of suicide, financial and work stress
- **Community level:** inadequate community connectedness, barriers to health care (e.g., lack of access to providers and medications)
- **Societal level:** availability of lethal means of suicide, unsafe media portrayals of suicide, stigma associated with help-seeking and mental illness.<sup>1,4</sup>

It is important to recognize that the vast majority of individuals who are depressed, attempt suicide, or have other risk factors, do *not* die by suicide.<sup>18,19</sup> Furthermore, the relevance of each risk factor can vary by age, race, gender, sexual orientation, residential geography, and socio-cultural and economic status.<sup>1,5</sup>





*Exposure to violence is associated with increased risk of depression, post-traumatic stress disorder (PTSD), anxiety, suicide, and suicide attempts.*

Protective factors, or those influences that buffer against the risk for suicide, can also be found across the different levels of the social ecological model. Protective factors identified in the literature include: effective coping and problem solving skills, moral objections to suicide, strong and supportive relationships with partners, friends, and family; connectedness to school, community, and other social institutions; availability of quality and ongoing physical and mental health care, and reduced access to lethal means.<sup>1,5</sup> These protective factors can either counter a specific risk factor or buffer against a number of risks associated with suicide.

**Suicide is connected to other forms of violence.** Exposure to violence (e.g., child abuse and neglect, bullying, peer violence, dating violence, sexual violence, and intimate partner violence) is associated with increased risk of depression, post-traumatic stress disorder (PTSD), anxiety, suicide, and suicide attempts.<sup>20-26</sup> Women exposed to partner violence are nearly 5 times more likely to attempt suicide as women not exposed to partner violence.<sup>26</sup> Exposure to adverse experiences in childhood, such as physical, sexual, emotional abuse and neglect, and living in homes with violence, mental health, substance abuse problems and other instability, is also associated with increased risk for suicide and suicide attempts.<sup>22,27</sup> The psychosocial effects of violence in childhood and adolescence can be observed decades later, including severe problems with finances, family, jobs, and stress – factors that can increase the risk for suicide. Suicide and other forms of violence often share the same individual, relationship, community, and societal risk factors suggesting that efforts to prevent interpersonal violence may also prove beneficial in preventing suicide.<sup>28-30</sup> Further, just as risk factors may be shared across suicide and interpersonal violence, so too may protective factors overlap. For example, connectedness to one's community,<sup>31</sup> school,<sup>32</sup> family,<sup>33</sup> caring adults,<sup>34,35</sup> and pro-social peers<sup>36</sup> can enhance resilience and help reduce risk for suicide and other forms of violence.





**The health and economic consequences of suicide are substantial.** Suicide and suicide attempts have far reaching consequences for individuals, families, and communities.<sup>37-40</sup> In an early study, Crosby and Sacks<sup>41</sup> estimated that 7% of the U.S. adult population, or 13.2 million adults, knew someone in the prior 12 months who had died by suicide. They also estimated that for each suicide, 425 adults were exposed, or knew about the death.<sup>41</sup> In a more recent study, in one state, Cerel et al<sup>42</sup> found that 48% of the population knew at least one person who died by suicide in their lifetime. Research indicates that the impact of knowing someone who died by suicide and/or having lived experience (i.e., personally have attempted suicide, have had suicidal thoughts, or have been impacted by suicidal loss) is much more extensive than injury and death. People with lived experience may suffer long-term health and mental health consequences ranging from anger, guilt, and physical impairment, depending on the means and severity of the attempt.<sup>43</sup> Similarly, survivors of a loved one's suicide may experience ongoing pain and suffering including complicated grief,<sup>44</sup> stigma, depression, anxiety, post-traumatic stress disorder, and increased risk of suicidal ideation and suicide.<sup>45,46</sup> Less discussed but no less important, are the financial and occupational effects on those left behind.<sup>47</sup>

The economic toll of suicide on society is immense as well. According to conservative estimates, in 2013, suicide cost \$50.8 billion in estimated lifetime medical and work-loss costs alone.<sup>47</sup> Adjusting for potential under-reporting of suicide and drawing upon health expenditures per capita, gross domestic product per capita, and variability among states in per capita health care expenditures and income, another study estimated the total lifetime costs associated with nonfatal injuries and deaths caused by self-directed violence to be approximately \$93.5 billion in 2013.<sup>48</sup> The overwhelming burden of these costs were from lost productivity over the life course, with the average cost per suicide being over \$1.3 million.<sup>48</sup> The true economic costs are likely higher, as neither study included monetary figures related to other societal costs such as those associated with the pain and suffering of family members or other impacts.

**Suicide can be prevented.** Like most public health problems, suicide is preventable.<sup>1,5</sup> While progress will continue to be made into the future, evidence for numerous programs, practices, and policies currently exists, and many programs are ready to be implemented now. Just as suicide is not caused by a single factor, research suggests that reductions in suicide will not be prevented by any single strategy or approach.<sup>1,49</sup> Rather, suicide prevention is best achieved by a focus across the individual, relationship, family, community, and societal-levels and across all sectors, private and public.<sup>1,5</sup>

## Assessing the Evidence

This technical package includes programs, practices, and policies with evidence of impact on suicide or risk or protective factors for suicide. To be considered for inclusion in the technical package, the program, practice, or policy selected had to meet at least one of these criteria: a) meta-analyses or systematic reviews showing impact on suicide; b) evidence from at least one rigorous (e.g., randomized controlled trial [RCT] or quasi-experimental design) evaluation study that found significant preventive effects on suicide; c) meta-analyses or systematic reviews showing impact on risk or protective factors for suicide, or d) evidence from at least one rigorous (e.g., RCT or quasi-experimental design) evaluation study that found significant impacts on risk or protective factors for suicide. Finally, consideration was also given to the likelihood of achieving beneficial effects on multiple forms of violence; no evidence of harmful effects on specific outcomes or with particular subgroups; and feasibility of implementation in a U.S. context if the program, policy, or practice has been evaluated in another country.





Within this technical package, some approaches do not yet have research evidence demonstrating impact on rates of suicide but instead are supported by evidence indicating impacts on risk or protective factors for suicide (e.g., help-seeking, stigma reduction, depression, connectedness). In terms of the strength of the evidence, programs that have demonstrated effects on suicidal behavior (e.g., reductions in deaths, attempts) provide a higher-level of evidence, but the evidence base is not that strong in all areas. For instance, there has been less evaluation of community engagement and family programs on suicidal behavior. Thus, approaches in this package that have effects on risk or protective factors reflect the developing nature of the evidence base and the use of the best available evidence at a given time.

It is also important to note that there is often significant heterogeneity among the programs, policies, or practices that fall within one approach or strategy in terms of the nature and quality of the available evidence. Not all programs, policies, or practices that utilize the same approach are equally effective, and even those that are effective may not work across all populations. Tailoring programs and conducting more evaluations may be necessary to address different population groups. The evidence-based programs, practices, or policies included in the package are not intended to be a comprehensive list for each approach, but rather to serve as examples that have been shown to impact suicide or have beneficial effects on risk or protective factors for suicide.

## Contextual and Cross-Cutting Themes

One important feature of the package is the complementary and potentially synergistic impact of the strategies and approaches. The strategies and approaches included in this technical package represent different levels of the social ecology, with efforts intended to impact community and societal levels, as well individual and relationship levels. The strategies and approaches are intended to work in combination and reinforce each other to prevent suicide (see box on page 12). The strategies are arranged in order such that those strategies hypothesized to have the greatest potential for broad public health impact on suicide are included first, followed by those that might impact subsets of the population (e.g., persons who have already made a suicide attempt).








***Like most  
public health  
problems,  
suicide is  
preventable.***





## Preventing Suicide

Strategy	Approach
<b>Strengthen economic supports</b> 	<ul style="list-style-type: none"> <li>• Strengthen household financial security</li> <li>• Housing stabilization policies</li> </ul>
<b>Strengthen access and delivery of suicide care</b>	<ul style="list-style-type: none"> <li>• Coverage of mental health conditions in health insurance policies</li> <li>• Reduce provider shortages in underserved areas</li> <li>• Safer suicide care through systems change</li> </ul>
<b>Create protective environments</b>	<ul style="list-style-type: none"> <li>• Preschool enrichment with family engagement </li> <li>• Improved quality of child care through licensing and accreditation</li> </ul>
<b>Promote connectedness</b>	<ul style="list-style-type: none"> <li>• Early childhood home visitation </li> <li>• Parenting skill and family relationship approaches</li> </ul>
<b>Teach coping and problem-solving skills</b>	<ul style="list-style-type: none"> <li>• Enhanced primary care </li> <li>• Behavioral parent training programs</li> <li>• Treatment to lessen harms of abuse and neglect exposure</li> <li>• Treatment to prevent problem behavior and later involvement in violence</li> </ul>
<b>Identify and support people at risk</b> 	<ul style="list-style-type: none"> <li>• Gatekeeper training</li> <li>• Crisis Intervention</li> <li>• Treatment for people at-risk of suicide</li> <li>• Treatment to prevent re-attempts</li> </ul>
<b>Lessen harms and prevent future risk</b>	<ul style="list-style-type: none"> <li>• Postvention</li> <li>• Safe reporting and messaging about suicide</li> </ul>

It is important to note that these strategies are not mutually exclusive but each has an immediate focus. For instance, social-emotional learning programs, an approach under the *Teach Coping and Problem-Solving Skills* strategy, sometimes include components to change peer norms and the broader environment. The primary focus of these programs, however, is to provide children and youth with skills to resolve problems in relationships, school, and with peers, and to help youth address other negative influences (e.g., substance use) associated with suicide.





The goal of this package is to stress the importance of comprehensive prevention efforts and to provide examples of effective programs addressing each level of the social ecology, with the knowledge that some programs, practices, and policies may impact multiple levels. Further, those that involve multiple sectors and that impact multiple levels of the social ecology are more likely to have a greater impact on the overall burden of suicide.

Suicide ideation, thoughts, attempts, and deaths vary by gender, race/ethnicity, age, occupation, and other important population characteristics.<sup>6,50</sup> Further, certain transition periods are also associated with higher rates of suicide (e.g., transition from working into retirement, transition from active duty military status to civilian status).<sup>48,51</sup> In fact, suicide risk can change along with dynamic risk factors. For example, individuals' coping skills may change during periods of crisis and heightened stress, limiting their normal ability to effectively solve problems and cope. Research indicates that suicide risk changes as a result of the number and intensity of key risk and protective factors experienced.<sup>52</sup> Ideally, the availability of multiple strategies and approaches tailored to the social, economic, cultural, and environmental context of individuals and communities are desirable as they may increase the likelihood of removing barriers to supportive and effective care and provide opportunities to develop individual and community resilience.<sup>1</sup>

Identifying programs, practices, and policies with evidence of impact on suicide, suicide attempts, or beneficial effects on risk or protective factors for suicide is only the first step. In practice, the effectiveness of the programs, policies and practices identified in this package will be strongly dependent on how well programs are implemented, as well as the partners and communities in which they are implemented. Practitioners in the field may be in the best position to assess the needs and strengths of their communities and work with community members to make decisions about the combination of approaches included here that are best suited to their context.

Data-driven strategic planning processes can help communities with this work.<sup>53-55</sup> These planning processes engage and guide community stakeholders through a prevention planning process designed to address a community's profile of risk and protective factors with evidence-based programs, practices, and policies. These processes can also be used to monitor implementation, track outcomes, and make adjustments as indicated by the data. The readiness of the program for broad dissemination and implementation (e.g., availability of program materials, training and technical assistance) can also influence program effects. Implementation guidance to assist practitioners, organizations and communities will be developed separately.

This package includes strategies where public health agencies are well positioned to bring leadership and resources to implementation efforts. It also includes strategies where public health can serve as an important collaborator (e.g., strategies addressing community and societal level risks), but where leadership and commitment from other sectors such as business, labor or health care is critical to implement a particular policy or program (e.g., workplace policies; treatment to prevent re-attempts). The role of various sectors in the implementation of a strategy or approach in preventing suicide is described further in the section on *Sector Involvement*.

In the sections that follow, the strategies and approaches with the best available evidence for preventing suicide are described.









# Strengthen Economic Supports for Families

## Rationale

Studies from the U.S. examining historical trends indicate that suicide rates increase during economic recessions marked by high unemployment rates, job losses, and economic instability and decrease during economic expansions and periods marked by low unemployment rates, particularly for working-age individuals 25 to 64 years old.<sup>56,57</sup> Economic and financial strain, such as job loss, long periods of unemployment, reduced income, difficulty covering medical, food, and housing expenses, and even the anticipation of such financial stress may increase an individual's risk for suicide or may indirectly increase risk by exacerbating related physical and mental health problems.<sup>58</sup> Buffering these risks can, therefore, potentially protect against suicide. For example, strengthening economic support systems can help people stay in their homes or obtain affordable housing while also paying for necessities such as food and medical care, job training, child care, among other expenses required for daily living. In providing this support, stress and anxiety and the potential for a crisis situation may be reduced, thereby preventing suicide. Although more research is needed to understand how economic factors interact with other factors to increase suicide risk, the available evidence suggests that strengthening economic supports may be one opportunity to buffer suicide risk.

## Approaches

Economic supports for individuals and families can be strengthened by targeting household financial security and ensuring stability in housing during periods of economic stress.

**Strengthening household financial security** can potentially buffer the risk of suicide by providing individuals with the financial means to lessen the stress and hardship associated with a job loss or other unanticipated financial problems. The provision of unemployment benefits and other forms of temporary assistance, livable wages, medical benefits, and retirement and disability insurance to help cover the cost of necessities or to offset costs in the event of disability, are examples of ways to strengthen household financial security.

**Housing stabilization policies** aim to keep people in their homes and provide housing options for those in need during times of financial insecurity. This may occur through programs that provide affordable housing such as through government subsidies or through other options available to potential homebuyers such as loan modification programs, move-out planning, or financial counseling services that help minimize the risk or impact of foreclosures and eviction.

## Potential Outcomes

- Reductions in foreclosure rates
- Reductions in eviction rates
- Reductions in emotional distress
- Reductions in rates of suicide





## Evidence

There is evidence suggesting that strengthening household financial security and stabilizing housing can reduce suicide risk.



**Strengthen household financial security.** The *Federal-State Unemployment Insurance Program* allows states to define the maximum amount and duration of unemployment benefits that workers are entitled to receive after a job loss.<sup>59</sup> An examination of variations in *unemployment benefit programs* across states demonstrated that the impact of unemployment on rates of suicide was offset in those states that provided greater than average unemployment benefits (mean level: \$7,990 per person in U.S. constant dollars). The effects of *unemployment benefit programs* were also consistent by sex and age group.<sup>59</sup> Another U.S. study examining the link between unemployment and suicide rates using monthly suicide data, length of unemployment (less than 5 weeks, 5-14 weeks, 15-26 weeks, and greater than 26 weeks), and job losses found that the duration of unemployment, as opposed to just the loss of job, predicted suicide risk.<sup>60</sup> Together, these results suggest that not only should state unemployment benefit programs be generous in their financial allocations, but also in their duration.

Other measures to strengthen household financial security (e.g., transfer payments related to retirement and disability insurance, unemployment insurance compensation, medical benefits, and other forms of family assistance) have also shown an impact on rates of suicide. A study by Flavin and Radcliff<sup>61</sup> examined the impact of states' per capita spending on transfer payments, medical benefits, and family assistance (Temporary Assistance to Needy Families – TANF) and total state spending on suicide rates between 1990-2000, controlling for a number of suicide risk factors (e.g., residential mobility, divorce rate, unemployment rate) at the state level. As per capita spending on total transfer payments, medical benefits, and family assistance increased there was an associated decrease in state suicide rates. In terms of lives saved, Flavin and Radcliff calculated the cost of reducing a state's suicide rate by a full point for the years studied.<sup>61</sup> At the national level, they estimated 3,000 fewer suicides would occur per year nationwide if every state increased its per capita spending on these types of





***Evidence suggests that strengthening household financial security and stabilizing housing can reduce suicide risk.***

assistance by \$45 per year.<sup>61</sup> Although this was a correlational study, the results demonstrate the potential benefits of policies that reach particularly vulnerable individuals during periods of great need. More evaluation studies are needed to further understand the outcomes impacted by programs such as these.

**Housing stabilization policies.** The *Neighborhood Stabilization Program*<sup>62</sup> was designed to help neighborhoods suffering from high rates of foreclosure and abandonment by slowing the deterioration of the neighborhoods and providing affordable housing options for low, moderate, and middle-income homebuyers. This program also offers financial assistance to eligible individuals for the purchase of a new home. Although this program has not been rigorously evaluated for its impact on suicide outcomes, it addresses foreclosure and eviction, which are risk factors for suicide. A longitudinal analysis of annual data on suicides and foreclosures demonstrated that as the proportion of foreclosed properties increased in U.S. states, so did the state suicide rate, particularly among working-aged adults.<sup>63</sup> Another study of data from 16 U.S. states participating in the *National Violent Death Reporting System* found that suicides precipitated by home foreclosures and evictions increased more than 100% from 2005 (before the housing crisis began) to 2010 (after it had peaked).<sup>57</sup> Most of these suicides occurred prior to the actual loss of the decedent's home. These findings suggest that integrating suicide prevention resources, messaging, and referrals into financial, foreclosure, and move-out planning and counseling services may help to prevent suicide.









# Strengthen Access and Delivery of Suicide Care

## Rationale

While most people with mental health problems do not attempt or die by suicide<sup>18,19</sup> and the level of risk conferred by different types of mental illness varies,<sup>64-66</sup> previous research indicates that mental illness is an important risk factor for suicide.<sup>5,67</sup> State-level suicide rates have also been found to be correlated with general mental health measures such as depression.<sup>68,69</sup> Findings from the *National Comorbidity Survey* indicate that relatively few people in the U.S. with mental health disorders receive treatment for those conditions.<sup>70</sup> Lack of access to mental health care is one of the contributing factors related to the underuse of mental health services.<sup>71</sup> Identifying ways to improve access to timely, affordable, and quality mental health and suicide care for people in need is a critical component to prevention.<sup>5</sup> Additionally, research suggests that services provided are maximized when health and behavioral health care systems are set up to effectively and efficiently deliver such care.<sup>72</sup> Apart from treatment benefits, these approaches can also normalize help-seeking behavior and increase the use of such services.

## Approaches

There are a number of approaches that can be used to strengthen access and delivery of suicide care, including:

**Coverage of mental health conditions in health insurance policies.** Federal and state laws include provisions for equal coverage of mental health services in health insurance plans that is on par with coverage for other health concerns (i.e., mental health parity).<sup>73</sup> Benefits and services covered include such things as the number of visits, co-pays, deductibles, inpatient/outpatient services, prescription drugs, and hospitalizations. If a state has a stronger mental health parity law than the federal parity law, then insurance plans regulated by the state must follow the state parity law. If a state has a weaker parity law than the federal parity law (e.g., includes coverage for some mental health conditions but not others), then the federal parity law will replace the state law. Equal coverage does not necessarily imply good coverage as health insurance plans vary in the extent to which benefits and services are offered to address various health conditions. Rather it helps to ensure that mental health services are covered on par with other health concerns.

**Reduce provider shortages in underserved areas.** Access to effective and state-of-the-art mental health care is largely dependent upon the training and the size of the mental health care workforce. Over 85 million Americans live in areas with an insufficient number of mental health providers; this shortage is particularly severe among low-income urban and rural communities.<sup>74</sup> There are various ways to increase the number and distribution of practicing mental health providers in underserved areas including offering financial incentives through existing state and federal programs (e.g., loan repayment programs) and expanding the reach of health services through telephone, video and web-based technologies. Such approaches can increase the likelihood that those in need will be able to access affordable, quality care for mental health problems, which can reduce risk for suicide.





**Safer suicide care through systems change.** Access to health and behavioral health care services is critical for people at risk of suicide; however this is just one piece of the puzzle. Care should also be delivered efficiently and effectively. More specifically, care should take place within a system that supports suicide prevention and patient safety through strong leadership, workforce training, systematic identification and assessment of suicide risk, implementation of evidence-based treatments (see *Identify and Support People At-Risk*), continuity of care, and continuous quality improvement. Care that is patient-centered and promotes equity for all patients is also of critical importance.<sup>75</sup>

## Potential Outcomes

- Increased use of mental health services
- Lower rates of treatment attrition
- Reductions in depressive symptoms
- Reductions in rates of suicide attempts
- Reductions in rates of suicide

## Evidence

There is evidence suggesting that coverage of mental health conditions in health insurance policies and improving access and the delivery of care can reduce risk factors associated with suicide and may directly impact suicide rates.

**Coverage of mental health conditions in health insurance policies.** The *National Survey on Drug Use and Health (NSDUH)* is a nationally representative survey of the U.S. population that provides data on substance use, mental health conditions, and service utilization.<sup>50</sup> Using data from this survey, Harris, Carpenter, and Bao<sup>76</sup> found that 12 months after states enacted *mental health parity laws*, self-reported use of mental healthcare services significantly increased. Moreover, subsequent research by Lang<sup>77</sup> examined state mental health laws and suicide rates between 1990 and 2004 and found that mental health parity laws, specifically, were associated with an approximate 5% reduction in suicide rates. This reduction, in the 29 states with parity laws, equated to the prevention of 592 suicides per year.<sup>69</sup>

**Reduce provider shortages in underserved areas.** One example of a program to improve access to mental health care providers is the *National Health Service Corps (NHSC)*, which offers financial incentives to attract mental/behavioral health clinicians to underserved areas.<sup>77</sup> Programs such as *NHSC* encourage individuals to work in the mental health profession in locations designated as Health Professional Shortage Areas (HPSAs) in exchange for student loan debt repayment. A 2012 retention survey conducted by the Health Resources and Services Administration (HRSA), found that 61% of mental and behavioral health care providers continued to practice in designated mental health shortage areas after their four year commitment to the *NHSC*.<sup>78</sup> Although this program has not been evaluated for impact on suicide, it addresses access to care, which is a critical component to suicide prevention.

*Telemental Health (TMH)* services refer to the use of telephone, video and web-based technologies for providing psychiatric or psychological care at a distance.<sup>79</sup> *TMH* can be used in a variety of settings (e.g. outpatient clinics, hospitals, military treatment facilities) to treat a wide range of mental health conditions. It can also improve access to care for patients in isolated areas, as well as reduce travel time and expenses, reduce delays in receiving care, and improve satisfaction interacting with the mental health care system. A systematic review of *TMH* services found that services rated as high or good quality were effective in treating mental health conditions such as depression, schizophrenia, substance





**Access to health  
and behavioral  
health care services  
is critical for  
people at risk  
of suicide.**

abuse, and suicidal ideation and suicide.<sup>79</sup> Further, Mohr and colleagues<sup>80</sup> conducted a meta-analysis examining the effect of psychotherapy delivered specifically via telephone and found that it significantly reduced depressive symptoms in comparison to face-to-face psychotherapy. They also found that treatment attrition rates were significantly lower among patients receiving telephone-administered psychotherapy compared to patients receiving face-to-face therapy.<sup>80</sup> Thus, TMH may not only offer improved access to mental health care, but it may also ensure continuity of care, and thereby further reduce the risk for suicide.

**Safer suicide care through systems change.** Henry Ford Health System, which is a large health maintenance organization (HMO) in the state of Michigan, pioneered *Perfect Depression Care*,<sup>81</sup> the pre-cursor to what is now called *Zero Suicide*. The overall goal of *Perfect Depression Care* was to eliminate suicide among HMO members. More broadly, the goal of the program was to redesign delivery of depression care to achieve “breakthrough improvement” in quality and safety by focusing on effectiveness, safety, patient centeredness, timeliness, efficiency, and equity among patients. The program screened and assessed each patient for suicide risk and implemented coordinated continuous follow-up care system wide.<sup>81</sup> An examination of the impact of the program found that there was a dramatic and statistically significant decrease in the rate of suicide between the baseline years, 1999 and 2000, ~~prior to the intervention to~~ the intervention years, 2002-2009. During this time period, the suicide rate fell by 82%.<sup>81,82</sup> Further, among HMO members who received mental health specialty services, the suicide rate significantly decreased over time from 1999 to 2010 (110.3 to 47.6 per 100,000 population;  $p < .04$ ) with a mean of 36.2 per 100,000 over the period. Additionally, for those HMO members who accessed only general medical services as opposed to specialty mental health services, the suicide rate increased from 2.7 to 5.6 per 100,000 ( $p < .01$ ).<sup>82</sup> Similarly, in the state of Michigan, rates of suicide in the general population increased over the period from 9.8 to 12.5 per 100,000 ( $p < .001$ ).<sup>83</sup>









# Create Protective Environments

## Rationale

Prevention efforts that focus not only on individual behavior change (e.g., help-seeking, treatment interventions) but on changes to the environment can increase the likelihood of positive behavioral and health outcomes.<sup>84</sup> Creating environments that address risk and protective factors where individuals live, work, and play can help prevent suicide.<sup>1,17</sup> For example, rates of suicide are high among middle-aged adults who comprise 42.6% of the workforce<sup>85</sup>; among certain occupational groups<sup>10,11</sup>; and among people in detention facilities (e.g. jail, prison),<sup>86</sup> to name a few. Thus, settings where these populations work and reside are ideal for implementing programs, practices and policies to buffer against suicide. Changes to organizational culture through the implementation of supportive policies, for instance, can change social norms, encourage help-seeking, and demonstrate that good health and mental health are valued and that stigma and other risk factors for suicide are not.<sup>87,88</sup> Similarly, modifying the characteristics of the physical environment to prevent harmful behavior such as access to lethal means can reduce suicide rates, particularly in times of crisis or transition.<sup>89-94</sup>

## Approaches

The current evidence suggests three potential approaches for creating environments that protect against suicide.

**Reduce access to lethal means among persons at-risk of suicide.** Means of suicide such as firearms, hanging/suffocation, or jumping from heights provide little opportunity for rescue and, as such, have high case fatality rates (e.g., about 85% of people who use a firearm in a suicide attempt will die from the injury).<sup>95</sup> Research also indicates that: 1) the interval between deciding to act and attempting suicide can be as short as 5 or 10 minutes,<sup>96,97</sup> and 2) people tend *not* to substitute a different method when a highly lethal method is unavailable or difficult to access.<sup>98,99</sup> Therefore, increasing the time interval between deciding to act and the suicide attempt, for example, by making it more difficult to access lethal means, can be lifesaving. The following are examples of approaches reducing access to lethal means for persons at-risk of suicide:

- *Intervening at Suicide Hotspots.* Suicide hotspots, or places where suicides may take place relatively easily, include tall structures (e.g., bridges, cliffs, balconies, and rooftops), railway tracks, and isolated locations such as parks. Efforts to prevent suicide at these locations include erecting barriers or limiting access to prevent jumping, and installing signs and telephones to encourage individuals who are considering suicide, to seek help.<sup>100</sup>
- *Safe Storage Practices.* Safe storage of medications, firearms, and other household products can reduce the risk for suicide by separating vulnerable individuals from easy access to lethal means. Such practices may include education and counseling around storing firearms locked in a secure place (e.g., in a gun safe or lock box), unloaded and separate from the ammunition; and keeping medicines in a locked cabinet or other secure location away from people who may be at risk or who have made prior attempts.<sup>89,101</sup>

**Organizational policies and culture** that promote protective environments may be implemented in places of employment, detention facilities, and other secured environments (e.g. residential settings). Such policies and cultural values encourage leadership from the top down and may promote prosocial behavior (e.g., asking for help), skill building, positive social norms, assessment, referral and access to helping services (e.g., mental health, substance abuse treatment, financial counseling), and development of crisis response plans, postvention and other measures to foster a safe physical environment. Such policies and cultural shifts can positively impact organizational climate and morale and help prevent suicide and its related risk factors (e.g. depression, social isolation).<sup>88,102</sup>





**Community-based policies to reduce excessive alcohol use.** Research studies in the United States have found that greater alcohol availability is positively associated with alcohol-involved suicides.<sup>103-105</sup> Policies to reduce excessive alcohol use broadly include zoning to limit alcohol outlet locations and density, taxes on alcohol, and bans on the sale of alcohol for individuals under the legal drinking age.<sup>105</sup> These policies are important because acute alcohol use has been found to be associated with more than one-third of suicides and approximately 40% of suicide attempts.<sup>106</sup>

## Potential Outcomes

- Increases in safe storage of lethal means
- Reductions in rates of suicide
- Reductions in suicide attempts
- Increases in help-seeking
- Reductions in alcohol-related suicide deaths

## Evidence

The evidence suggests that creating protective environments can reduce suicide and suicide attempts and increase protective behaviors.

**Reduce access to lethal means among persons at-risk of suicide.** A meta-analysis examining the impact of *suicide hotspot interventions* implemented in combination or in isolation, both in the U.S. and abroad, found associated reduced rates of suicide.<sup>100,107</sup> For example, after erecting a barrier on the Jacques-Cartier bridge in Canada, the suicide rate from jumping from the bridge decreased from about 10 suicide deaths per year to about 3 deaths per year.<sup>108</sup> Moreover, the reduction in suicides by jumping was sustained even when all bridges and nearby jumping sites were considered, suggesting little to no displacement of suicides to other jumping sites.<sup>108</sup> Further evidence for the effectiveness of bridge barriers was demonstrated by a study examining the impact of the *removal* of safety barriers from the Grafton Bridge in Auckland, New Zealand. After removal of the barrier, both the number and rate of suicide increased five-fold.<sup>93,109</sup>

Another form of means reduction involves implementation of *safe storage practices*. In a case-control study of firearm-related events identified from 37 counties in Washington, Oregon, and Missouri, and from 5 trauma centers, researchers found that storing firearms unloaded, separate from ammunition, in a locked place or secured with a safety device was protective of suicide attempts among adolescents.<sup>110</sup> Further, a recent systematic review of clinic and community-based education and counseling interventions suggested that the provision of safety devices significantly increased safe firearm storage practices compared to counseling alone or compared to the provision of economic incentives to acquire safety devices on one's own.<sup>101</sup>







Another program, the *Emergency Department Counseling on Access to Lethal Means (ED CALM)*, trained psychiatric emergency clinicians in a large children's hospital to provide lethal means counseling and safe storage boxes to parents of patients under age 18 receiving care for suicidal behavior. In a pre-post quality improvement project, Runyan et al<sup>89</sup> found that at post-test 76% (of the 55% of parents followed up, n=114) reported that all medications in the home were locked up as compared to fewer than 10% at the time of the initial emergency department visit. Among parents who indicated the presence of guns in the home at pre-test (i.e., 67%), all (100%) reported guns were currently locked up at post-test.<sup>89</sup>

**Organizational policies and culture.** *Together for Life* is a workplace program of the Montreal Police Force implemented to address suicide among officers. Policy and program components were designed to foster an organizational culture that promoted mutual support and solidarity among all members of the Force. The program included training of supervisors, managers and all units to improve competencies in identifying suicidal risk and to improve use and awareness of existing resources. The program also included an education campaign to improve awareness and help-seeking.<sup>111</sup> Police suicides were tracked over 12 years and compared to rates in the control city of Quebec. The suicide rate in the intervention group decreased significantly by 78.9% to a rate of 6.4 suicides per 100,000 population per year compared to an 11% increase in the control city (29.0 per 100,000).<sup>111</sup>

Another example of this approach is the *United States Air Force Suicide Prevention Program*. The program included 11 policy and education initiatives and was designed to change the culture of the Air Force surrounding suicide. The program uses leaders as role models and agents of change, establishes expectations for behavior related to awareness of suicide risk, develops population skills and knowledge (i.e., education and training), and investigates every suicide (i.e., outcomes measurement). The program represents a fundamental shift from viewing suicide and mental illness solely as medical problems and instead sees them as larger service-wide problems impacting the whole community.<sup>112</sup> Using a time-series design to examine the impact of the program on various violence-related outcomes, researchers found that the program was associated with a 33% relative risk reduction in suicide.<sup>112</sup> The program was also associated with relative risk reductions in related outcomes including moderate and severe family violence (30% and 54%, respectively), homicide (51%), and accidental death (18%).<sup>112</sup> A longitudinal assessment of the program over the period 1981 to 2008 (16 years before the 1997 launch of the program and 11 years post-launch) found significantly lower rates of suicide after the program was launched than before.<sup>87</sup> These effects were sustained over time, except in 2004, which the authors found was associated with less rigorous implementation of program components in that year than in the other years.<sup>87</sup>

Finally, while the evidence is still being built for suicide prevention in correctional facilities, preliminary evidence suggests organizational policies and practices that include routine suicide prevention training for all staff; standardized intake screening and risk assessment; provision of shared information between staff members (especially in transitioning or transferring of inmates); varying levels of observation; safe physical environment; emergency response protocols; notification of suicidal behavior/suicide through the chain of command; and critical incident stress debriefing and death review can potentially reduce suicide.<sup>102</sup> When these policies and practices were implemented across 11 state prisons in Louisiana, suicide rates dropped 46%, from a rate of 23.1 per 100,000 before the intervention to 12.4 per 100,000 the following year.<sup>113</sup> Other similar programs have seen declines in suicide both in the United States and internationally.<sup>114</sup>

**Community-based policies to reduce excessive alcohol use.** While multiple policies to limit excessive use of alcohol exist, several studies on alcohol outlet density and risk factors for suicide, such as interpersonal violence and social connectedness,<sup>115-118</sup> suggest that measures to reduce alcohol outlet density can potentially reduce alcohol-involved suicides. Additionally, a longitudinal analysis of alcohol outlet density, suicide mortality, and hospitalizations for suicide attempts over 6 years in 581 California zip codes indicated that greater density of bars, specifically, is related to greater suicide and suicide attempts, particularly in rural areas.<sup>119</sup>









# Promote Connectedness

## Rationale

Sociologist, Emile Durkheim theorized in 1897 that weak social bonds, i.e., lack of connectedness, are among the chief causes for suicidality.<sup>120</sup> Connectedness is the degree to which an individual or group of individuals are socially close, interrelated, or share resources with others.<sup>121</sup> Social connections can be formed within and between multiple levels of the social ecology,<sup>17</sup> for instance between individuals (e.g., peers, neighbors, co-workers), families, schools, neighborhoods, workplaces, faith communities, cultural groups, and society as a whole. Related to connectedness, social capital refers to a sense of trust in one's community and neighborhood, social integration, and also the availability and participation in social organizations.<sup>122,123</sup> Many ecological cross-sectional and longitudinal studies have examined the impact of aspects of social capital on depression symptoms, depressive disorder, mental health more generally, and suicide. While the evidence is limited, existing studies suggest a positive association between social capital (as measured by social trust and community/neighborhood engagement), and improved mental health.<sup>124,125</sup> Connectedness and social capital together may protect against suicidal behaviors by decreasing isolation, encouraging adaptive coping behaviors, and by increasing belongingness, personal value, and worth, to help build resilience in the face of adversity. Connectedness can also provide individuals with better access to formal supports and resources, mobilize communities to meet the needs of its members and provide collective primary prevention activities to the community as a whole.<sup>121</sup>

## Approaches

Promoting connectedness among individuals and within communities through modeling peer norms and enhancing community engagement may protect against suicide.

**Peer norm programs** seek to normalize protective factors for suicide such as help-seeking, reaching out and talking to trusted adults, and promote peer connectedness. By leveraging the leadership qualities and social influence of peers, these approaches can be used to shift group-level beliefs and promote positive social and behavioral change. These approaches typically target youth and are delivered in school settings but can also be implemented in community settings.<sup>126</sup>

**Community engagement activities.** Community engagement is an aspect of social capital.<sup>127</sup> Community engagement approaches may involve residents participating in a range of activities, including religious activities, community clean-up and greening activities, and physical exercise. These activities provide opportunities for residents to become more involved in the community and to connect with other community members, organizations, and resources, resulting in enhanced overall physical health, reduced stress, and decreased depressive symptoms, thereby reducing risk of suicide.





## Potential Outcomes

- Potential Outcomes
- Increases in healthy coping attitudes and behaviors
- Increases in referrals for youth in distress
- Increases in help-seeking behaviors
- Increases in positive perceptions of adult support



***Promoting  
connectedness  
among individuals  
and within  
communities may  
protect against  
suicide.***



## Evidence

Current evidence suggests a number of positive benefits of peer norm and community engagement activities, although more evaluation research is needed to examine whether these improvements in factors that protect against suicidal behavior translate into reduced suicide attempts and deaths.

**Peer norm programs.** Evaluations show that programs such as *Sources of Strength* can improve school norms and beliefs about suicide that are created and disseminated by student peers. In a randomized controlled trial of *Sources of Strength* conducted with 18 high-schools (6 metropolitan, 12 rural), researchers found that the program improved adaptive norms regarding suicide, connectedness to adults, and school engagement.<sup>36</sup> Peer leaders were also more likely than controls to refer a suicidal friend to an adult. For students, the program resulted in increased perceptions of adult support for suicidal youths, particularly among those with a history of suicidal ideation, and the acceptability of help-seeking behaviors. Finally, trained peer leaders also reported a greater decrease in maladaptive coping attitudes compared with untrained leaders.<sup>36</sup>

**Community engagement activities.** A vacant lot greening initiative was undertaken in Philadelphia between 1999 and 2008. Local residents and community members worked together to green 4,436 lots (or 7.8 million square feet) in 4 areas of the city. Researchers found significant reductions in community residents' self-reported level of stress, which is a risk factor for suicide, and engagement in more physical exercise, a protective factor for suicide, than residents in control vacant lot areas. There is some evidence for other cross-cutting benefits, including reductions in firearm assaults and vandalism.<sup>128,129</sup>











# Teach Coping and Problem-Solving Skills

## Rationale

Building life skills prepares individuals to successfully tackle every day challenges and adapt to stress and adversity. Life skills encompasses many concepts, but most often include coping and problem-solving skills, emotional regulation, conflict resolution, and critical thinking. Life skills are important in shielding individuals from suicidal behaviors.<sup>126</sup> Suicide prevention programs that focus on life and social skills training are drawn from social cognitive theories,<sup>130</sup> surmising that suicidal behavior is attributed to either direct learning and modeling or environmental and individual (e.g. hopelessness) characteristics. The inability to employ adequate strategies to cope with immediate stressors or identify and find solutions for problems has been characterized among suicide attempters.<sup>131</sup> Teaching and providing youth with the skills to tackle every day challenges and stressors is, therefore, an important developmental component to suicide prevention.

## Approaches

Social-emotional learning programs and parenting skill and family relationship programs are two approaches for teaching coping and problem-solving skills.

**Social-emotional learning programs** focus on developing and strengthening communication and problem-solving skills, emotion regulation, conflict resolution, help seeking and coping skills. These approaches address a range of risk and protective factors for suicidal behavior. They provide children and youth with skills to resolve problems in relationships, school, and with peers, and help youth to address other negative influences (e.g., substance use) associated with suicide.<sup>126</sup> These approaches are typically delivered to all students in a particular grade or school, although some programs also focus on groups of students considered to be at high risk for suicide. Opportunities to practice and reinforce skills are an important part of programs that work.<sup>132</sup>

**Parenting skill and family relationship programs** provide caregivers with support and are designed to strengthen parenting skills, enhance positive parent-child interactions, and improve children's behavioral and emotional skills and abilities.<sup>132</sup> Programs are typically designed for parents or caregivers with children in a specific age range and can be self-directed or delivered to individual families or groups of families. Some programs have sessions primarily with parents or caregivers while others include sessions for parents or caregivers, youth, and the family. Specific program content typically varies by the age of the child but often has consistent themes of child development, parent-child communication and relationships, and youth's interpersonal and problem-solving skills.





## Potential Outcomes

- Reductions in suicide ideation
- Reductions in suicide attempts
- Reductions in suicide risk behaviors (i.e., depression, anxiety, conduct problems, substance abuse)
- Improvements in help-seeking behavior
- Improvements in social competence and emotional regulation skills
- Improvements in problem-solving and conflict management skills

## Evidence

Several social-emotional learning and parenting and family relationship programs have been shown in rigorous evaluations to improve resilience and reduce problem behavior and risk factors for various behaviors, including ones closely related to suicide, such as depression, internalizing behaviors, and substance abuse.<sup>133</sup>

**Social-emotional learning programs.** The *Youth Aware of Mental Health Program (YAM)* is a program developed for teenagers aged 14-16 that uses interactive dialogue and role-playing to teach adolescents about the risk and protective factors associated with suicide (including knowledge about depression and anxiety) and enhances their problem-solving skills for dealing with adverse life events, stress, school and other problems.<sup>134</sup> In a cluster-randomized controlled trial conducted across 10 European Union countries and 168 schools, students in schools randomized to *YAM* were significantly less likely to attempt suicide and have severe suicidal ideation at the 12-month follow-up compared to students in control schools which received educational materials and care as usual. Overall, the relative risk of youth suicide attempts among the *YAM* group was reduced by over 50% demonstrating that out of 1000 students, five attempted suicide in the *YAM* group compared to 11 in the control group. Additionally, related to severe suicide ideation, in the *YAM* group, relative risk fell by 49.6%.<sup>134</sup>

Another example is the *Good Behavior Game (GBG)*, which is a classroom-based program for elementary school children aged 6-10. The program uses a team-based behavior management strategy that promotes good behavior by setting clear expectations for good behavior and consequences for maladaptive behavior. The goal of the *GBG* program is to create an integrated classroom social system that is supportive of all children being able to learn with little aggressive or disruptive behavior.<sup>135</sup> Two cohorts of youths participated in the program in 1985-86 and 1986-87 school years when they were in the first and second grades. A number of proximal and distal outcomes were assessed among the two cohorts over time. With respect to distal suicide-related outcomes, an outcome evaluation of the *GBG* indicated that individuals in the first cohort who were assigned to participate in *GBG* when they were in the first grade reported half the adjusted odds of suicidal ideation and suicide attempts when assessed approximately 15 years later, between the ages of 19 to 21, compared to peers who had been in a standard classroom setting. The beneficial effect of the program was consistent for suicidal ideation regardless of whether baseline covariates were included.<sup>135</sup> The *GBG* effect on attempts was less robust in some adjusted models including caregiver mental health. In the second cohort of *GBG* students, neither suicidal ideation nor suicide attempts were significantly different between *GBG* and the control interventions.<sup>135</sup> The researchers believed this may have been due to a lack of implementation fidelity, including less mentoring and monitoring of teachers. *GBG* was also found to be associated with reduced risk of later substance abuse and other suicide risk factors among the first cohort of students. Results for the second cohort were generally smaller but in the desired direction.<sup>136</sup>





**Parenting skill and family relationship programs.** Parenting and family skills training approaches have shown promising impacts in preventing key risk factors associated with suicide. For example, the *Incredible Years (IY)* is a comprehensive group training program for parents, teachers and children designed to reduce conduct and substance abuse problems, two important suicide risk factors in youth by improving protective factors such as responsive and positive parent-teacher-child interactions and relationships, emotion self-regulation and social competence (all protective factors for suicide).<sup>132</sup> The program includes 9-20 sessions offered in community-based settings (e.g., religious, recreation centers, mental health treatment centers, and hospitals). Several studies have demonstrated the effect of the *IY* program on reducing internalizing symptoms, such as anxiety and depression, and child conduct problems.<sup>137,138</sup> The program is also associated with improved problem-solving and conflict management; these skills were maintained at 1-year follow-up.<sup>139-141</sup> Additionally, the program demonstrated greater benefits in mother-rated child internalizing symptoms, compared to the waitlisted control group, when parent, child, and teacher components were included.<sup>132</sup>

Additionally, *Strengthening Families 10–14* is a program that involves sessions for parents, youth, and families with the goal of improving parents' skills for disciplining, managing emotions and conflict, and communicating with their children; promoting youths' interpersonal and problem-solving skills; and creating family activities to build cohesion and positive parent-child interactions. The premise of the program is that developing these skills for both parents and children will reduce internalizing behavior and adolescent substance abuse, two important risk factors for suicide.<sup>142</sup> *Strengthening Families* has been shown to significantly decrease externalizing behaviors, such as aggression, alcohol use, and drug use among youth participants, as well as reduce depression, alcohol use, and drug use among participating families.<sup>142</sup>



**Parenting and family skills training approaches have shown promising impacts in preventing key risk factors associated with suicide.**









# Identify and Support People At-Risk

## Rationale

In order to decrease suicide, care of, and attention to, vulnerable populations is necessary, as these groups tend to experience suicidal behavior at higher than average rates. Such vulnerable populations include, but are not limited to, individuals with lower socio-economic status or who are living with a mental health problem; people who have previously attempted suicide; Veterans and active duty military personnel; individuals who are institutionalized, have been victims of violence, or are homeless; individuals of sexual minority status; and members of certain racial and ethnic minority groups.<sup>8,9,12,13,143</sup> Supporting people at-risk requires proactive case finding and effective response, crisis intervention, and evidence-based treatment. Finding optimal ways of identifying at-risk individuals, customizing services to make them more accessible (e.g., Internet-based services when appropriate) and engaging people in evidence-based care (e.g., through such measures as collaborative treatment), remain key challenges.<sup>81,144,145</sup> Simply improving or expanding services does not guarantee that those services will be used by people most in need, nor will it necessarily increase the number of people who follow recommended referrals or treatment. For example, some people living in disadvantaged communities may face social and economic issues that can adversely affect their ability to access supportive services.<sup>70</sup>

## Approaches

The following approaches focus on identifying and supporting people at increased risk of suicide.

**Gatekeeper training** is designed to train teachers, coaches, clergy, emergency responders, primary and urgent care providers, and others in the community to identify people who may be at risk of suicide and to respond effectively, including facilitating treatment seeking and support services. Gatekeeper training may be implemented in a variety of settings to identify and support people at risk.<sup>146</sup>

**Crisis intervention.** These approaches provide support and referral services, typically by connecting a person in crisis (or a friend or family member of someone at-risk) to trained volunteers or professional staff via telephone hotline, online chat, text messaging, or in-person. Crisis intervention approaches are intended to impact key risk factors for suicide, including feelings of depression, hopelessness, and subsequent mental health care utilization.<sup>147</sup> Similar to means reduction, crisis interventions can put space or time between an individual who may be considering suicide and harmful behavior.

**Treatment for people at-risk of suicide** can include various forms of psychotherapy delivered by licensed providers to help individuals with mental health problems and other suicide risk factors with problem-solving and emotion regulation. Treatment usually takes place in a one-on-one or group format between patients and clinicians and can vary in duration from several weeks to ongoing therapy, as needed. Treatment that employs collaborative (i.e., between patient and therapist or care manager) and/or integrated care (e.g., linkage between primary care and behavioral health care) can help engage and motivate patients, thereby increasing retention in therapy and decreasing suicide risk.<sup>148-150</sup>





**Treatment to prevent re-attempts.** These approaches typically include follow-up contact and use diverse modalities (e.g., home visits, mail, telephone, e-mail) to engage recent suicide attempt survivors in continued treatment to prevent re-attempts.<sup>151</sup> Treatment may focus on improved coping skills, mindfulness, and other emotional regulation skills, and may include case management home visits to increase adherence to treatment and continuity of care; and one-on-one interpersonal therapy and/or group therapy. Approaches that engage and connect **attempters** to peers and providers are especially important because many attempters do not present to aftercare; 12%-25% **reattempt** within a year, and 3%-9% of attempt survivors die by suicide within 1 to 5 years of their initial attempt.<sup>151</sup>

## Potential Outcomes

- Reductions in suicidal ideation
- Reductions in suicide attempts
- Reductions in suicide rates
- Reductions in depression and feelings of hopelessness
- Reductions in **re-attempts**
- Improvements in coping skills
- Increases in treatment engagement and compliance with medications

## Evidence

The current evidence suggests that identifying people at risk of suicide and the continued provision of treatment and support for these individuals can positively impact suicide and its associated risk factors.

**Gatekeeper training.** *Applied Suicide Intervention Skills Training (ASIST)* is a widely implemented training program that helps hotline counselors, emergency workers, and other gatekeepers to identify and connect with suicidal individuals, understand their reasoning for living and dying, and assist with safely connecting those in need to available resources. In a study employing a randomized controlled trial, Gould, Cross, Pisani, Munfakh, & Kleinman<sup>152</sup> evaluated the training across the *National Suicide Prevention Lifeline* network of hotlines over the period 2008-2009. Using data from 1,410 suicidal individuals who called 17 Lifeline centers, the researchers found that callers who spoke with ASIST-trained





counselors were significantly more likely to feel less depressed, less suicidal, less overwhelmed, and more hopeful by the end of their call, compared to callers who spoke to non-ASIST trained counselors. Counselors trained in ASIST were also more skilled at keeping callers on the phone longer and establishing a connection with them. However, training in ASIST did not result in more comprehensive suicide risk assessments than usual care training.<sup>152</sup>

Gatekeeper training has also been a primary component of the *Garret Lee Smith (GLS) Suicide Prevention Program*, which has been funded in 50 states and 50 tribes. A multi-site evaluation assessed the impact of community gatekeeper training on suicide attempts and deaths by comparing the change in suicide rates and nonfatal suicidal behavior among young people aged 10-24 in counties implementing GLS trainings, with the trajectory observed in similar counties that did not implement these trainings. Counties that implemented GLS trainings had significantly lower youth suicide rates one year following the training implementation.<sup>153</sup> This finding equates to a decrease of 1 suicide death per 100,000 among youth ages 10 to 24, or the prevention of approximately 237 deaths in the age group, between 2007 and 2010. Counties implementing GLS program activities also had significantly lower suicide attempt rates among youth ages 16 to 23 in the year following implementation of the GLS program than did similar counties that did not implement GLS activities (4.9 fewer attempts per 1000 youths).<sup>154</sup> More than 79,000 suicide attempts may have been prevented during the period examined.

**Crisis intervention.** Suicide prevention hotlines are one way to provide crisis intervention. In an evaluation of the effectiveness of the *National Suicide Prevention Lifeline* to prevent suicide, 1,085 suicidal individuals who called the hotline completed a standard risk assessment for suicide, and 380 of those completed a follow-up assessment between 1 and 52 days (mean=13.5 days) after the initial assessment. Researchers found that over half of the initial sample were seriously considering suicide when they called, and they had a plan for their suicide. Researchers also found that among follow-up participants, there was a significant decrease in psychological pain, hopelessness, and intent to die between initiation of the call (time 1) to follow-up (time 3).<sup>155</sup> Between time 2 (end of the call) to time 3, the effect remained for psychological pain and hopelessness, but was not significant for intent to die, suggesting that greater effort at outreach during and following the call is needed for the callers with high levels of suicide intent.<sup>155</sup>

**Treatment for people at-risk of suicide.** The *Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)* program aims to prevent suicide among older primary care patients by reducing suicide ideation and depression. IMPACT facilitates the development of a therapeutic alliance, a personalized treatment plan that includes patient preferences, as well as proactive follow-up (biweekly during an acute phase and monthly during continuation phase) by a depression care manager.<sup>156</sup> The program has been shown to significantly improve quality of life, and to reduce functional impairment, depression and suicidal ideation over 24-months of follow-up<sup>156,157</sup> relative to patients who received care as usual.

*Collaborative Assessment and Management of Suicidality (CAMS)*, is a therapeutic approach for suicide-specific assessment and treatment. The program's flexible approach can be used across treatment settings and clinician theoretical orientations and involves the clinician and patient working together in an interactive assessment process to develop patient-specific treatment plans. Sessions are collaborative and involve constant patient input about what is and is not working with the ultimate goal of enhancing the therapeutic alliance and increasing treatment motivation in the suicidal patient. CAMS has been tested and supported in 6 correlational studies,<sup>144</sup> in a variety of inpatient and outpatient settings, and in one RCT with several additional RCTs under way. A feasibility trial with a community-based sample of suicidal outpatients randomly assigned to CAMS or enhanced care as usual (intake with a psychiatrist or psychiatric nurse practitioner followed by 1-11 visits with a case manager and medication as needed) found better treatment retention among the CAMS group and significant improvements in suicidal ideation, overall symptom distress, and feelings of hopelessness at the 12 month follow-up.<sup>158</sup>





Other examples include *Dialectical Behavioral Therapy (DBT)* and *Attachment-Based Family Therapy (ABFT)*. *DBT* is a multicomponent therapy for individuals at high risk for suicide and who may struggle with impulsivity and emotional regulation issues. The components of *DBT* include individual therapy, group skills training, between-session telephone coaching and a therapist consultation team. In a randomized controlled trial of women with recent suicidal or self-injurious behavior, those receiving *DBT* were half as likely to make a suicide attempt at two-year follow-up than women receiving community treatment (23% vs 46%), required less hospitalization for suicide ideation, and had lower medical risk across all suicide attempts and self-injurious acts combined.<sup>159</sup>

*ABFT* is a program for adolescents aged 12-18 and is designed to treat clinically diagnosed major depressive disorder, eliminate suicidal ideation, and reduce dispositional anxiety.<sup>160</sup> A randomized controlled trial of *ABFT* found that suicidal adolescents assigned to *ABFT* experienced significantly greater improvement in suicidal ideation over 24 weeks of follow-up than did adolescents assigned to enhanced usual care. Additionally, a significantly higher percentage of *ABFT* participants reported no suicidal ideation in the week prior to assessment at 12 weeks than did adolescents receiving enhanced usual care (69.2% vs. 34.6%) and at 24 weeks (82.1% vs. 46.2%).<sup>160</sup>


The Veterans Affairs *Translating Initiatives for Depression into Effective Solutions* project (*TIDES*) uses a depression care liaison to link primary care and mental health services. The depression care liaison assesses and educates patients and follows-up with both patients and providers between primary care visits to optimize treatment. This collaborative care increases the efficiency of providing mental health services by bringing mental health care to the primary care setting, where most patients are first detected and subsequently treated for many mental health conditions. An evaluation of *TIDES* found significant decreases in depression severity scores among 70% of primary care patients.<sup>161</sup> *TIDES* also demonstrated 85% and 95% compliance with medication and follow-up visits, respectively.<sup>161</sup>

**Treatment to prevent re-attempts.** Several strategies that aim to prevent re-attempts have demonstrated impact on reducing suicide deaths. For example, *Emergency Department Brief Intervention with Follow-up Visits* is a program that involves a one-hour discharge information session that addresses suicidal ideation and attempts, distress, risk and protective factors, alternatives to self-harm, and referral options, combined with nine follow-up contacts over 18 months (at 1, 2, 4, 7, 11 weeks and 4, 6, 12, 18 months). Follow-up contacts are either conducted by phone or through home visits according to a specific timeline for up to 18 months. A randomized controlled trial that enrolled suicide attempters from eight hospital emergency departments in five countries (Brazil, India, Sri Lanka, Iran, and China) found that a brief intervention combined with nine follow-up visits over 18 months was associated with significantly fewer deaths from suicide relative to a treatment-as-usual group (0.2% versus 2.2%, respectively).<sup>162</sup>

Another example of treatment to prevent re-attempts involves *active follow-up contact approaches* such as postcards, letters, and telephone calls intended to increase a patient's sense of connectedness with health care providers and decrease isolation.<sup>151</sup> These approaches include expression of care and support and typically invite patients to reconnect with their provider. Contacts are made periodically (e.g., monthly or every few months in the first 12 months post-discharge with some programs continuing contact for two or more years). In a meta-analysis conducted by Inagaki et al<sup>151</sup> interventions to prevent repeat suicide attempts in patients admitted to an emergency department for suicide attempt were found to reduce reattempts by approximately 17% for up to 12 months post-discharge; however, the effects of these approaches beyond 12 months on reattempts has not yet been demonstrated.<sup>151</sup> Also, because the number of trials and associated sample sizes included in this meta-analysis were small, it was not possible to determine the effect of active contact and follow-up approaches on death by suicide.





In a randomized controlled trial of the post-crisis suicide prevention long-term follow-up contact approach, Motto, Boström  found that patients who refused ongoing care but who were randomized to be contacted by letter four times per year had a lower rate of suicide over two years of follow-up than did patients in the control group who received no further contact. Other studies have also shown post-crisis letters and coping cards to be protective against suicide ideation and attempts.<sup>164,165</sup>

Finally, *Cognitive Behavior Therapy for Suicide Prevention (CBT-SP)* is an example of a therapeutic approach to prevent re-attempts. It uses a risk-reduction, relapse prevention approach that includes an analysis of proximal risk factors and stressors (e.g., relationship problems, school or work-related difficulties) leading up to and following the suicidal event; safety plan development; skill building; and psychoeducation. *CBT-SP* also has family skill modules focused on family support and communication patterns as well as improving the family's problem solving skills. A randomized controlled trial of *CBT-SP* found that 10-session outpatient cognitive therapy designed to prevent repeat suicide attempts resulted in a 50% reduction in the likelihood of a suicide reattempt among adults who had been admitted to an emergency department for a suicide attempt relative to treatment as usual.<sup>166</sup>



**Several strategies  
that aim to prevent  
re-attempts have  
demonstrated  
impact on reducing  
suicide deaths.**







# Lessen Harms and Prevent Future Risk

## Rationale

Millions of people are bereaved by suicide every year in the United States and throughout the world.<sup>5</sup> Risk of suicide and suicide risk factors has been shown to increase among people who have lost a friend/peer, family member, co-worker, or other close contact to suicide.<sup>167</sup> Care and attention to the bereaved is therefore of high importance. Despite often good intentions, media and others responding to suicide may add to this risk. For example, research suggests that exposure to sensationalized or otherwise uninformed reporting on suicide may heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to what is known as suicide contagion.<sup>168,169</sup>

## Approaches

Some approaches that can be used to lessen harms and reduce future risk of suicide include postvention and safe reporting and messaging following a suicide.

**Postvention** approaches are implemented *after* a suicide has taken place and may include debriefing sessions, counseling, and/or bereavement support groups for surviving friends and family members/loved ones. These programs have not typically been evaluated for their impact on suicide or suicidal behavior but may reduce survivors' guilt, feelings of depression, and complicated grief.<sup>170</sup>

**Safe reporting and messaging about suicide.** The manner in which information on a recent suicide is communicated to the public (e.g., school assemblies, mass media, social media) can heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to suicide contagion. Reports that are inclusive of suicide prevention messages, stories of hope and resilience, risk and protective factors, and links to helping resources (e.g., hotline), and that avoid sensationalizing events or reducing suicide to one cause, can help reduce the likelihood of suicide contagion.<sup>171</sup>

## Potential Outcomes

- Reductions in suicidal ideation
- Reductions in suicide attempts
- Reductions in rates of suicide
- Reductions in psychological distress
- Improvements in reporting following suicide
- Reductions in contagion effects related to suicide





## Evidence

Current evidence suggests that postvention and safe reporting and messaging can impact risk and protective factors for suicide.

**Postvention.** One example of a postvention program with evidence of impact on risk and protective factors for suicide is the *StandBy Response Service (StandBy)*. *StandBy* provides clients with face-to-face outreach and telephone support through a professional crisis response team. Site coordinators develop customized case management plans, referring clients to other existing community services matched to their needs.<sup>172</sup> In a study by Visser, Comans, and Scuffham,<sup>172</sup> *StandBy* clients were significantly less likely to be at high risk for suicidality (suicide ideation and attempts) and had less psychological distress than a suicide bereaved comparison group who had not had contact with the *StandBy* program (48% and 64% respectively). Additionally, research suggests that active postvention approaches in which outreach to suicide survivors occurs at the scene of a suicide is associated with intake into treatment sooner, greater attendance at support group meetings, and attendance at more meetings compared to passive postvention (~~versus passive~~ approaches where survivors self-refer for services).<sup>173</sup>

**Safe reporting and messaging about suicide.** One way to ensure safe reporting and messaging about suicide is to encourage news media adhere to *Recommendations for Reporting on Suicide* (<http://www.reportingonsuicide.org>). The most compelling evidence supporting these recommendations for reporting comes from Austria. After a sharp increase in suicides on the Viennese subway, media guidelines were introduced and an interrupted time series design was used to evaluate the national impact of the guidelines on subsequent suicides. Changes in the quality and quantity of media reporting resulted in a nationwide significant reduction of 81 suicides annually.<sup>169</sup> Finally, research suggests that not only does reporting on suicide in a negative way (e.g., reporting on suicide myths and repetition) have harmful effects on suicide, but reporting on positive coping skills in the face of adversity can also demonstrate protective effects against suicide.<sup>174</sup> Reports of individual suicidal ideation not accompanied by reports of suicide or suicide attempts, along with reports describing a “mastery” of a crisis situation where adversities were overcome, was associated with significant decreases in suicide rates in the time period immediately following such reports.<sup>174</sup>



*Postvention and  
safe reporting and  
messaging can  
impact risk and  
protective factors  
for suicide.*





# Sector Involvement

Public health can play an important and unique role in addressing suicide. Public health agencies, which typically place prevention at the forefront of efforts and work to create broad population-level impact, can bring critical leadership and resources to bear on this problem. For example, these agencies can serve as a convener, bringing together partners and stakeholders to plan, prioritize, and coordinate suicide prevention efforts. Public health agencies are also well positioned to collect and disseminate data, implement preventive measures, evaluate programs, and track progress. Although public health can play a leadership role in preventing suicide, the strategies and approaches outlined in this technical package cannot be accomplished by the public health sector alone. As noted in the *National Strategy for Suicide Prevention*,<sup>1</sup> the integration and coordination of prevention activities across sectors and settings is critical for expanding the reach and impact of suicide prevention efforts.

Other sectors vital to implementing this package include, but are not limited to, education, government (local, state, and federal), social services, health services, business, labor, justice, housing, media, and organizations that comprise the civil society sector such as faith-based organizations, youth-serving organizations, foundations, and other non-governmental organizations. Collectively, these sectors can make a difference in preventing suicide by impacting the various contexts and underlying risks that contribute to suicide.

The strategies and approaches described in this technical package are summarized in Appendix A along with the relevant sectors that are well positioned to lead implementation efforts. For example, business and labor, the health sector (including insurers, providers, and health systems), and government entities are in the best position to implement programs and policies that *Strengthen Economic Supports* and *Strengthen Access and Delivery of Suicide Care*. These types of supports go beyond individual behavior change and require commitment and support from those sectors that can directly address some of the underlying risks and the environmental contexts that increase the risk for suicide. Public health entities can play an important role by gathering and synthesizing information to inform policy, raise awareness, and evaluate the effectiveness of various policies. Moreover, partnerships with non-governmental and community organizations can be instrumental in increasing awareness of and garnering support for policies affecting individuals and families.

The public health sector has been at the forefront of many community-based prevention efforts, working collaboratively with schools and community-based organizations, to change social norms and positively impact health behavior. Public health is well suited to take on a similar leadership role in *Promoting Connectedness* through peer norm and community engagement activities and supporting the development, evaluation, and adoption of effective programs that *Teach Coping and Problem-Solving Skills* to prevent suicide ~~from happening~~ in the first place. These programs are often delivered in school and community settings, making education and non-governmental organizations vital partners in prevention.

Businesses, workplaces, and local and state government entities, on the other hand, are in the best position to establish policies and support practices that *Create Protective Environments* where people live, work, and play. Public health entities can serve in an important role by gathering and synthesizing information, working with other governmental agencies (e.g., criminal justice, defense) and agencies within the executive branch of their state or local government in support of policy and other approaches, and evaluating the effectiveness of measures taken. In a similar fashion, public health entities can partner with schools, workplaces, and community organizations to implement and evaluate prevention programs, policies and practices geared toward creating safe, healthy, and supportive environments.





Finally, this technical package includes a number of interventions delivered in hospital, primary care, behavioral health care, and community settings designed to *Identify and Support People At-Risk*. The intensity and activities for many of these interventions require the expertise of professionals who are licensed and trained to deliver critical intervention support. The health, social services, and justice sectors can work collaboratively to support individuals at high-risk for suicide and their families. These activities also require coordination of supports across various service providers and community organizations.

Regardless of strategy, action by many sectors will be necessary for the successful implementation of this package. In this regard, all sectors can play an important and influential role in preventing suicide from happening in the first place and lessening the immediate and long-term harms of suicidal behavior by helping those in times of crisis get the services and support they need.



***All sectors can  
play an important  
and influential role in  
preventing suicide.***



# Monitoring and Evaluation

Monitoring and evaluation are necessary components of the public health approach to prevention. It is important to have timely and reliable data to monitor the extent of the problem and to evaluate the impact of prevention efforts. Data are also necessary for prevention planning and implementation.

Gathering ongoing and systematic data is important for prevention efforts. However, it is also important to gather data that are uniform and consistent across systems. Consistent data allow public health and other entities to better gauge the scope of the problem, identify high-risk groups, and monitor the effects of prevention programs and policies. Currently, it is common for different sectors, agencies, and organizations to employ varying definitions of suicidal ideation, behavior, and death that can make it difficult to consistently monitor specific outcomes across sectors and over time. For example, the manner in which deaths are classified can change from one jurisdiction to another, and can change based on local medical and/or medico-legal standards.<sup>4</sup> CDC's uniform definitions and recommended data elements for self-directed violence provide a useful framework to help ensure that data are collected in a consistent manner across surveillance systems.<sup>4</sup>

Surveillance systems exist at the federal, state, and local levels. It is important to assess the availability of surveillance data and data systems across these levels to identify and address gaps in the systems. CDC's *National Vital Statistics System (NVSS)*<sup>7</sup> and the *National Violent Death Reporting System (NVDRS)*<sup>175</sup> are examples of surveillance systems that provide data on deaths from suicide. NVSS is a nationwide surveillance system that collects demographic, geographic, and cause-of-death data from death certificates.<sup>7</sup> NVDRS is a state-based surveillance system (currently in 40 states, the District of Columbia, and Puerto Rico) that combines data from death certificates, law enforcement reports, and coroner or medical examiner reports to provide detailed information on the circumstances of violent deaths, including suicide, which can assist communities in guiding prevention approaches.<sup>175</sup> Data from state and local Child Death Review teams<sup>176</sup> and Suicide Death Review Teams (which are in a few states) offer another source to identify deaths and obtain insight into the gaps in services, systems, and modifiable risk factors for suicide.







The *National Electronic Injury Surveillance System-All Injury Program (NEISS-AIP)* provides nationally representative data about all types and causes of nonfatal injuries treated in U.S. hospital emergency departments, and can be used to assess national rates of, and trends in, self-harm injuries by cause (e.g., falls, poisoning, etc.), age, race/ethnicity, sex, disposition (where the injured person goes when released from the Emergency Department).<sup>6</sup>

In addition to information on deaths and nonfatal injuries, there are also surveillance systems that provide national, state, and some local estimates of suicidal behavior. The *Youth Risk Behavior Surveillance System (YRBSS)* collects information from a nationally representative sample of 9-12 grade students and is a key resource in monitoring health-risk behaviors among youth, including whether youth have seriously considered attempting suicide, attempted suicide, made a plan, or required treatment by a doctor or nurse for a suicide attempt that resulted in an injury, poisoning, or overdose.<sup>177</sup> The YRBSS data are obtained from a national school-based survey conducted by CDC as well as from state, territorial, tribal, and large urban school district surveys conducted by education and health agencies.<sup>177</sup> The *National Survey on Drug Use and Health (NSDUH)*<sup>50</sup> is an annual survey of the civilian, non-institutionalized population aged 12 years and older. NSDUH provides both national and state-level estimates of substance use (alcohol, tobacco, illicit drugs, and non-medical use of prescription drugs); mental health (past year mental illness, co-occurring illnesses); and service utilization, along with suicide ideation, suicide plans, and suicide attempts. NSDUH is a key resource to track trends in suicide-related risk factors in the population and to help identify groups at increased risk.<sup>50</sup>

It is also important at all levels (local, state, and federal) to address gaps in responses, track progress of prevention efforts and evaluate the impact of those efforts, including the impact of this technical package. Evaluation data, produced through program implementation and monitoring, is essential to provide information on what does and does not work to reduce rates of suicide and its associated risk and protective factors. Theories of change and logic models that identify short, intermediate, and long-term outcomes are an important part of program evaluation.

The evidence-base for suicide prevention has advanced greatly over the last few decades. However, additional research is needed to understand the impact of programs, policies, and practices on suicide (and suicide attempts, at a minimum), as opposed to merely examining their effectiveness on risk factors. More research is also needed to examine the effectiveness of primary prevention strategies (before risk occurs) and community-level strategies to prevent suicide at the population level. It will be important for researchers to test the effectiveness of combinations of the strategies and approaches included in this package. Most existing evaluations focus on approaches implemented in isolation, but there is potential to understand the synergistic effects within a comprehensive prevention approach. Lastly, there are also many potential opportunities to build and strengthen partnerships across program areas (e.g., violence prevention, substance abuse prevention) to evaluate the impact of different approaches on multiple outcomes.






# Conclusion

Suicide is a serious public health problem whose rates have been on the rise for more than a decade and whose costs stretch well into the billions of dollars each year. While suicide is a rare outcome statistically, its human impact has a ripple effect that is far-reaching. Each of us likely interacts with suicide survivors, those with lived experience, and those with thoughts of suicide on a daily basis – at home, at work, and in our communities. Suicide and suicide attempts are public health issues of societal concern. There are a number of barriers that have impeded progress, including, for example, stigma related to help-seeking, mental illness, being a survivor and fear related to asking someone about suicidal thoughts. Fortunately, like many public health problems, suicide is preventable,<sup>1,5</sup> and more is being done to prevent suicide than ever before, as evidenced by the work of the National Action Alliance for Suicide Prevention,<sup>39,40,75,88</sup> the release of the first world report on suicide,<sup>5</sup> and more timely surveillance data, to name just a few examples.

In an effort to continue pushing the field and society further towards prevention, this technical package includes strategies and approaches that ideally would be used in a comprehensive, multi-level and multi-sectoral way. It includes strategies and approaches to prevent suicide from occurring in the first place, as well as strategies focused on lessening the immediate and long-term harms of suicidal behavior. It includes strategies that range from a focus on the whole population regardless of risk to strategies designed to support people at highest risk. Importantly, this technical package extends the bounds of the typical prevention strategies to consider approaches that go beyond individual behavior change to better address risk factors impacting communities and populations more broadly (e.g., economic policies to strengthen housing and financial security).

While the evidence base continues to emerge, the collection of programs, policies, and practices laid out here are available for implementation now. In keeping with good public health practice, the intent is that monitoring and evaluation will play a key role in that implementation. Moreover, as new evidence becomes available, this technical package can be refined to reflect the current state of the science.

In closing, and in keeping with a message of resilience as spoken by those with lived experience, “hope, help, and healing is possible.”



***“Hope, help,  
and healing  
is possible.”***









# References

1. U.S. Office of the Surgeon General, National Action Alliance for Suicide Prevention. 2012 National Strategy for Suicide Prevention: Goals and Objectives for Action. Washington, D.C.: HHS; 2012.
2. National Action Alliance for Suicide Prevention. Action Alliance Priorities. 2017; <http://actionallianceforsuicideprevention.org/priorities>.
3. Frieden TR. Six components necessary for effective public health program implementation. *Am J Public Health*. 2014;104(1):17-22.
4. Crosby AE, Ortega L, Melanson C. Self-directed Violence Surveillance: Uniform Definitions and Recommended Data Elements, Version 1.0. Atlanta, GA: Centers for Disease Control and Prevention, National Center for Injury Prevention and Control; 2011.
5. World Health Organization. Suicide Prevention: A Global Imperative. Geneva, Switzerland: WHO Press; 2014.
6. Centers for Disease Control and Prevention. Web-Based Injury Statistics Query and Reporting System (WISQARS). Atlanta, GA: National Center for Injury Prevention and Control. Available online: <http://www.cdc.gov/injury/wisqars/index.html>.
7. Centers for Disease Control and Prevention, National Center for Health Statistics. National Vital Statistics System. <https://www.cdc.gov/nchs/nvss/deaths.htm>.
8. Bachynski KE, Canham-Chervak M, Black SA, Dada EO, Millikan AM, Jones BH. Mental health risk factors for suicides in the US Army, 2007–8. *Inj Prev*. 2012;18(6):405-412.
9. Lineberry TW, O'Connor SS. Suicide in the US Army. *Mayo Clinic Proceedings*. 2012;87(9):871-878.
10. McIntosh WL, Spies E, Stone DM, Lokey CN, Trudeau AR, Bartholow B. Suicide Rates by Occupational Group - 17 States, 2012. *MMWR Morb Mortal Wkly Rep*. 2016;65(25):641-645.
11. Han B, Crosby AE, Ortega LA, Parks SE, Compton WM, Gfroerer J. Suicidal ideation, suicide attempt, and occupations among employed adults aged 18–64 years in the United States. *Compr Psychiatry*. 2016;66:176-186.
12. Kann L, McManus T, Harris WA, et al. Youth Risk Behavior Surveillance - United States, 2015. *MMWR CDC Surveill Summ*. 2016;65(6):1-174.
13. Russell ST, Joyner K. Adolescent sexual orientation and suicide risk: Evidence from a national study. *Am J Public Health*. 2001;91(8):1276-1281.
14. Stone DM, Luo F, Ouyang L, Lippy C, Hertz MF, Crosby AE. Sexual orientation and suicide ideation, plans, attempts, and medically serious attempts: evidence from local Youth Risk Behavior Surveys, 2001-2009. *Am J Public Health*. 2014;104(2):262-271.
15. Crosby AE, Han B, Ortega LA, Parks SE, Gfroerer J. Suicidal thoughts and behaviors among adults aged  $\geq 18$  years—United States, 2008-2009. *MMWR CDC Surveill Summ*. 2011;60(13):1-22.
16. Lipari R, Piscopo K, Kroutil LA, Kilmer Miller G. Suicidal thoughts and behavior among adults: Results from the 2014 National Survey on Drug Use and Health. *NSDUH Data Review 2015*; <https://www.samhsa.gov/data/sites/default/files/NSDUH-FRR2-2014/NSDUH-FRR2-2014.pdf>.
17. Dahlberg LL, Krug EG. Violence—a global public health problem. In: Krug E, Dahlberg LL, Mercy JA, Zwi AB, Lozano R, eds. *World Report on Violence and Health*. Geneva, Switzerland: World Health Organization; 2002:1-21.
18. Owens D. Fatal and non-fatal repetition of self-harm: Systematic review. *Br J Psychiatry*. 2002;181(3):193-199.
19. Olfson M, Gerhard T, Huang C, Crystal S, Stroup TS. Premature Mortality Among Adults With Schizophrenia in the United States. *JAMA Psychiatry*. 2015;72(12):1172-1181.
20. Bossarte RM, Karras E, Lu N, et al. Associations between the Department of Veterans Affairs' suicide prevention campaign and calls to related crisis lines. *Public Health Rep (Washington, D.C.: 1974)*. 2014;129(6):516-525.





21. Chapman DP, Whitfield CL, Felitti VJ, Dube SR, Edwards VJ, Anda RF. Adverse childhood experiences and the risk of depressive disorders in adulthood. *J Affect Disord.* 2004;82(2):217-225.
22. Dube SR, Anda RF, Felitti VJ, Chapman DP, Williamson DF, Giles WH. Childhood abuse, household dysfunction, and the risk of attempted suicide throughout the life span: findings from the Adverse Childhood Experiences Study. *JAMA.* 2001;286(24):3089-3096.
23. Felitti VJ, Anda RF, Nordenberg D, et al. Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: The Adverse Childhood Experiences (ACE) Study. *Am J Prev Med.* 1998;14(4):245-258.
24. Klomek AB, Sourander A, Gould M. The association of suicide and bullying in childhood to young adulthood: a review of cross-sectional and longitudinal research findings. *Can J Psychiatry.* 2010;55(5):282-288.
25. Leeb RT, Lewis T, Zolotor AJ. A review of physical and mental health consequences of child abuse and neglect and implications for practice. *American Journal of Lifestyle Medicine.* 2011;5(5):454-468.
26. World Health Organization. Global and Regional Estimates of Violence Against Women: Prevalence and Health Effects of Intimate Partner Violence and Non-Partner Sexual Violence. Geneva: World Health Organization; 2013.
27. Bellis MA, Hughes K, Leckenby N, et al. Adverse childhood experiences and associations with health-harming behaviours in young adults: surveys in eight eastern European countries. *Bull World Health Organ.* 2014;92(9):641-655.
28. Haegerich TM, Dahlberg LL. Violence as a public health risk. *American Journal of Lifestyle Medicine.* 2011;5(5):392-406.
29. Wilkins N, Tsao B, Hertz M, Davis R, Klevens J. Connecting the dots: An overview of the links among multiple forms of violence. Atlanta, GA: National Center for Injury Prevention and Control, Centers for Disease Control and Prevention; 2014.
30. Hamby S, Grych J. The web of violence: exploring connections among different forms of interpersonal violence and abuse. *Briefs in Sociology.* New York, NY: Springer; 2013.
31. Kleiman EM, Riskind JH, Schaefer KE, Weingarden H. The moderating role of social support on the relationship between impulsivity and suicide risk. *Crisis.* 2012;33(5):273-279.
32. Carter M, McGee R, Taylor B, Williams S. Health outcomes in adolescence: associations with family, friends and school engagement. *J Adolesc.* 2007;30(1):51-62.
33. Maimon D, Browning CR, Brooks-Gunn J. Collective efficacy, family attachment, and urban adolescent suicide attempts. *J Health Soc Behav.* 2010;51(3):307-324.
34. Capaldi DM, Knoble NB, Shortt JW, Kim HK. A Systematic Review of Risk Factors for Intimate Partner Violence. *Partner Abuse.* 2012;3(2):231-280.
35. Losel F, Farrington DP. Direct protective and buffering protective factors in the development of youth violence. *Am J Prev Med.* 2012;43(2 Suppl 1):S8-S23.
36. Wyman PA, Brown CH, LoMurray M, et al. An outcome evaluation of the Sources of Strength suicide prevention program delivered by adolescent peer leaders in high schools. *Am J Public Health.* 2010;100(9):1653-1661.
37. Dunne EJ, McIntosh JL, Dunne-Maxim K, eds. *Suicide and its aftermath: Understanding and counseling the survivors.* New York: Norton; 1987.
38. Mishara BL. *The Impact of Suicide.* New York: Springer; 1995.
39. National Action Alliance for Suicide Prevention: Suicide Attempt Survivors Task Force. *The Way Forward: Pathways to hope, recovery, and wellness with insights from lived experience.* Washington, D.C. : Author; 2014.
40. National Action Alliance for Suicide Prevention: Survivors of Suicide Loss Task Force. *Responding to Grief, Trauma, and Distress After a Suicide: U.S. National Guidelines.* Washington, D.C. : Author; 2015.
41. Crosby AE, Sacks JJ. Exposure to suicide: incidence and association with suicidal ideation and behavior: United States, 1994. *Suicide Life Threat Behav.* 2002;32(3):321-328.
42. Cerel J, Maple M, De Venne A, Moore M, Flaherty C, Brown M. Exposure to Suicide in the Community: Prevalence and Correlates in One US State. *Public Health Rep (Washington, D.C.: 1974).* 2016;131(1):100-107.





43. Chapman AL, Dixon-Gordon KL. Emotional antecedents and consequences of deliberate self-harm and suicide attempts. *Suicide Life Threat Behav.* 2007;37(5):543-552.
44. Mitchell AM, Kim Y, Prigerson HG, Mortimer-Stephens M. Complicated grief in survivors of suicide. *Crisis.* 2004;25(1):12-18.
45. Sudak H, Maxim K, Carpenter M. Suicide and stigma: a review of the literature and personal reflections. *Acad Psychiatry.* 2008;32(2):136-142.
46. Cerel J, McIntosh JL, Neimeyer RA, Maple M, Marshall D. The Continuum of "Survivorship": Definitional Issues in the Aftermath of Suicide. *Suicide Life Threat Behav.* 2014;44(6):591-600.
47. Florence C, Simon T, Haegerich T, Luo F, Zhou C. Estimated lifetime medical and work-loss costs of fatal injuries-United States, 2013. *MMWR Morb Mortal Wkly Rep.* 2015;64(38):1074-1077.
48. Shepard DS, Gurewich D, Lwin AK, Reed GA, Jr., Silverman MM. Suicide and Suicidal Attempts in the United States: Costs and Policy Implications. *Suicide Life Threat Behav.* 2016;46(3):352-362.
49. Silverman MM, Maris RW. The prevention of suicidal behaviors: An overview. *Suicide Life Threat Behav.* 1995;25(1):10-21.
50. Substance Abuse and Mental Health Services Administration, Center for Behavioral Health Statistics and Quality. National Survey on Drug Use and Health. 2016; [https://nsduhwebesn.rti.org/respweb/project\\_description.html](https://nsduhwebesn.rti.org/respweb/project_description.html).
51. Desai RA, Dausey DJ, Rosenheck RA. Mental health service delivery and suicide risk: the role of individual patient and facility factors. *Am J Psychiatry.* 2005;162(2):311-318.
52. Turecki G. Epigenetics and suicidal behavior research pathways. *Am J Prev Med.* 2014;47(3):S144-S151.
53. Edwards RW, Jumper-Thurman P, Plested BA, Oetting ER, Swanson L. Community readiness: Research to practice. *Journal of Community Psychology.* 2000;28(3):291-307.
54. Hawkins JD, Catalano RF, Kuklinski MR. Communities that care. *Encyclopedia of Criminology and Criminal Justice:* Springer; 2014:393-408.
55. Plested BA, Edwards RW, Jumper-Thurman P. Community readiness: A handbook for successful change. *Fort Collins, CO: Tri-Ethnic Center for Prevention Research.* 2006.
56. Luo F, Florence CS, Quispe-Agnoli M, Ouyang L, Crosby AE. Impact of business cycles on US suicide rates, 1928-2007. *Am J Public Health.* 2011;101(6):1139-1146.
57. Fowler KA, Gladden RM, Vagi KJ, Barnes J, Frazier L. Increase in suicides associated with home eviction and foreclosure during the US housing crisis: findings from 16 National Violent Death Reporting System States, 2005-2010. *Am J Public Health.* 2015;105(2):311-316.
58. Stack S, Wasserman I. Economic strain and suicide risk: a qualitative analysis. *Suicide Life Threat Behav.* 2007;37(1):103-112.
59. Cylus J, Glymour MM, Avendano M. Do generous unemployment benefit programs reduce suicide rates? A state fixed-effect analysis covering 1968-2008. *Am J Epidemiol.* 2014;180(1):45-52.
60. Classen TJ, Dunn RA. The effect of job loss and unemployment duration on suicide risk in the United States: a new look using mass-layoffs and unemployment duration. *Health Econ.* 2012;21(3):338-350.
61. Flavin P, Radcliff B. Public policies and suicide rates in the American states. *Social Indicators Research.* 2009;90(2):195-209.
62. U.S. Department of Housing and Urban Development. Neighborhood Stabilization Program. <https://www.hudexchange.info/programs/nsp/>, 2017.
63. Houle JN, Light MT. The home foreclosure crisis and rising suicide rates, 2005 to 2010. *Am J Public Health.* 2014;104(6):1073-1079.
64. Arsenault-Lapierre G, Kim C, Turecki G. Psychiatric diagnoses in 3275 suicides: a meta-analysis. *BMC Psychiatry.* 2004;4:37.





65. Harris EC, Barraclough B. Suicide as an outcome for mental disorders. A meta-analysis. *Br J Psychiatry*. 1997;170:205-228.
66. Tyrer P, Reed GM, Crawford MJ. Classification, assessment, prevalence, and effect of personality disorder. *Lancet*. 2015;385(9969):717-726.
67. Harris EC, Barraclough B. Excess mortality of mental disorder. *Br J Psychiatry*. 1998;173:11-53.
68. Mark TL, Shern DL, Bagalman JE, Cao Z. Ranking America's mental health: An analysis of depression across the states. Alexandria, VA: Mental Health America. 2007.
69. Lang M. The impact of mental health insurance laws on state suicide rates. *Health Econ*. 2013;22(1):73-88.
70. Wang PS, Demler O, Kessler RC. Adequacy of treatment for serious mental illness in the United States. *Am J Public Health*. 2002;92(1):92-98.
71. Cunningham PJ. Beyond parity: primary care physicians' perspectives on access to mental health care. *Health Aff (Millwood)*. 2009;28(3):w490-501.
72. Coffey CE. Building a system of perfect depression care in behavioral health. *Jt Comm J Qual Patient Saf*. 2007;33(4):193-199.
73. The Paul Wellstone and Pete Domenici Mental Health Parity and Addiction Equity Act of 2008 (MHPEA), HR 1424, 110<sup>th</sup> Congress. 2008.
74. U.S. Department of Health and Human Services Health Resources and Services Administrations. Designated Health Professional Shortage Areas Statistics. [As of November 4, 2016. 2016.](#)
75. National Action Alliance for Suicide Prevention: Clinical Workforce Preparedness Task Force. *Suicide prevention and the clinical workforce: Guidelines for training*. Washington, D.C.: Author; 2014.
76. Harris KM, Carpenter C, Bao Y. The effects of state parity laws on the use of mental health care. *Med Care*. 2006;44(6):499-505.
77. Health Resources & Services Administration. National Health Service Corps. 2017; <https://www.nhsc.hrsa.gov/>.
78. U.S. Department of Health and Human Services Health Resources and Services Administrations. National Health Service Corp Clinician Retention: A Story of Dedication and Commitment. 2016.
79. Hailey D, Roine R, Ohinmaa A. The effectiveness of telemental health applications: a review. *The Can J Psychiatry*. 2008;53(11):769-778.
80. Mohr DC, Vella L, Hart S, Heckman T, Simon G. The effect of telephone-administered psychotherapy on symptoms of depression and attrition: A meta-analysis. *Clinical Psychology: Science and Practice*. 2008;15(3):243-253.
81. Coffey CE. Pursuing perfect depression care. *Psychiatr Serv*. 2006;57(10):1524-1526.
82. Coffey CE, Coffey MJ, Ahmedani BK. An update on perfect depression care. *Psychiatr Serv*. 2013;64(4):396.
83. Coffey M, Coffey C, Ahmedani BK. Suicide in a health maintenance organization population. *JAMA Psychiatry*. 2015;72(3):294-296.
84. Haddon W. Advances in the epidemiology of injuries as a basis for public policy. *Public Health Rep*. 1980;95(5):411-421.
85. Toosi M. Labor force projections to 2024: The labor force is growing, but slowly. Washington, D.C.: Bureau of Labor Statistics; *Monthly Labor Review*. 2015:1-33.
86. Noonan ME. Mortality in State Prisons, 2001-2014 *Bureau of Justice Statistical Tables*. 2016;250150(December).
87. Knox KL, Pflanz S, Talcott GW, et al. The US Air Force suicide prevention program: implications for public health policy. *Am J Public Health*. 2010;100(12):2457-2463.
88. National Action Alliance for Suicide Prevention Workplace Task Force. *Comprehensive Blueprint for Workplace Suicide Prevention*. Washington, D.C. : Author; 2015.
89. Runyan CW, Becker A, Brandspigel S, Barber C, Trudeau A, Novins D. Lethal Means Counseling for Parents of Youth Seeking Emergency Care for Suicidality. *West J Emerg Med*. 2016;17(1):8-14.





90. Miller M, Warren M, Hemenway D, Azrael D. Firearms and suicide in US cities. *Inj Prev*. 2015;21(e1):e116-119.
91. Crosby AE, Espitia-Hardeman V, Ortega L, Lozano B. Alcohol and suicide. *Alcohol: Science, Policy and Public Health*. 2013;190-193.
92. Kaplan MS, McFarland BH, Huguet N, et al. Acute alcohol intoxication and suicide: a gender-stratified analysis of the National Violent Death Reporting System. *Inj Prev*. 2013;19(1):38-43.
93. Beautrais AL, Gibb SJ, Fergusson DM, Horwood LJ, Larkin GL. Removing bridge barriers stimulates suicides: An unfortunate natural experiment. *Aust NZ J Psychiat*. 2009;43(6):495-497.
94. Stokes ML, McCoy KP, Abram KM, Byck GR, Teplin LA. Suicidal Ideation and Behavior in Youth in the Juvenile Justice System: A Review of the Literature. *Journal of Correctional Health Care*. 2015;21(3):222-242.
95. Elnour AA, Harrison J. Lethality of suicide methods. *Inj Prev*. 2008;14(1):39-45.
96. Simon OR, Swann AC, Powell KE, Potter LB, Kresnow MJ, O'Carroll PW. Characteristics of impulsive suicide attempts and attempters. *Suicide Life Threat Behav*. 2001;32(1 Suppl):49-59.
97. Deisenhammer EA, Ing CM, Strauss R, Kemmler G, Hinterhuber H, Weiss EM. The duration of the suicidal process: how much time is left for intervention between consideration and accomplishment of a suicide attempt? *J Clin Psychiatry*. 2009;70(1):19-24.
98. Hawton K. Restricting access to methods of suicide: Rationale and evaluation of this approach to suicide prevention. *Crisis*. 2007;28(51):4-9.
99. Yip P, Caine E, Yousuf S, Chang S-S, Wu K, Chen Y-Y. Means restriction for suicide prevention. *Lancet*. 2012;379(9834):2393-2399.
100. Cox GR, Owens C, Robinson J, et al. Interventions to reduce suicides at suicide hotspots: a systematic review. *BMC Public Health*. 2013;13(1):1-12.
101. Rowhani-Rahbar A, Simonetti JA, Rivara FP. Effectiveness of Interventions to Promote Safe Firearm Storage. *Epidemiol Rev*. 2016;38(1):111-124.
102. Hayes LM. Suicide prevention in correctional facilities: reflections and next steps. *Int J Law Psychiatry*. 2013;36(3-4):188-194.
103. Giesbrecht N, Huguet N, Ogden L, et al. Acute alcohol use among suicide decedents in 14 US states: impacts of off-premise and on-premise alcohol outlet density. *Addiction*. 2015;110(2):300-307.
104. Escobedo LG, Ortiz M. The relationship between liquor outlet density and injury and violence in New Mexico. *Accid Anal Prev*. 2002;34(5):689-694.
105. Xuan Z, Naimi TS, Kaplan MS, et al. Alcohol Policies and Suicide: A Review of the Literature. *Alcohol Clin Exp Res*. 2016;40(10):2043-2055.
106. Cherpitel CJ, Borges GLG, Wilcox HC. Acute alcohol use and suicidal behavior: A review of the literature. *Alcoholism: Clinical and Experimental Research*. 2004;28(5 SUPPL.):18S-28S.
107. Pirkis J, Too LS, Spittal MJ, Krysinska K, Robinson J, Cheung YTD. Interventions to reduce suicides at suicide hotspots: A systematic review and meta-analysis. *Lancet Psychiatry*. 2015;2(11):994-1001.
108. Perron S, Burrows S, Fournier M, Perron PA, Ouellet F. Installation of a bridge barrier as a suicide prevention strategy in Montreal, Quebec, Canada. *Am J Public Health*. 2013;103(7):1235-1239.
109. Beautrais AL. Effectiveness of barriers at suicide jumping sites: A case study. *Aust NZ J Psychiat*. 2001;35(5):557-562.
110. Grossman DC, Mueller BA, Riedy C, et al. Gun storage practices and risk of youth suicide and unintentional firearm injuries. *JAMA*. 2005;293(6):707-714.
111. Mishara BL, Martin N. Effects of a comprehensive police suicide prevention program. *Crisis*. 2012;33(3):162-168.
112. Knox KL, Litts DA, Talcott GW, Feig JC, Caine ED. Risk of suicide and related adverse outcomes after exposure to a suicide prevention programme in the US Air Force: cohort study. *BMJ*. 2003;327(7428):1376.





113. Hayes LM. Prison Suicide: An Overview and a Guide to Prevention. *The Prison Journal*. 1995;75(4):431-456.
114. Barker E, Kölves K, De Leo D. Management of Suicidal and Self-Harming Behaviors in Prisons: Systematic Literature Review of Evidence-Based Activities. *Archives of Suicide Research*. 2014;18(3):227-240.
115. Rush BR, Gliksman L, Brook R. Alcohol availability, alcohol consumption and alcohol-related damage. I. The distribution of consumption model. *J Stud Alcohol*. 1986;47(1):1-10.
116. Gruenewald PJ, Remer L. Changes in outlet densities affect violence rates. *Alcohol Clin Exp Res*. 2006;30(7):1184-1193.
117. Lipton R, Gruenewald P. The spatial dynamics of violence and alcohol outlets. *J Stud Alcohol*. 2002;63(2):187-195.
118. Lippy C, DeGue S. Exploring alcohol policy approaches to prevent sexual violence perpetration. *Trauma, Violence, & Abuse*. 2016;17(1):26-42.
119. Johnson FW, Gruenewald PJ, Remer LG. Suicide and alcohol: do outlets play a role? *Alcohol Clin Exp Res*. 2009;33(12):2124-2133.
120. Durkheim E. Suicide: A study in sociology (JA Spaulding & G. Simpson, trans.). Glencoe, IL: Free Press. (Original work published 1897). 1897/1951.
121. Centers for Disease Control and Prevention. Strategic direction for the prevention of suicidal behavior: Promoting individual, family, and community connectedness to prevent suicidal behavior. 2009; Available at: [http://www.cdc.gov/ViolencePrevention/pdf/Suicide\\_Strategic\\_Direction\\_Full\\_version-a.pdf](http://www.cdc.gov/ViolencePrevention/pdf/Suicide_Strategic_Direction_Full_version-a.pdf).
122. Muennig P, Cohen AK, Palmer A, Zhu W. The relationship between five different measures of structural social capital, medical examination outcomes, and mortality. *Soc Sci Med*. 2013;85:18-26.
123. Beyer KM, Layde PM, Hamberger LK, Laud PW. Does neighborhood environment differentiate intimate partner femicides from other femicides? *Violence Against Women*. 2015;21(1):49-64.
124. Whitley R, McKenzie K. Social capital and psychiatry: review of the literature. *Harv Rev Psychiatry*. 2005;13(2):71-84.
125. De Silva MJ, McKenzie K, Harpham T, Huttly SR. Social capital and mental illness: a systematic review. *J Epidemiol Community Health*. 2005;59(8):619-627.
126. Wyman PA. Developmental approach to prevent adolescent suicides: research pathways to effective upstream preventive interventions. *Am J Prev Med*. 2014;47(3 Suppl 2):S251-256.
127. Centers for Disease Control and Prevention. Principles of community engagement. *CDC/ATSDR Committee on Community Engagement*. 1997.
128. Branas CC, Cheney RA, MacDonald JM, Tam VW, Jackson TD, Ten Have TR. A difference-in-differences analysis of health, safety, and greening vacant urban space. *Am J Epidemiol*. 2011;174(11):1296-1306.
129. Branas CC, Kondo MC, Murphy SM, South EC, Polsky D, MacDonald JM. Urban blight remediation as a cost-beneficial solution to firearm violence. *Am J Public Health*. 2016;106(12):2158-2164.
130. Bandura A. *Social foundations of thought and action: A social cognitive theory*. Prentice-Hall, Inc; 1986.
131. Pollock LR, Williams JM. Problem-solving in suicide attempters. *Psychol Med*. 2004;34(1):163-167.
132. Herman KC, Borden LA, Reinke WM, Webster-Stratton C. The Impact of the Incredible Years Parent, Child, and Teacher Training Programs on Children's Co-Occurring Internalizing Symptoms. *Sch Psychol Q*. 2011;26(3):189-201.
133. Knox MS, Burkhart K, Hunter KE. ACT against violence parents raising safe kids program: Effects on maltreatment-related parenting behaviors and beliefs. *Journal of Family Issues*. 2010.
134. Wasserman D, Hoven CW, Wasserman C, et al. School-based suicide prevention programmes: The SEYLE cluster-randomised, controlled trial. *Lancet*. 2014;385(9977):1536-1544.
135. Wilcox HC, Kellam SG, Brown CH, et al. The impact of two universal randomized first- and second-grade classroom interventions on young adult suicide ideation and attempts. *Drug Alcohol Depend*. 2008;95 Suppl 1:S60-73.
136. Kellam SG, Brown CH, Poduska JM, et al. Effects of a universal classroom behavior management program in first and second grades on young adult behavioral, psychiatric, and social outcomes. *Drug Alcohol Depend*. 2008;95 Suppl 1:S5-S28.





137. Webster-Stratton C, Jamila Reid M, Stoolmiller M. Preventing conduct problems and improving school readiness: evaluation of the incredible years teacher and child training programs in high-risk schools. *Journal of Child Psychology and Psychiatry*. 2008;49(5):471-488.
138. Webster-Stratton CH, Reid MJ, Beauchaine T. Combining parent and child training for young children with ADHD. *Journal of Clinical Child & Adolescent Psychology*. 2011;40(2):191-203.
139. Reid MJ, Webster-Stratton C, Hammond M. Follow-up of children who received the Incredible Years intervention for oppositional-defiant disorder: Maintenance and prediction of 2-year outcome. *Behavior Therapy*. 2003;34(4):471-491.
140. Webster-Stratton C, Hammond M. Treating children with early-onset conduct problems: a comparison of child and parent training interventions. *J Consult Clin Psychol*. 1997;65(1):93-109.
141. Webster-Stratton C, Reid MJ, Hammond M. Preventing conduct problems, promoting social competence: a parent and teacher training partnership in head start. *J Clin Child Psychol*. 2001;30(3):283-302.
142. Spoth RL, Guyll M, Day SX. Universal family-focused interventions in alcohol-use disorder prevention: cost-effectiveness and cost-benefit analyses of two interventions. *J Stud Alcohol*. 2002;63(2):219-228.
143. Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999-2014. *NCHS Data Brief*. Hyattsville, MD: National Center for Health Statistics; 2016.
144. Jobes DA. The Collaborative Assessment and Management of Suicidality (CAMS): an evolving evidence-based clinical approach to suicidal risk. *Suicide Life Threat Behav*. 2012;42(6):640-653.
145. Wilcox HC, Wyman PA. Suicide Prevention Strategies for Improving Population Health. *Child Adolesc Psychiatr Clin N Am*. 2016;25:219-233.
146. Isaac M, Elias B, Katz LY, et al. Gatekeeper training as a preventative intervention for suicide: a systematic review. *Can J Psychiatry*. 2009;54(4):260-268.
147. Gould MS, Munfakh JL, Kleinman M, Lake AM. National suicide prevention lifeline: enhancing mental health care for suicidal individuals and other people in crisis. *Suicide Life Threat Behav*. 2012;42(1):22-35.
148. Gilbody S, Bower P, Fletcher J, Richards D, Sutton AJ. Collaborative care for depression: a cumulative meta-analysis and review of longer-term outcomes. *Arch Int Med*. 2006;166(21):2314-2321.
149. Archer J, Bower P, Gilbody S, et al. Collaborative care for depression and anxiety problems. *Cochrane Database of Systematic Reviews*. 2012;10(Art No CD006525).
150. Bruce ML, Ten Have TR, Reynolds III CF, et al. Reducing suicidal ideation and depressive symptoms in depressed older primary care patients: a randomized controlled trial. *JAMA*. 2004;291(9):1081-1091.
151. Inagaki M, Kawashima Y, Kawanishi C, et al. Interventions to prevent repeat suicidal behavior in patients admitted to an emergency department for a suicide attempt: a meta-analysis. *J Affect Disord*. 2015;175:66-78.
152. Gould MS, Cross W, Pisani AR, Munfakh JL, Kleinman M. Impact of Applied Suicide Intervention Skills Training on the National Suicide Prevention Lifeline. *Suicide Life Threat Behav*. 2013;43(6):676-691.
153. Walrath C, Garraza LG, Reid H, Goldston DB, McKeon R. Impact of the Garrett Lee Smith youth suicide prevention program on suicide mortality. *Am J Public Health*. 2015;105(5):986-993.
154. Godoy Garraza L, Walrath C, Goldston DB, Reid H, McKeon R. Effect of the Garrett Lee Smith Memorial Suicide Prevention Program on Suicide Attempts Among Youths. *JAMA Psychiatry*. 2015;72(11):1143-1149.
155. Gould MS, Kalafat J, Harrismunfakh JL, Kleinman M. An evaluation of crisis hotline outcomes. Part 2: Suicidal callers. *Suicide Life Threat Behav*. 2007;37(3):338-352.
156. Hunkeler EM, Katon W, Tang L, et al. Long term outcomes from the IMPACT randomised trial for depressed elderly patients in primary care. *BMJ*. 2006;332(7536):259-263.
157. Unutzer J, Tang L, Oishi S, et al. Reducing suicidal ideation in depressed older primary care patients. *J Am Geriatr Soc*. 2006;54(10):1550-1556.





158. Comtois KA, Jobes DA, S. O'Connor S, et al. Collaborative assessment and management of suicidality (CAMS): feasibility trial for next-day appointment services. *Depress Anxiety*. 2011;28(11):963-972.
159. Linehan MM, Comtois KA, Murray AM, et al. Two-year randomized controlled trial and follow-up of dialectical behavior therapy vs therapy by experts for suicidal behaviors and borderline personality disorder. *Arch Gen Psychiatry*. 2006;63(7):757-766.
160. Diamond GS, Wintersteen MB, Brown GK, et al. Attachment-based family therapy for adolescents with suicidal ideation: a randomized controlled trial. *J Am Acad Child Adolesc Psychiatry*. 2010;49(2):122-131.
161. Rubenstein LV, Chaney EF, Ober S, et al. Using evidence-based quality improvement methods for translating depression collaborative care research into practice. *Families, Systems, & Health*. 2010;28(2):91-113.
162. Fleischmann A, Bertolote JM, Wasserman D, et al. Effectiveness of brief intervention and contact for suicide attempters: a randomized controlled trial in five countries. *Bull World Health Organ*. 2008;86(9):703-709.
163. Motto JA, Bostrom AG. A randomized controlled trial of postcrisis suicide prevention. *Psychiatr Serv*. 2001;52(6):828-833.
164. Hassanian-Moghaddam H, Sarjami S, Kolahi AA, Carter GL. Postcards in Persia: randomised controlled trial to reduce suicidal behaviours 12 months after hospital-treated self-poisoning. *Br J Psychiatry*. 2011;198(4):309-316.
165. Wang YC, Hsieh LY, Wang MY, Chou CH, Huang MW, Ko HC. Coping Card Usage can Further Reduce Suicide Reattempt in Suicide Attempter Case Management Within 3-Month Intervention. *Suicide Life Threat Behav*. 2016;46(1):106-120.
166. Brown GK, Ten Have T, Henriques GR, Xie SX, Hollander JE, Beck AT. Cognitive therapy for the prevention of suicide attempts: a randomized controlled trial. *JAMA*. 2005;294(5):563-570.
167. Pitman A, Osborn D, King M, Erlangsen A. Effects of suicide bereavement on mental health and suicide risk. *Lancet Psychiatry*. 2014;1:86-94.
168. Etzersdorfer E, Sonneck G. Preventing suicide by influencing mass-media reporting: The Viennese experience, 1980-1996. *Arch Suicide Res*. 1998;4(1):67-74.
169. Niederkrotenthaler T, Sonneck G. Assessing the impact of media guidelines for reporting on suicides in Austria: Interrupted time series analysis. *Aust N Z J Psychiatry*. 2007;41(5):419-428.
170. Szumilas M, Kutcher S. Post-suicide intervention programs: A systematic review. *Can J Public Health*. 2011;102(1):18-29.
171. Bohanna I, Wang X. Media guidelines for the responsible reporting of suicide: a review of effectiveness. *Crisis*. 2012;33(4):190-198.
172. Visser VS, Comans TA, Scuffham PA. Evaluation Of The Effectiveness Of A Community-Based Crisis Intervention Program For People Bereaved By Suicide. *Journal of Community Psychology*. 2014;42(1):19-28.
173. Cerel J, Campbell FR. Suicide survivors seeking mental health services: a preliminary examination of the role of an active postvention model. *Suicide Life Threat Behav*. 2008;38(1):30-34.
174. Niederkrotenthaler T, Voracek M, Herberth A, et al. Media and suicide. Papageno v Werther effect. *BMJ*. 2010;341:c5841.
175. Centers for Disease Control and Prevention. National Violent Death Reporting System. Atlanta, GA: Centers for Disease Control and Prevention, National Center for Injury Prevention and Control; 2017. Available online: <https://www.cdc.gov/injury/wisqars/nvdrs.html>.
176. The National Center for the Review & Prevention of Child Deaths. U.S. Child Death Review Programs. <https://www.childdeathreview.org/cdr-programs/u-s-cdr-programs/>.
177. Centers for Disease Control and Prevention, Brener ND, Kann L, et al. Methodology of the Youth Risk Behavior Surveillance System--2013. *MMWR Recomm Rep*. 2013;62(RR-1):1-20.









# Appendix: Summary of Strategies and Approaches to Prevent Suicide

Strategy	Approach/Program, Practice or Policy	Best Available Evidence			Lead Sectors <sup>1</sup>
		Suicide	Suicide Attempts or Ideation	Other Risk/Protective Factors for Suicide	
Strengthen economic supports	<b>Strengthening household financial security</b>				Government (local, state, Federal)
	<i>Unemployment benefit programs</i>	✓		✓	
	<i>Other income supports</i>	✓			Business/Labor
	<b>Housing stabilization policies</b>				Government (local, state, Federal)
	<i>Neighborhood Stabilization Program</i>			✓	
Strengthen access and delivery of suicide care	<b>Coverage of mental health conditions in health insurance policies</b>				Government (local, state, Federal)
	<i>Mental Health Parity Laws</i>	✓		✓	
	<b>Reduce provider shortages in underserved areas</b>				Healthcare
	<i>National Health Service Corps (NHSC)</i>			✓	
	<i>Telemental Health (TMH)</i>			✓	
	<b>Safer suicide care through systems change</b>				Social Services
	<i>Henry Ford Perfect Depression Care (Pre-cursor to Zero Suicide)</i>	✓		✓	
Create protective environments	<b>Reduce access to lethal means among persons at-risk</b>				Government (local, state)
	<i>Intervening at suicide hot spots</i>	✓			
	<i>Safe storage practices</i>		✓	✓	Public Health
	<i>Emergency Department Counseling on Access to Lethal Means (ED CALM)</i>			✓	Healthcare
	<b>Organizational policies and culture</b>				Business/labor
	<i>Together for Life</i>	✓			Justice
	<i>US Air Force Suicide Prevention Program</i>	✓		✓	Government (local, state, Federal)
	<i>Correctional suicide prevention</i>	✓			
	<b>Community-based policies to reduce excessive alcohol use</b>				Government (local, state)
	<i>Alcohol outlet density</i>	✓		✓	Business/labor
Promote connectedness	<b>Peer norm programs</b>				Public Health
	<i>Sources of Strength</i>			✓	Education
	<b>Community engagement activities</b>				Public Health
	<i>Greening vacant urban spaces</i>			✓	Government (local)

\*This column refers to the lead sectors well positioned to bring leadership and resources to implementation efforts. For each strategy, there are many other sectors such as non-governmental organizations that are instrumental to prevention planning and implementing specific activities.





Strategy	Approach/Program, Practice or Policy	Best Available Evidence			Lead Sectors <sup>1</sup>
		Suicide	Suicide Attempts or Ideation	Other Risk/Protective Factors for Suicide	
Teach coping and problem-solving skills	<b>Social-emotional learning programs</b>				Public Health Education
	Youth Aware of Mental Health Program		✓	✓	
	Good Behavior Game		✓	✓	
	<b>Parenting skill and family relationship approaches</b>				Public Health Education
	The Incredible Years			✓	
	Strengthening Families 10–14			✓	
Identify and support people at-risk	<b>Gatekeeper training</b>				Public Health Health Care
	Applied Suicide Intervention Skills Training			✓	
	Garret Lee Smith Federal Grant Program	✓	✓		
	<b>Crisis intervention</b>				Public Health Social Services
	National Suicide Prevention Lifeline		✓	✓	
	<b>Treatment for people at risk of suicide</b>				Healthcare Social Services Justice
	Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)		✓	✓	
	Collaborative Assessment and Management of Suicidality (CAMS)		✓	✓	
	Dialectical Behavioral Therapy (DBT)		✓	✓	
	Attachment-Based Family Therapy (ABFT)		✓		
	Translating Initiatives for Depression into Effective Solutions project (TIDES)			✓	
	<b>Treatment to prevent re-attempts</b>				Healthcare Social Services
	ED Brief Intervention with Follow-up Visits	✓			
	Active follow-up contact approaches	✓	✓		
	CBT for Suicide Prevention		✓		
Lessen harms and prevent future risk	<b>Postvention</b>				Healthcare
	StandBy Response Service		✓	✓	
	<b>Safe reporting and message about suicide</b>				Public Health Media
	Media Guidelines	✓			

\*This column refers to the lead sectors well positioned to bring leadership and resources to implementation efforts. For each strategy, there are many other sectors such as non-governmental organizations that are instrumental to prevention planning and implementing specific activities.



## For more information

To learn more about preventing child abuse and neglect, call 1-800-CDC-INFO or visit CDC's violence prevention pages at [www.cdc.gov/violenceprevention](http://www.cdc.gov/violenceprevention).

National Center for Injury Prevention and Control  
Division of Violence Prevention



DRAFT NARRATIVE FOR CDC CLEARANCE

The information in this narrative has not been cleared for dissemination.  
Please do not cite, copy or disseminate

**Preventing Suicide:  
A Technical Package of Policy, Programs, and Practices**

**Prepared by:**

**Deb Stone, ScD, MSW, MPH  
Kristin Holland, PhD, MPH  
Brad Bartholow, PhD  
Alex Crosby, MD, MPH  
Shane Davis, PhD  
Natalie Wilkins, PhD**

**Division of Violence Prevention  
National Center for Injury Prevention and Control (NCIPC)  
Centers for Disease Control and Prevention**

**2017**



***Preventing Suicide: A Technical Package of Policies, Programs, and Practices* is a publication of the  
National Center for Injury Prevention and Control of the Centers for Disease Control and  
Prevention.**

Centers for Disease Control and Prevention  
Thomas R. Frieden, MD, MPH, Director

National Center for Injury Prevention and Control  
Debra E. Houry, MD, MPH, Director

Division of Violence Prevention  
James A. Mercy, PhD, Director

*Suggested Citation:* Stone, D.M., Holland, K.M., Bartholow, B., Crosby, A.E., Davis, S., and Wilkins, N.  
*Preventing Suicide: A Technical Package of Policies, Programs, and Practices*. Atlanta, GA: National  
Center for Injury Prevention and Control, Centers for Disease Control and Prevention, 2017.

## Contents

Acknowledgements.....	4
External Reviewers.....	5
Overview of Technical Package.....	6
Strengthen Economic Supports.....	14
Strengthen Access and Delivery of Suicide Care.....	17
Create Protective Environments.....	21
Promote Connectedness.....	26
Teach Coping and Problem-Solving Skills.....	28
Identify and Support People At-Risk.....	31
Lessen Harms and Prevent Future Risk.....	37
Sector Involvement.....	39
Monitoring and Evaluation.....	41
Conclusion.....	42
References.....	44
Appendix A.....	50



## Acknowledgments

We would like to thank the following individuals who contributed in specific ways to the development of this technical package. We give special thanks to Linda Dahlberg for her vision, guidance, and support throughout the development of this package. We thank Division, Center, and CDC leadership for their careful review and helpful feedback on earlier iterations of this document. We thank Alida Knuth for her formatting and design expertise. Last but definitely not least, we extend our thanks and gratitude to all the external reviewers for their helpful feedback, support and encouragement for this resource.

## External Reviewers

Casey Castaldi  
Prevention Institute

Carmen Clelland  
Office for State, Tribal, Local and Territorial  
Support, Centers for Disease Control and  
Prevention

Amalia Corby-Edwards  
American Psychological Association

Rachel Davis  
Prevention Institute

Pamela End of Horn  
Indian Health Service Headquarters

Craig Fisher  
American Psychological Association

Keita Franklin  
Department of Defense

Jill M. Harkavy Friedman  
American Foundation for Suicide Prevention

Jarrold Hindman  
Colorado Department of Public Health and  
Environment

Linda Langford  
Education Development Center, Inc.

Richard McKeon  
Substance Abuse and Mental Health Services  
Administration

Doreen S. Marshall  
American Foundation for Suicide Prevention

Christine Moutier  
American Foundation for Suicide Prevention

Jason H. Padgett  
Education Development Center, Inc.

Jerry Reed  
Education Development Center, Inc.

Christine Schuler  
National Institute for Occupational Safety and  
Health, Centers for Disease Control and  
Prevention

Morton Silverman  
Education Development Center, Inc.

Ellyson Stout  
Education Development Center, Inc.

Hope M. Tiesman  
National Institute for Occupational Safety and  
Health, Centers for Disease Control and  
Prevention

Dan Reidenberg  
Suicide Awareness Voices for Education (SAVE)

The experts above are listed with their affiliations at the time this document was reviewed.



## Overview

This technical package represents a select group of strategies based on the best available evidence to help communities and states sharpen their focus on prevention activities with the greatest potential to prevent suicide. These strategies include: strengthening economic supports; strengthening access ~~to mental health~~ and delivery of suicide care; creating protective environments; promoting connectedness; teaching coping and problem-solving skills; identifying and supporting people at-risk; and ~~intervening to~~ lessen harms and prevent future risk. The strategies represented in this package include those with a focus on preventing suicide from happening in the first place as well as approaches to lessen the immediate and long-term harms of suicidal behavior for individuals, families, communities, and society. The strategies in the technical package support the goals and objectives of the National Strategy for Suicide Prevention and the National Action Alliance for Suicide Prevention's priority to strengthen community-based prevention. Commitment, cooperation, and leadership from numerous sectors, including public health, education, justice, health care, social services, business, labor, and government can bring about the successful implementation of this package.

### What is a Technical Package?

A technical package is a compilation of a core set of strategies to achieve and sustain substantial reductions in a specific risk factor or outcome (Frieden, 2014). Technical packages help communities and states prioritize prevention activities based on the best available evidence. This technical package has three components. The first component is the **strategy** or the preventive direction or actions to achieve the goal of preventing suicide. The second component is the **approach**. The approach includes the specific ways to advance the strategy. This can be accomplished through *programs, policies, and practices*. The approaches included come primarily from studies based in the United States. The **evidence** for each of the approaches in preventing suicide or its associated risk factors is included as the third component. This package is intended as a resource to guide and inform prevention decision-making in communities and states.

### Preventing Suicide is a Priority

Suicide, as defined by the Centers for Disease Control and Prevention (CDC), is part of a broader class of behavior called *self-directed violence*. Self-directed violence refers to behavior directed at oneself that deliberately results in injury or the *potential* for injury (A.E. Crosby, Ortega, & Melanson, 2011). Self-directed violence may be *suicidal* or *non-suicidal* in nature. For the purposes of this document, we refer only to behavior where suicide is intended:

- **Suicide** is a death caused by self-directed injurious behavior with any intent to die as a result of the behavior.

- **Suicide attempt** is defined as a *non-fatal* self-directed and potentially injurious behavior with any intent to die as a result of the behavior. A suicide attempt may or may not result in injury.

**Suicide is highly prevalent.** Suicide presents a major challenge to public health in the United States and worldwide. It contributes to premature death, morbidity, lost productivity, and health care costs (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014). In 2014 (the most recent year of available death data), suicide was responsible for 42,773 deaths in the U.S., which is approximately one suicide every 12 minutes (Centers for Disease Control and Prevention, 2016). In 2014, suicide ranked as the 10th leading cause of death and has been among the top 12 leading causes of death since 1975 in the U.S (Centers for Disease Control and Prevention, 2016). Overall suicide rates increased 24% from 1999 to 2014 (Curtin, Warner, & Hedegaard, 2016). Suicide is a problem throughout the life span; it is the second leading cause of death among those aged 10–34 years; it is the fourth leading cause among persons in their 40s and seventh among persons in their 50s.

Suicide rates vary by race/ethnicity, age, and other population characteristics, with the highest rates across the lifespan occurring among non-Hispanic American Indian/Alaska Native (AI/AN) and non-Hispanic White population groups. In 2014, the rates for these groups were 17.8 and 16.4 per 100,000 population, respectively (Centers for Disease Control and Prevention, 2016). Other population groups disproportionately impacted by suicide include middle-aged adults (whose rates increased 48% from 1999 to 2014, with steep increases seen among both males (43%) and females (63%) aged 45-64 years; (Curtin et al., 2016); Veterans and other military personnel (whose suicide rate nearly doubled from 2003 to 2008, surpassing the rate of suicide among civilians for the first time in decades;(Bachynski et al., 2012; Lineberry & O'Connor); workers in certain occupational groups (e.g., protective service occupations; workers in farming, fishing, and forestry; McIntosh et al., 2016); and lesbian, gay, bisexual, and/or queer (LGBQ) youth, who experience increased suicidal ideation and behavior compared to their heterosexual counterparts (Kann et al., 2016; Russell & Joyner, 2001).

Suicides reflect only a portion of the problem (A.E. Crosby, Han, Ortega, Parks, & Gfroerer, 2011). Substantially more people are hospitalized as a result of nonfatal suicidal behavior (i.e. suicide attempts) than are fatally injured, and an even greater number are either treated in ambulatory settings (e.g., emergency departments) or not treated at all (A.E. Crosby, Han, et al., 2011). For example, during 2014, among adults aged 18 years and older, for every one suicide there were 9 adults treated in hospital emergency departments for self-harm injuries, 27 who reported making a suicide attempt, and over 227 who reported seriously considering suicide (i.e. ideation) (Ferdon et al., In press).

**Suicide is associated with several risk and protective factors.** Suicide, like other human behaviors, has no single determining cause. Instead, suicide occurs in response to multiple biological, psychological, interpersonal, environmental and societal influences that interact with one another, often over time.



The social-ecological model – encompassing multiple levels of focus from the individual, relationship, community, and societal – is a useful framework for viewing and understanding suicide risk factors identified in the literature (Dahlberg & Krug, 2002). Risk and protective factors for suicide exist at each level. For example, risk factors include:

- **Individual level:** history of depression and other mental illnesses, hopelessness, substance abuse, certain health conditions, previous suicide attempt, violence victimization and perpetration, and genetic and biological determinants
- **Relationship level:** high conflict or violent relationships, sense of isolation and lack of social support, family/loved one's history of suicide, financial and work stress
- **Community level:** inadequate community connectedness, barriers to health care (e.g., lack of access to providers and medications)
- **Societal level:** availability of lethal means of suicide, unsafe media portrayals of suicide, stigma associated with help-seeking and mental illness (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014).

It is important to recognize that the vast majority of individuals who are depressed, attempt suicide, or who have other risk factors noted, do *not* die by suicide. Furthermore, the relevance of each risk factor can vary by age, race, gender, sexual orientation, residential geography, and socio-cultural and economic status (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014).

Protective factors, or those influences that buffer against the risk for suicide, can also be found across the different levels of the social-ecological model. Protective factors identified in the literature include: effective coping and problem solving skills, moral objections to suicide, strong and supportive relationships with partners, friends, and family; connectedness to school, community, and other social institutions; availability of quality and ongoing physical and mental health care, and reduced access to lethal means (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014). These protective factors can either counter a specific risk factor or buffer against a number of risks associated with suicide.

**Suicide is connected to other forms of violence.** Exposure to violence (e.g., child abuse and neglect, bullying, peer violence, dating violence, sexual violence, and intimate partner violence) increases the risk of depression, post-traumatic stress disorder (PTSD), anxiety, suicide, and suicide attempts (Bossarte et al., 2014; D. P. Chapman et al., 2004; Dube et al., 2001; Felitti et al., 1998; Klomek, Sourander, & Gould, 2010; Leeb, Lewis, & Zolotor, 2011; World Health Organization, 2013). Women exposed to partner violence are nearly 5 times more likely to attempt suicide as women not exposed to partner violence (WHO, 2013). Exposure to adverse experiences in childhood, such as physical, sexual, emotional abuse and neglect, and living in homes with violence, mental health, substance abuse problems and other

instability, increases the risk for suicide and suicide attempts several fold (Bellis et al., 2014; Dube et al., 2001). The psychosocial effects of violence in childhood and adolescence can be observed decades later, including severe problems with finances, family, jobs, and stress – factors that increase the risk for suicide. Suicide and other forms of violence often share the same individual, relationship, community, and societal risk factors suggesting that efforts to prevent interpersonal violence may also prove beneficial in preventing suicide (Haegerich & Dahlberg, 2011; Hamby & Grych, 2013; Wilkins, Tsao, Hertz, Davis, & Klevens, 2014). Further, just as risk factors may be shared across suicide and interpersonal violence, so too may protective factors overlap. For example, connectedness to one's community (Kleiman, Riskind, Schaefer, & Weingarden, 2012), school (Carter, McGee, Taylor, & Williams, 2007), family (Maimon, Browning, & Brooks-Gunn, 2010), caring adults (Capaldi, Knoble, Shortt, & Kim, 2012; Losel & Farrington, 2012), and pro-social peers (Wyman et al., 2010) enhances resilience to suicide and other forms of violence.

**The health and economic consequences of suicide are substantial.** Suicide and suicide attempts have far reaching consequences for individuals, families, and communities (Dunne, McIntosh, & Dunne-Maxim, 1987; Mishara, 1995; National Action Alliance for Suicide Prevention: Suicide Attempt Survivors Task Force, 2014; National Action Alliance for Suicide Prevention: Survivors of Suicide Loss Task Force, 2015). In an early study, Crosby and Sacks (2002) estimated that 7% of the U.S. adult population, or 13.2 million adults, knew someone in the prior 12 months who had died by suicide. They also estimated that for each suicide, 425 adults were exposed, or knew about the death. In a more recent study, in one state, Cerel et al (2016) found that 48% of the population knew at least one person who died by suicide in their lifetime. Research indicates that the impact of knowing someone who died by suicide and/or having lived experience (i.e., personally have attempted suicide, have had suicidal thoughts, or have been impacted by suicidal loss) is much more extensive than injury and death. People with lived experience may suffer long-term health and mental health consequences ranging from anger, guilt, and physical impairment, depending on the means and severity of the attempt (A. L. Chapman & Dixon-Gordon, 2007). Similarly, survivors of a loved one's suicide may experience ongoing pain and suffering including complicated grief (Mitchell, Kim, Prigerson, & Mortimer-Stephens, 2004), stigma, depression, anxiety, post-traumatic stress disorder, and increased risk of suicidal ideation and suicide (Cerel, McIntosh, Neimeyer, Maple, & Marshall, 2014; Sudak, Maxim, & Carpenter, 2008). Less discussed but no less important, are the financial and occupational effects for those left behind (Florence, Simon, Haegerich, Luo, & Zhou, 2015).

The economic toll of suicide is immense as well. According to conservative estimates, in 2013, suicide cost \$50.8 billion in estimated lifetime medical and work-loss costs alone (Florence et al., 2015). Adjusting for potential under-reporting of suicide and drawing upon health expenditures per capita, GDP per capita, and variability among states in per capita health care expenditures and income, another study estimated the total lifetime costs associated with nonfatal injuries and deaths caused by self-directed violence to be approximately \$93.5 billion in 2013 (Shepard, Gurewich, Lwin, Reed, & Silverman, 2016). The overwhelming burden of these costs were from lost productivity over the life course, with the



average cost per suicide being over \$1.3 million (Shepard et al., 2016). The true economic costs are likely higher, as neither study included monetary figures related to other societal costs such as those associated with the pain and suffering of family members or other impacts.

**Suicide can be prevented.** Like most public health problems, suicide is preventable (U.S. Public Health Service, 1999). While progress will continue to be made into the future, evidence for numerous programs, practices, and policies currently exists, and many programs are ready to be implemented now. Just as suicide is not caused by a single factor, research suggests that reductions in suicide will not be prevented by any single strategy or approach (Silverman & Maris, 1995; U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). Rather, suicide prevention is best achieved by a focus across the individual, relationship, family, community, and societal-levels and across all sectors, private and public (e.g., business, public health, physical and behavioral healthcare, justice, education, and labor; National Action Alliance for Suicide Prevention, 2014; World Health Organization, 2014).

### Assessing the Evidence

This technical package includes programs, practices, and policies with evidence of impact on suicide or risk or protective factors for suicide. To be considered for inclusion in the technical package, the program, practice, or policy selected had to meet at least one of these criteria: a) meta-analyses or systematic reviews showing impact on suicide; b) evidence from at least one rigorous (e.g., randomized controlled trial [RCT] or quasi-experimental design) evaluation study that found significant preventive effects on suicide; c) meta-analyses or systematic reviews showing impact on risk or protective factors for suicide, or d) evidence from at least one rigorous (e.g., RCT or quasi-experimental design) evaluation study that found significant impacts on risk or protective factors for suicide. Finally, consideration was also given to the likelihood of achieving beneficial effects on multiple forms of violence; no evidence of harmful effects on specific outcomes or with particular subgroups; and feasibility of implementation in a U.S. context if the program, policy, or practice has been evaluated in another country.

Within this technical package, some approaches do not yet have research evidence demonstrating impact on rates of suicide but instead are supported by evidence indicating impacts on risk or protective factors for suicide (e.g., help-seeking, stigma reduction, depression, connectedness). In terms of the strength of the evidence, programs that have demonstrated effects on suicidal behavior (e.g., reductions in deaths, attempts) provide a higher-level of evidence, but the evidence base is not that strong in all areas. For instance, there has been less evaluation of community engagement and family programs on suicidal behavior. Thus, approaches in this package that have effects on risk or protective factors reflect the developing nature of the evidence base and the use of the best available evidence at a given time.

It is also important to note that there is often significant heterogeneity among the programs, policies, or practices that fall within one approach or strategy area in terms of the nature and quality of the available



evidence. Not all programs, policies, or practices that utilize the same approach are equally effective, and even those that are effective may not work across all populations. Tailoring programs and more evaluation may be necessary to address different population groups. The evidence-based programs, practices, or policies included in the package are not intended to be a comprehensive list for each approach, but rather to serve as examples that have been shown to impact suicide or have beneficial effects on risk or protective factors for suicide.

### Context and Cross-Cutting Themes

One important feature of the package is the complementary, but potentially synergistic impact of the strategies and approaches. The strategies and approaches included in this technical package represent different levels of the social ecology, with efforts intended to impact community and societal levels, as well individual and relationship levels. The strategies and approaches are intended to work in combination and reinforce each other to prevent suicide (see box below). The strategies are arranged in order such that those strategies hypothesized to have the greatest potential for broad public health impact on suicide are included first, followed by those that might impact more select populations (e.g., persons who have already made a suicide attempt).

Preventing Suicide	
Strategy	Approach
Strengthen economic supports	<ul style="list-style-type: none"> <li>Strengthen household financial security</li> <li>Housing stabilization policies</li> </ul>
Strengthen access and delivery of suicide care	<ul style="list-style-type: none"> <li>Coverage of mental health conditions in health insurance policies</li> <li>Reduce provider shortages in underserved areas</li> <li>Safer suicide care through systems change</li> </ul>
Create protective environments	<ul style="list-style-type: none"> <li>Reduce access to lethal means among persons at-risk of suicide</li> <li>Organizational policies and culture</li> <li>Community-based policies to reduce excessive alcohol use</li> </ul>
Promote connectedness	<ul style="list-style-type: none"> <li>Peer norm programs</li> <li>Community engagement activities</li> </ul>
Teach coping and problem-solving skills	<ul style="list-style-type: none"> <li>Social-emotional learning programs</li> <li>Parenting skill and family relationship approaches</li> </ul>
Identify and support people at risk	<ul style="list-style-type: none"> <li>Gatekeeper training</li> <li>Crisis Intervention</li> <li>Screening and treatment for people at risk of suicide</li> <li>Treatment to prevent re-attempts</li> </ul>
Lessen harms and prevent future risk	<ul style="list-style-type: none"> <li>Postvention</li> <li>Safe reporting following a suicide</li> </ul>



It is important to note that these strategies are not mutually exclusive but each has an immediate focus. For instance, social emotional learning programs, an approach under the *Teach Coping and Problem-Solving Skills* strategy, sometimes include components to change peer norms and the broader environment. The primary focus of these programs, however, is to provide children and youth with skills to resolve problems in relationships, school, and with peers, and to help youth address other negative influences (e.g., substance use) associated with suicide.

The goal of this package is to stress the importance of comprehensive prevention efforts and to provide examples of effective programs addressing each level of the social ecology, with the knowledge that some programs, practices, and policies may impact multiple levels. Further, those that involve multiple sectors and that impact multiple levels of the social ecology are more likely to have a greater impact on the overall burden of suicide.

Suicide ideation, thoughts, attempts, and deaths vary by gender, race/ethnicity, age, occupation, and other important population characteristics. Further, certain transition periods are also associated with higher rates of suicide (e.g., transition from working into retirement, transition from active duty military status to civilian status). In fact, suicide risk can change along with dynamic risk factors. For example, individuals' coping skills may change during periods of crisis and heightened stress, limiting their normal ability to effectively solve problems and cope. Research indicates that suicide risk changes as a result of the number and intensity of key risk and protective factors experienced (Turecki, 2014). Ideally, the availability of multiple strategies and approaches tailored to the social, economic, cultural, and environmental context of individuals and communities are desirable as they may increase the likelihood of removing barriers to supportive and effective care and provide opportunities to develop individual and community resilience.

Identifying programs, practices, and policies with evidence of impact on suicide, suicide attempts, or beneficial effects on risk or protective factors for suicide is only the first step. In practice, the effectiveness of the programs, policies and practices identified in this package will be strongly dependent on how well programs are implemented, as well as the partners and communities in which they are implemented. Practitioners in the field may be in the best position to assess the needs and strengths of their communities and work with community members to make decisions about the combination of approaches included here that are best suited to their context.

Data-driven strategic planning processes can help communities with this work (e.g., see Edwards, Jumper-Thurman, Plested, Oetting, & Swanson, 2000; Hawkins, Catalano, & Kuklinski, 2014; Plested, Edwards, & Jumper-Thurman, 2006). These planning processes engage and guide community stakeholders through a prevention planning process designed to address a community's profile of risk and protective factors with evidence-based programs, practices, and policies. These processes can also be used to monitor implementation, track outcomes, and make adjustments as indicated by the data. The readiness of the program for broad dissemination and implementation (e.g., availability of program

materials, training and technical assistance) can also influence program effects. Implementation guidance to assist practitioners, organizations and communities will be developed separately.

This package includes strategies where public health agencies are well positioned to bring leadership and resources to implementation efforts. It also includes strategies where public health can serve as an important collaborator (e.g., strategies addressing community and societal level risks), but where leadership and commitment from other sectors such as business, labor or health care is critical to implement a particular policy or program (e.g., workplace policies; [treatment to prevent re-attempts](#)). The role of various sectors in the implementation of a strategy or approach in preventing suicide is described further in the section on *Sector Involvement*.

In the sections that follow, the strategies and approaches with the best available evidence for preventing suicide are described.



## Strengthen Economic Supports

### Rationale

Studies from the U.S. examining historical trends indicate that suicide rates increase during economic recessions marked by high unemployment rates, job losses, and economic instability and decrease during economic expansions and periods marked by low unemployment rates, particularly for working-age individuals 25 to 64 years old (Luo et al., 2011; Fowler et al., 2015). Economic and financial strain, such as job loss, long periods of unemployment, reduced income, difficulty covering medical, food, and housing expenses, and even the anticipation of such financial stress may increase an individual's risk for suicide or may indirectly increase risk by exacerbating related physical and mental health problems. Buffering these risks can, therefore, potentially protect against suicide (Stack & Wasserman, 2007). For example, strengthening economic support systems can help people stay in their homes or obtain affordable housing while also paying for necessities such as food and medical care, job training, child care, among other expenses required for daily living. In providing this support, stress and anxiety and the potential for a crisis situation may be reduced, thereby preventing suicide. Although more research is needed to understand how economic factors interact with other factors to increase suicide risk, the available evidence suggests that strengthening economic supports may be one opportunity to buffer suicide risk.

### Approaches

Economic supports for individuals and families can be strengthened by targeting household financial security and ensuring stability in housing during periods of economic stress.

- **Strengthening household financial security** can potentially buffer the risk of suicide by providing individuals with the financial means to lessen the stress and hardship associated with a job loss or other unanticipated financial problems. The provision of unemployment benefits and other forms of temporary assistance, livable wages, medical benefits, and retirement and disability insurance to help cover the cost of necessities or to offset costs in the event of disability, are examples of ways to strengthen household financial security.
- **Housing stabilization policies** aim to keep people in their homes and provide housing options for those in need during times of financial insecurity. This may occur through programs that provide affordable housing such as through government subsidies or through other options available to potential homebuyers such as loan modification programs, move-out planning, or financial counseling services that help minimize the risk or impact of foreclosures and eviction.



## Potential Outcomes

- Reductions in foreclosure rates
- Reductions in eviction rates
- Reductions in emotional distress
- Reductions in suicide

## Evidence

There is evidence suggesting that strengthening household financial security and stabilizing housing can reduce suicide risk.

- **Strengthen household financial security.** The *Federal-State Unemployment Insurance Program* allows states to define the maximum amount and duration of unemployment benefits that workers are entitled to receive after a job loss (Cylus, Glymour, & Avendano, 2014). An examination of variations in *unemployment benefit programs* across states demonstrated that the impact of unemployment on rates of suicide was offset in those states that provided greater than average unemployment benefits (mean level: \$7,990 per person in U.S. constant dollars; Cylus et al., 2014). The effects of *unemployment benefit programs* were also consistent by sex and age group. Another U.S. study examining the link between unemployment and suicide rates using monthly suicide data, length of unemployment (less than 5 weeks, 5-14 weeks, 15-26 weeks, and greater than 26 weeks), and job losses found that the duration of unemployment, as opposed to just the loss of job, predicted suicide risk (Classen & Dunn, 2012). Together, these results suggest that not only should state unemployment benefit programs be generous in their financial allocations, but also in their duration.

Other measures to strengthen household financial security (e.g., transfer payments related to retirement and disability insurance, unemployment insurance compensation, medical benefits, and other forms of family assistance) have also shown an impact on rates of suicide. A study by Flavin and Radcliff (2009) examined the impact of states' per capita spending on transfer payments, medical benefits, and family assistance (Temporary Assistance to Needy Families – TANF) and total state spending on suicide rates between 1990-2000, controlling for a number of suicide risk factors (e.g., residential mobility, divorce rate, unemployment rate) at the state level. As per capita spending on total transfer payments, medical benefits, and family assistance increased there was an associated decrease in state suicide rates. Moreover, it wasn't spending in general that was associated with the reduction but spending on these types of assistance. In terms of lives saved, Flavin & Radcliff calculated the cost of reducing a state's suicide rate by a full point for the years studied. At the national level, they estimated that 3,000 fewer suicides would occur per year nationwide if every state increased its per capita spending on these types of assistance by \$45 per year (Flavin & Radcliff, 2009). Although this was a correlational study,



the results demonstrate the potential benefits of policies that reach particularly vulnerable individuals during periods of great need and increased risk for suicide. More evaluation studies are needed to further understand the outcomes impacted by programs such as these.

- **Housing stabilization policies.** The *National Neighborhood Stabilization Program* was designed to help neighborhoods suffering from high rates of foreclosure and abandonment by slowing the deterioration of the neighborhoods and providing affordable housing options for low, moderate, and middle-income homebuyers. This program also offers financial assistance to eligible individuals for the purchase of a new home. Although this program has not been rigorously evaluated for its impact on suicide outcomes, it addresses foreclosure and eviction, which are risk factors for suicide. A longitudinal analysis of annual data on suicides and foreclosures demonstrated that as the proportion of foreclosed properties increased in U.S. states, so did the state suicide rate, particularly among working-aged adults (Houle & Light, 2014). Another study of data from 16 U.S. states participating in the National Violent Death Reporting System found that suicides precipitated by home foreclosures and evictions increased more than 100% from 2005 (before the housing crisis began) to 2010 (after it had peaked; Fowler, Gladden, Vagi, Barnes, and Frazier (2015)). Most of these suicides occurred prior to the actual loss of the decedent's home. These findings suggest that integrating suicide prevention resources, messaging, and referrals into financial, foreclosure, and move-out planning and counseling services may help to prevent suicide.

## Strengthen Access and Delivery of Suicide Care

### Rationale

While most people with mental health problems do not attempt or die by suicide (Olfson, Gerhard, Huang, Crystal, & Stroup, 2015; Owens, 2002), and the level of risk conferred by different types of mental illness varies (Arsenault-Lapierre, Kim, & Turecki, 2004; E. C. Harris & Barraclough, 1997; Tyrer, Reed, & Crawford, 2015), previous research indicates that mental illness is an important risk factor for suicide (E. C. Harris & Barraclough, 1998; World Health Organization, 2014). State-level suicide rates have also been found to be correlated with general mental health measures such as depression (Lang, 2013; Mark, Shern, Bagalman, & Cao, 2007). Findings from the National Comorbidity Survey indicate that relatively few people in the U.S. with mental health disorders receive treatment for those conditions (Kessler et al., 2005). Lack of access to mental health care is one of the contributing factors related to the underuse of mental health services (Cunningham, 2009). Identifying ways to improve access to timely, affordable, and quality mental health and suicide care for people in need is a critical component to prevention (World Health Organization, 2014). Additionally, research suggests that services provided are maximized when health and behavioral health care systems are set up to effectively and efficiently deliver such care (C.E. Coffey, 2007). Apart from treatment benefits, these approaches can also normalize help-seeking behavior and increase the use of such services.

### Approaches

There are a number of approaches that can be used to strengthen access and delivery of suicide care, including:

- **Coverage of mental health conditions in health insurance policies.** Federal and state laws include provisions for equal coverage of mental health services in health insurance plans that is on par with coverage for other health concerns (i.e., mental health parity). Benefits and services covered include such things as the number of visits, co-pays, deductibles, inpatient/outpatient services, prescription drugs, and hospitalizations. If a state has a stronger mental health parity law than the federal parity law, then insurance plans regulated by the state must follow the state parity law. If a state has a weaker parity law than the federal parity law (e.g., includes coverage for some mental health conditions but not others), then the federal parity law will replace the state law. Equal coverage does not necessarily imply good coverage as health insurance plans vary in the extent to which benefits and services are offered to address various health conditions. Rather it helps to ensure that mental health services are covered on par with other health concerns.
- **Reduce provider shortages in underserved areas.** Access to effective and state-of-the-art mental health care is largely dependent upon the training and the size of the mental health care workforce. Over 85 million Americans live in areas with an insufficient number of mental health



providers; this shortage is particularly severe among low-income urban and rural communities (U.S. Department of Health and Human Services Health Resources and Services Administrations, 2016a). There are a number of ways to increase the number and distribution of practicing mental health providers in underserved areas including offering financial incentives through existing state and federal programs (e.g., loan repayment programs) and expanding telemental health services. Such approaches can increase the likelihood that those in need will be able to access affordable, quality care for mental health problems, which can reduce risk for suicide.

- **Safer suicide care through systems change.** Access to health and behavioral health care services is critical for people at risk of suicide; however this is just one piece of the puzzle. Care being accessed must should also be *delivered* efficiently and effectively. More specifically, care should take place within a system that supports suicide prevention and patient safety through strong leadership, workforce training, systematic identification and assessment of suicide risk, implementation of evidence-based treatments (see *Identify and Support People At-Risk*, p.31), continuity of care, and continuous quality improvement. Care that is patient-centered and promotes equity for all patients is also of critical importance (National Action Alliance for Suicide Prevention: Clinical Workforce Preparedness Task Force, 2014).

#### Potential Outcomes

- Increases in access to mental health services
- Increase in utilization of mental health services
- Reductions in symptoms of mental illnesses and suicidality
- Reductions in rates of suicide attempts
- Reductions in rates of suicide

#### Evidence

There is evidence suggesting that coverage of mental health conditions in health insurance policies and improving access and the delivery of care can reduce risk factors associated with suicide and may directly impact suicide rates.

- **Coverage of mental health conditions in health insurance policies.** The National Survey of Drug Use and Health is a nationally representative survey of the U.S. population that provides data on substance use, mental health conditions, and services utilization. Using data from this survey, K. M. Harris, Carpenter, and Bao (2006) found that 12 months after states enacted *mental health parity laws*, self-reported use of mental healthcare services significantly increased. Moreover, subsequent research by Lang (2013) examined state mental health laws and suicide rates between 1990 and 2004 and found that mental health parity laws, specifically, were associated

**Comment [A]:** Cross-check the outcomes with the evidence presented and make sure everything is consistent.

with an approximate 5% reduction in suicide rates. This reduction, in the 29 states with parity laws, equated to the prevention of 592 suicides per year (Lang, 2013).

- **Reduce provider shortages in underserved areas.** One example of a program to improve access to mental health care providers is the *National Health Service Corps (NHSC)*, which offers financial incentives to attract mental/behavioral health clinicians to underserved areas. Programs such as *NHSC* encourage individuals to work in the mental health profession in locations designated as Health Professional Shortage Areas (HPSAs) in exchange for student loan debt repayment. A 2012 retention survey conducted by the Health Resources and Services Administration (HRSA), found that 61% of mental and behavioral health care providers continued to practice in designated mental health shortage areas after their four year commitment to The National Health Service Corps (U.S. Department of Health and Human Services Health Resources and Services Administrations, 2016b). Although this program has not been evaluated for impact on suicide, it addresses access to care, which is a critical component to suicide prevention. ~~NHSC is made possible by Title VII (Section 747, Primary Care Training) funding which improves the educational infrastructure of medical schools and residency programs to encourage physicians to work with underserved populations. Using data from the 2004 American Medical Association's Physician Masterfile and from Medicare claims data, one study demonstrated that attending a medical school or residency program that received Title VII training was positively associated with both participation in the NHSC loan repayment program and with staffing of community health centers serving underserved populations (Rittenhouse et al., 2008). While this evaluation focused on the commitment of primary care physicians to these programs, examination of the impact of such programs on improved care in underserved settings, among specialty physicians, such as psychiatrists, is still needed. Moreover, between 2003 and 2008, Title VII funds were reduced by almost 50%—from \$92 million per year to \$48 million, so additional study on the program's impact is needed.~~

**Comment [A]:** Suggest dropping this piece. It mostly speaks to primary care physicians and the funding is precarious.

*Telemental health (TMH)* services refer to the use of telephone, video and web-based technologies for providing psychiatric or psychological care at a distance. *TMH* can be used in a variety of settings (e.g. outpatient clinics, hospitals, military treatment facilities) to treat a wide range of mental health conditions. It can also improve access to care for patients in isolated areas, as well as reduce travel time and expenses, reduce delays in receiving care, and improve satisfaction interacting with the mental health care system. A systematic review of *TMH* services found that services rated as high or good quality were ~~associated with effectiveness~~ in treating mental health conditions such as depression, schizophrenia, substance abuse, and suicidal ideation and suicide ~~deathsmortality~~ among other outcomes (Hailey, Roine, & Ohinmaa, 2008).



Further, Mohr and colleagues (2008) conducted a meta-analysis examining the effect of psychotherapy delivered specifically via telephone and found that it significantly reduced depressive symptoms in comparison to face-to-face psychotherapy. They also found that treatment attrition rates were significantly lower among patients receiving telephone-administered psychotherapy compared to patients receiving face-to-face therapy. Thus, *TMH* may not only offer improved access to mental health care, but it may also ensure continuity of care, and thereby further reduce the risk for suicide.

- **Safer suicide care through systems change.** *Henry Ford* healthcare system, which is a large health maintenance organization (HMO) in the state of Michigan pioneered the *Perfect Depression Care* program, the pre-cursor to what is now called *Zero Suicide*. The overall goal of *Perfect Depression Care* was to eliminate suicide among HMO members. More broadly, the goal of the program was to redesign delivery of depression care to achieve “breakthrough improvement” in quality and safety by focusing on effectiveness, safety, patient centeredness, timeliness, efficiency, and equity among patients. The program screened and assessed each patient for suicide risk and implemented coordinated continuous follow-up care system wide (C. E. Coffey, 2006). An examination of the impact of the program found that there was a dramatic and statistically significant decrease in the rate of suicide between the baseline years, 1999 and 2000, prior to the intervention to the intervention years, 2002-2009. During this time period, the suicide rate fell by 82% (C. E. Coffey, 2006; C. E. Coffey, Coffey, & Ahmedani, 2013). Further, among HMO members who received mental health specialty services, the suicide rate significantly decreased over time from 1999 to 2010 (110.3 to 47.6 per 100,000;  $p < .04$ ) with a mean of 36.2 per 100,000 over the period. Additionally, for those HMO members who accessed only general medical services as opposed to specialty mental health services, the suicide rate increased from 2.7 to 5.6 per 100,000 ( $p < .01$ ). Similarly, in the state of Michigan, rates of suicide in the general population increased over the period from 9.8 to 12.5 per 100,000 ( $p < .001$ ) (M. Coffey, Coffey, & Ahmedani, 2015).

## Create Protective Environments

### Rationale

Prevention efforts that focus not only on individual behavior change (e.g., help-seeking, treatment interventions) but on changes to the environment can increase the likelihood of positive behavioral and health outcomes (Haddon, 1980). Creating environments that address risk and protective factors where individuals live, work, and play, can help prevent suicide (Dahlberg & Krug, 2002; U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). For example, rates of suicide are high among middle-aged adults (who comprise 42.6% of the workforce; Toosi, 2015); among certain occupational groups (e.g., farming, fishing, forestry, and construction; Han et al., 2016; McIntosh et al., 2016), and among people in detention facilities (e.g. jail, prison), to name a few. Thus, settings where these populations work and reside are ideal for implementing programs, practices and policies to buffer against suicide. Changes to organizational culture through the implementation of supportive policies, for instance, can change social norms, encourage help-seeking, and demonstrate that good health and mental health are valued and that stigma and other risk factors for suicide are not (Knox et al., 2010; National Action Alliance for Suicide Prevention Workplace Task Force, 2015). Similarly, modifying the characteristics of the physical environment to prevent harmful behavior such as access to lethal means can reduce suicide rates, particularly in times of crisis or transition (Beautrais, Gibb, Fergusson, Horwood, & Larkin, 2009; A.E. Crosby, Espitia-Hardeman, Ortega, & Lozano, 2013; Kaplan et al., 2013; Miller, Warren, Hemenway, & Azrael, 2015; Runyan et al., 2016; Stokes, McCoy, Abram, Byck, & Teplin, 2015).

### Approaches

The current evidence suggests three potential approaches for creating environments that protect against suicide.

- **Reduce access to lethal means among persons at-risk of suicide.** Means of suicide such as firearms, hanging/suffocation, or jumping from heights provide little opportunity for rescue and, as such, have high case fatality rates (e.g., about 85% of people who use a firearm in a suicide attempt will die from the injury). Research also indicates that: 1) the interval between deciding to act and attempting suicide can be as short as 5 or 10 minutes (Deisenhammer et al., 2009; Simon et al., 2001), and 2) that people tend *not* to substitute a different method when a highly lethal method is unavailable or difficult to access (Hawton, 2007; Yip et al., 2012). Therefore, increasing the time interval between deciding to act and the suicide attempt, for example, by making it more difficult to access lethal means, can be lifesaving. The following are examples of approaches reducing access to lethal means for persons at-risk of suicide:



- *Intervening at Suicide Hotspots.* Suicide hotspots, or places where suicides may take place relatively easily, include tall structures (e.g., bridges, cliffs, balconies, and rooftops), railway tracks, and isolated locations such as parks. Efforts to prevent suicide at these locations include erecting barriers or limiting access to prevent jumping, and installing signs and telephones to encourage individuals who are considering suicide, to seek help (Cox et al., 2013).
- *Safe Storage Practices.* Safe storage of medications, firearms, and other household products can reduce the risk for suicide by separating vulnerable individuals from easy access to lethal means. Such practices may include education and counseling around storing firearms--locked in a secure place (e.g., in a gun safe or lock box), unloaded and separate from the ammunition--and keeping medicines in a locked cabinet or other secure location away from people who may be at risk or who have made prior attempts (Rowhani-Rahbar, Simonetti, & Rivara, 2016; Runyan et al., 2016).

- **Organizational policies and culture** that promote protective environments may be implemented in places of employment, detention facilities, and other secured environments (e.g. residential **programs/settings**). Such policies and cultural values encourage leadership from the top down and may promote prosocial behavior (e.g., asking for help), skill building, positive social norms, assessment, referral and access to helping services (e.g. mental health, substance abuse treatment, financial counseling), and development of crisis response plans, postvention and other measures to foster a safe physical environment. Such policies and cultural shifts can positively impact organizational climate and morale and help prevent suicide and its related risk factors (e.g. depression, social isolation) (Hayes, 2013; National Action Alliance for Suicide Prevention Workplace Task Force, 2015).
- **Community-based policies to reduce excessive alcohol use.** Research studies in the United States have found that greater alcohol availability is positively associated with alcohol-involved suicides (Escobedo & Ortiz, 2002; Giesbrecht et al., 2015). Policies to reduce excessive alcohol use broadly include zoning to limit alcohol outlet locations and density, taxes on alcohol, and bans on the sale of alcohol for individuals under the legal drinking age. These policies are important because acute alcohol use has been found to be associated with more than one-third of suicides and approximately 40% of suicide attempts (Cherpitel, Borges, & Wilcox, 2004).

#### Potential **Outcomes**

- Increases in safe storage of lethal means
- Reductions in suicide attempts
- Reductions in suicide deaths

**Comment [A]:** Program doesn't seem to be the right word here. Are you referring to residential care facilities or something along those lines?

**Comment [A]:** Be sure to do a cross-walk between the outcomes listed here and the evidence described in the next section.

- Increases in help-seeking
- Reductions in alcohol-related suicide deaths

## Evidence

The evidence suggests that creating protective environments can reduce suicide and suicide attempts and increase protective behaviors.

- **Reduce access to lethal means among persons at-risk of suicide.** A meta-analysis examining the impact of *suicide hotspot interventions* implemented in combination or in isolation, both in the U.S. and abroad, found associated reduced rates of suicide (Cox et al., 2013; Pirkis et al., 2015). For example, after erecting a barrier on the Jacques-Cartier bridge in Canada, the suicide rate from jumping from the bridge decreased from about 10 suicide deaths per year to about 3 deaths per year (Perron, Burrows, Fournier, Perron, & Ouellet, 2013). Moreover, the reduction in suicides by jumping was sustained even when all bridges and nearby jumping sites were considered, suggesting little to no displacement of suicides to other jumping sites (Perron et al., 2013). Further evidence for the effectiveness of bridge barriers was demonstrated by a study examining the impact of the *removal* of safety barriers from the Grafton Bridge in Auckland, New Zealand. After removal of the barrier, both the number and rate of suicide increased fivefold (Beautrais, 2001; Beautrais et al., 2009).

Another form of means reduction involves implementation of *safe storage practices*. In a case-control study of firearm-related events identified from 37 counties in Washington, Oregon, and Missouri, and from 5 trauma centers, Grossman et al. (2005) found that storing firearms unloaded, separate from ammunition, in a locked place or secured with a safety device was protective of suicide attempts among adolescents. Further, a recent systematic review of clinic and community-based education and counseling interventions suggested that the provision of safety devices significantly increased safe firearm storage practices compared to counseling alone or compared to the provision of economic incentives to acquire safety devices on one's own (Rowhani-Rahbar et al., 2016).

Another program, *The Emergency Department Counseling on Access to Lethal Means (ED CALM)*, trained psychiatric emergency clinicians in a large children's hospital to provide lethal means counseling and safe storage boxes to parents of patients under age 18 receiving care for suicidal behavior. In a pre-post quality improvement project, Runyan et al. (2016) found that at post-test 76% (of the 55% of parents followed up, n=114) reported that all medications in the home were locked up as compared to fewer than 10% at the time of the initial emergency department visit. Among parents who indicated the presence of guns in the home at pre-test (i.e. 67%), all (100%) reported guns were currently locked up at post-test (Runyan et al., 2016).



- **Organizational policies and culture.** *Together for Life* is a workplace program of the Montreal Police Force implemented to address suicide among officers. Policy and program components were designed to foster an organizational culture that promoted mutual support and solidarity among all members of the Force. The program included training of supervisors, managers and all units to improve competencies in identifying suicidal risk and to improve use and awareness of existing resources. The program also included an education campaign to improve awareness and help-seeking (Mishara & Martin, 2012). Police suicides were tracked over 12 years and compared to rates in the control city of Quebec. The suicide rate in the intervention group decreased significantly by 78.9% to a rate of 6.4 suicides per 100,000 population per year compared to an 11% increase in the control city (29.0 per 100,000; Mishara & Martin, 2012).

Another example of this approach is the *United States Air Force Suicide Prevention Program*. The program included 11 policy and education initiatives and was designed to change the culture of the Air Force surrounding suicide. The program uses leaders as role models and agents of change, establishes expectations for behavior related to awareness of suicide risk, develops population skills and knowledge (i.e., education and training), and investigates every suicide (i.e., outcomes measurement). The program represents a fundamental shift from viewing suicide and mental illness solely as medical problem and instead sees them as larger service-wide problems impacting the whole community (Knox, Litts, Talcott, Feig, & Caine, 2003). Using a time-series design to examine the impact of the program on various violence-related outcomes, researchers found that the program was associated with a 33% relative risk reduction in suicide (Knox et al., 2003). The program was also associated with relative risk reductions in related outcomes including moderate and severe family violence (30% and 54%, respectively), homicide (51%), and accidental death (18%) (Knox et al., 2003). A longitudinal assessment of the program over the period 1981 to 2008 (16 years before the 1997 launch of the program and 11 years post-launch) found significantly lower rates of suicide after the program was launched than before (Knox et al., 2010). These effects were sustained over time, except in 2004, which the authors found was associated with less rigorous implementation in that year than in the other years (Knox et al., 2010).

*Mates in Construction (MATES)* is another example of a program designed to raise awareness of suicide as a safety issue facing workplace health, improve help-seeking, and link those in need to appropriate care. The program includes general awareness training for all construction workers on-site; training for "connectors" who serve to keep coworkers safe while connecting them to help; a 24-hour telephone response line and online counseling; and applied suicide intervention skills training for other individuals who are formally trained on-site to identify and respond to suicidal ideation and behavior. An examination of suicide rates among male construction workers in Queensland prior to the program (2003-2007) compared with rates for the five years of the

**Comment [A]:** I don't think the evidence is strong enough to include this example. I found a study in addition to the economic study you cite below, but the relative reduction among construction workers was not significant. Just mentioned this to Jim and he doesn't think it is strong enough to include.

program (2008-2012) and to general rates of male suicide in Queensland and Australia for the two time periods, found a ~~relative reduction of 7.9%~~ among construction industry workers during the years of the program (Martin, Swannell, Milner, & Gullestrup, 2016). The age-adjusted male suicide rate, by comparison, increased during the period 2008-2012. ~~An evaluation of the potential economic impact of widespread implementation of the program (Doran, Ling, Gullestrup, Swannell, & Milner, 2016) found that it could potentially avert 0.4 suicides, 1.01 full incapacity cases, and almost 5 short absences per year in the construction industry, generating an annual savings of \$3.66 million AU. They further indicated that every Australian dollar invested in the program would result in a \$4.60 return (Doran, Ling, Gullestrup, Swannell, & Milner, 2016).~~

Finally, while the evidence is still being built for suicide prevention in correctional facilities, preliminary evidence suggests that organizational policies and practices that include routine suicide prevention training for all staff, standardized intake screening and risk assessment, provision of shared information between staff members, especially in transitioning or transferring of inmates, varying levels of observation, safe physical environment, emergency response protocols, notification of suicidal behavior/suicide through the chain of command, and critical incident stress debriefing and death review can potentially reduce suicide. When these policies and practices were implemented across 11 state prisons in Louisiana, suicide rates dropped from a rate of 23.1 per 100,000 before the intervention to 12.4 per 100,000 the following year (Hayes, 1995). Other similar programs have seen declines in suicide both in the United States and internationally (Barker, Kölves, & De Leo, 2014).

- **Community-based policies to reduce excessive alcohol use.** While multiple policies to limit excessive use of alcohol exist, several studies on alcohol outlet *density*, specifically, suggest that measures to reduce alcohol outlet density can potentially reduce alcohol-involved suicides. Additionally, a longitudinal analysis of alcohol outlet density, suicide mortality, and hospitalizations for suicide attempts over 6 years in 581 California zip codes indicated that the density of bars, specifically, is related to suicide and suicide attempts, particularly in rural areas (Johnson, Gruenewald, & Remer, 2009).

**Comment [A]:** Non-significant reduction – they believe the study was underpowered.

**Comment [A]:** Martin G, Swannell S, Milner A, Gullestrup J (2016) Mates in Construction Suicide Prevention Program: A Five Year Review. J Community Medicine and Health Education, 6:465. doi:10.4172/2161-0711.1000465



## Promote Connectedness

### Rationale

Sociologist, Emile Durkheim theorized in 1897 that weak social bonds, i.e. lack of connectedness, are among the chief causes for suicidality (Durkheim, 1897/1951). *Connectedness* is the degree to which an individual or group of individuals are socially close, interrelated, or share resources with others (Centers for Disease Control and Prevention, 2009). Social connections can be formed within and between multiple levels of the social ecology (Dahlberg & Krug, 2002), for instance between individuals (e.g. peers, neighbors, co-workers), families, schools, neighborhoods, workplace, faith communities, cultural groups, and society as a whole. Related to connectedness, *social capital* refers to a sense of trust in one's community and neighborhood, social integration, and also the availability and participation in social organizations (Beyer, Layde, Hamberger, & Laud, 2015; Muennig, Cohen, Palmer, & Zhu, 2013). Many ecological cross-sectional and longitudinal studies have examined the impact of aspects of social capital on depression symptoms, depressive disorder, mental health more generally, and suicide. While the evidence is limited, existing studies suggest the pattern is towards a positive association between social capital measured by social trust, community/neighborhood engagement, and improved mental health. Connectedness and social capital together can serve to protect against suicidal behaviors by decreasing isolation, encouraging adaptive coping behaviors, increasing belongingness, personal value and worth all of which helps individuals to build resilience in the face of adversity. Connectedness can also provide individuals with better access to formal supports and resources, mobilize communities to meet the needs of its members and provide collective primary prevention activities to the community as a whole (Centers for Disease Control and Prevention, 2009).

### Approaches

Promoting connectedness among individuals and within communities through modeling peer norms and enhancing community engagement may protect against suicide.

- **Peer norm programs** seek to normalize protective factors for suicide such as help-seeking, reaching out and talking to trusted adults, and promote peer connectedness. By leveraging the leadership qualities and social influence of peers, these approaches can be used to shift group-level beliefs and promote positive social and behavioral change. These approaches typically target youth and are delivered in school settings but can also be implemented in community settings.
- **Community engagement activities.** Community engagement is an aspect of social capital. Community engagement approaches may involve residents participating in a range of activities, including religious activities, community clean-up and greening activities, and physical exercise. These activities provide opportunities for residents to become more involved in the community and to connect with other community members, organizations, and resources, resulting in

enhanced overall physical health, reduced stress, and decreased depressive symptoms, thereby reducing risk of suicide.

### Potential Outcomes

- Reductions in maladaptive coping attitudes and behaviors
- Increases in healthy coping attitudes and behaviors
- Increases in referrals for youth in distressed
- Increases help-seeking behaviors
- Increases in positive perceptions of adult support

### Evidence

Current evidence suggests a number of positive benefits of peer norm and community engagement activities, although more evaluation research is needed to examine whether these improvements in factors that protect against suicidal behavior translate into reduced suicide attempts and deaths.

- **Peer norm programs.** Evaluations show that programs such as *Sources of Strength* can improve school norms and beliefs about suicide that are created and disseminated by student peers. In a randomized controlled trial of *Sources of Strength* conducted with 18 high-schools (6 metropolitan, 12 rural), Wyman et al. (2010) found that the program improved adaptive norms regarding suicide among peer leaders, connectedness to adults, and school engagement. Peer leaders were also more likely than controls to refer a suicidal friend to an adult. For students, the program resulted in increased perceptions of adult support for suicidal youths, particularly among those with a history of suicidal ideation, and the acceptability of help-seeking behaviors. Finally, trained peer leaders also reported a greater decrease in maladaptive coping attitudes compared with untrained leaders (Wyman et al., 2010).
- **Community engagement activities.** A vacant lot greening initiative was undertaken in Philadelphia between 1999 and 2008. Local residents and community members worked together to green 4,436 lots (or 7.8 million square feet) in 4 areas of the city. Researchers found significant reductions in community residents' self-reported level of stress, which is a risk factor for suicide, and engagement in more physical exercise, a protective factor for suicide, than residents in control vacant lot areas. Other benefits included reductions in firearm assaults and vandalism (Branas et al., 2011).



## Teach Coping and Problem-Solving Skills

### Rationale

Building life skills prepares individuals to successfully tackle every day challenges and adapt to stress and adversity. Life skills encompasses many concepts, but most often include coping and problem-solving skills, emotional regulation, conflict resolution, and critical thinking. Life skills are important in shielding individuals from suicidal behaviors (World Health Organization, 2014). Suicide prevention programs that focus on life and social skills training are drawn from social cognitive theories (Bandura, 1986), surmising that suicidal behavior is attributed to either direct learning and modeling or environmental and individual (e.g. hopelessness) characteristics. The inability to employ adequate strategies to cope with immediate stressors or identify and find solutions for problems has been characterized among suicide attempters (Pollock & Williams, 2004). Teaching and providing youth with the skills to tackle every day challenges and stressors is, therefore, an important developmental component to suicide prevention.

### Approaches

Social emotional learning programs and parenting skill and family relationship programs are two approaches for teaching coping and problem-solving skills.

- **Social emotional learning programs** focus on developing and strengthening communication and problem-solving skills, emotion regulation, conflict resolution, help seeking and coping skills. These approaches address a range of risk and protective factors for suicidal behavior. They provide children and youth with skills to resolve problems in relationships, school, and with peers, and help youth to address other negative influences (e.g., substance use) associated with suicide. These approaches are typically delivered to all students in a particular grade or school, although some programs also focus on groups of students considered to be at high risk for suicide. Opportunities to practice and reinforce skills are an important part of programs that work (Herman, Borden, Reinke, & Webster-Stratton, 2011).
- **Parenting skill and family relationship programs** provide caregivers with support and are designed to strengthen parenting skills, enhance positive parent-child interactions, and improve children's behavioral and emotional skills and abilities. Programs are typically designed for parents or caregivers with children in a specific age range and can be self-directed or delivered to individual families or groups of families. Some programs have sessions primarily with parents or caregivers while others include sessions for parents or caregivers, youth, and the family. Specific program content typically varies by the age of the child but often has consistent themes of child development, parent-child communication and relationships, and youth's interpersonal and problem-solving skills.



## Potential Outcomes

- Reductions in suicide attempts and suicide ideation
- Reductions in suicide risk behaviors (i.e., depression, anxiety, conduct problems, substance abuse)
- Improvements in help-seeking behavior
- Improvements in social competence and emotional regulation skills
- Improvements in problem-solving and conflict management skills

## Evidence

Several social emotional learning and parenting and family relationship programs have been shown in rigorous evaluations to improve resilience and reduce problem behavior and risk factors for various behaviors, including ones closely related to suicide, such as depression, internalizing behaviors, and substance abuse (M. S. Knox, Burkhart, & Hunter, 2010).

- **Social emotional learning programs.** The *Youth Aware of Mental Health Program (YAM)* is a program developed for teenagers aged 14-16 that uses interactive dialogue and role-playing to teach adolescents about the risk and protective factors associated with suicide (including knowledge about depression and anxiety) and enhances their problem-solving skills for dealing with adverse life events, stress, school and other problems (Wasserman et al., 2014). In a cluster-randomized controlled trial conducted across 10 European Union countries and 168 schools, students in schools randomized to *YAM* were significantly less likely to attempt suicide and have severe suicidal ideation at the 12-month follow-up compared to students in control schools which received educational materials and care as usual. Overall, the relative risk of youth suicide attempts among the *YAM* group was reduced by over 50% demonstrating that out of 1000 students, five attempted suicide in the *YAM* group compared to 11 in the control group. Additionally, related to severe suicide ideation, in the *YAM* group absolute risk fell by 0.50% and relative risk fell by 49.6% (Wasserman et al., 2014).

Another example is the *Good Behavior Game (GBG)*, which is a classroom-based program for elementary school children aged 6-10. The program uses a team-based behavior management strategy that promotes good behavior by setting clear expectations for good behavior and consequences for maladaptive behavior. The goal of the *GBG* program is to create an integrated classroom social system that is supportive of all children being able to learn with little aggressive or disruptive behavior (Wilcox et al., 2008). Two cohorts of youths participated in the program in 1985-86 and 1986-87 school years when they were in the first and second grades. A number of proximal and distal outcomes were assessed among the two cohorts over time. With respect to distal suicide-related outcomes, an outcome evaluation of the *GBG* indicated that individuals in the first cohort who were assigned to participate in *GBG* when they were in the first grade reported half the adjusted odds of suicidal ideation



and suicide attempts when assessed approximately 15 years later, between the ages of 19 to 21, compared to peers who had been in a standard classroom setting. The beneficial effect of the program was consistent for suicidal ideation regardless of whether baseline covariates were included. The *GBG* effect on attempts was less robust in some adjusted models including caregiver mental health. In the second cohort of *GBG* students, neither suicidal ideation nor suicide attempts were significantly different between *GBG* and the control interventions (Wilcox et al., 2008). The researchers believed this may have been due to a lack of implementation fidelity. *GBG* was also found to be associated with reduced risk of later substance abuse, a risk factor for suicide (Kellam et al., 2008).

- **Parenting skill and family relationship programs.** Parenting and family skills training approaches have shown promising impacts in preventing key risk factors associated with suicide. For example, the *Incredible Years (IY)* is a comprehensive group training program for parents, teachers and children designed to reduce conduct and substance abuse problems, two important suicide risk factors in youth by improving protective factors such as responsive and positive parent-teacher-child interactions and relationships, emotion self-regulation and social competence (all protective factors for suicide) (Herman et al., 2011). The program includes 9-20 sessions offered in community-based settings (e.g., religious, recreation centers, mental health treatment centers, and hospitals). Several studies have demonstrated the effect of the *IY* program on reducing internalizing symptoms, such as anxiety and depression, and child conduct problems (C. H. Webster-Stratton, Reid, & Beauchaine, 2011; Webster-Stratton, Jamila Reid, & Stoolmiller, 2008). The program is also associated with improved problem-solving and conflict management; these skills were maintained at 1-year follow-up (Reid, Webster-Stratton, & Hammond, 2003; C. Webster-Stratton & Hammond, 1997; C. Webster-Stratton, Reid, & Hammond, 2001). The program demonstrated greater benefits as the dosage of the intervention increased (Herman et al., 2011).

Additionally, *Strengthening Families 10–14* is a program that involves sessions between parents, youth, and family with the goal of improving parents' skills for disciplining, managing emotions and conflict, and communicating with their children; promoting youths' interpersonal and problem-solving skills; and creating family activities to build cohesion and positive parent-child interactions. The premise of the program is that developing these skills for both parents and children will reduce internalizing behavior and adolescent substance abuse, two important risk factors for suicide (Spoth, Gyll, & Day, 2002). *Strengthening Families* has been shown to significantly decrease externalizing behaviors, such as aggression, alcohol use, and drug use among youth participants, as well as reduce depression, alcohol use, and drug use among participating families (Spoth et al., 2002).

## Identify and Support People At-Risk

### Rationale

In order to decrease suicide, ~~care of, and~~ attention to, ~~people at increased risk~~ vulnerable populations is necessary, as these ~~individuals groups~~ tend to experience suicidal behavior at higher than average rates. ~~These~~ Such vulnerable populations include, but are not limited to, individuals with lower socio-economic status or who are living with a mental health problem; people who have ~~previously~~ attempted suicide ~~previously~~; Veterans and active duty military personnel; individuals who are institutionalized, have been victims of violence, or are homeless; individuals of sexual minority status; and members of certain racial and ethnic minority groups (Bachynski et al., 2012; Centers for Disease Control and Prevention, 2016; Curtin et al., 2016; Kann et al., 2016; Lineberry & O'Connor; Russell & Joyner, 2001). Supporting these ~~vulnerable~~ groups requires proactive case finding ~~and effective response, crisis intervention, and evidence-based treatment~~ ~~along with access to, and retention in, mental health services~~. Finding ~~effective optimal~~ ways of identifying at-risk ~~or vulnerable groups~~ individuals, customizing services to make them ~~more~~ accessible (e.g., ~~internet-based services when appropriate~~) and engaging ~~people~~ in evidence-based care (e.g. through such measures as collaborative treatment), remain key challenges. ~~For example, S~~ simply improving ~~or expanding~~ services does not guarantee that those services will be used by ~~those people~~ most in need of them, nor will it necessarily increase the number of people who follow ~~treatments that are~~ recommended referrals or treatment. ~~For example, some p~~ People living in ~~economically disadvantaged communities areas may~~ face social and economic issues that ~~can~~ adversely affect their ability to ~~access supportive services~~.

Comment [A]: Not sure the rationale fully captures the treatment pieces; seems a bit heavy on access.

Comment [A]: Made edits below

Comment [A]: This sentence seemed problematic because we were saying we need to pay attention to people at increased risk because they have higher rates of suicidal behavior—that appeared circular so changed.

Comment [A]: This now falls under the second strategy.

Comment [A]: I revised the wording here, so that it is more clear that we are talking about economically disadvantaged areas and not “disadvantaged people”.

Comment [A]: I thought it sounded odd to use economic twice so changed first mention to low income.

### Approaches

The following approaches focus on identifying and supporting people at increased risk.

- **Gatekeeper training** is designed to train teachers, coaches, clergy, emergency responders, primary and urgent care providers, and others in the community to identify people who may be at risk of suicide and to respond effectively, including facilitating treatment seeking and support services. Gatekeeper training may be implemented in a variety of settings to identify and support people at risk.
- **Crisis intervention.** These approaches provide support and referral services, typically by connecting a person in crisis (or a friend or family member of someone at-risk) to trained volunteers or professional staff via telephone hotline, online chat, text messaging, or in-person. Crisis intervention approaches are intended to impact key risk factors for suicide, including feelings of depression, hopelessness, and subsequent mental health care utilization. Similar to means reduction, crisis interventions can put space or time between an individual who may be considering suicide and harmful behavior.



- **Treatment for people at-risk of suicide** can include various forms of psychotherapy delivered by licensed providers to help individuals with mental health problems and other suicide risk factors with problem-solving and emotion regulation. Treatment usually takes place in a one on one or group format between patients and clinicians and can vary in duration from several weeks to ongoing therapy, as needed. Treatment that employs collaborative (i.e., between patient and therapist or care manager) and/or integrated care (e.g., linkage between primary care and behavioral health care) can help engage and motivate patients, thereby increasing retention in therapy and decreasing suicide risk (Archer et al., 2012; Bruce et al., 2004; Gilbody, Bower, Fletcher, Richards, & Sutton, 2006).
- **Treatment to prevent re-attempts.** These approaches typically include follow-up contact and use diverse modalities (e.g., home visits, mail, telephone, e-mail) to engage recent suicide attempt survivors in continued treatment to prevent re-attempts. Treatment may focus on improved coping skills, mindfulness, and other emotional regulation skills, and may include case management home visits to increase adherence to treatment and continuity of care; and one-on-one interpersonal therapy and/or group therapy. Approaches that engage and connect attempters to peers and providers are especially important because many attempters do not present to aftercare; 12%-25% reattempt within a year, and 3%-9% of attempt survivors die by suicide within 1 to 5 years of their initial attempt (Inagaki et al., 2015)

**Comment [A]:** Need to do a cross-walk with the evidence presented for each approach to make sure all relevant outcomes are included here (and not just the ones that were there before the revision).

### Potential Outcomes

- Reductions in suicide attempts
- Reductions in suicide deaths
- Increases in identification of individuals at-risk for suicidal behavior
- Increases in at-risk individuals in treatment
- Increases in community members trained to identify at-risk individuals
- Increases in referrals for health care

### Evidence

The current evidence suggests that identifying people at risk of suicide and the continued provision of treatment and support for these individuals can positively impact suicide and its associated risk factors.

- **Gatekeeper training.** *Applied Suicide Intervention Skills Training (ASIST)* is a widely implemented training program that helps hotline counselors, emergency workers, and other gatekeepers to identify and connect with suicidal individuals, understand their reasoning for living and dying, and assist with safely connecting those in need to available resources. In a study employing a randomized controlled trial, Gould, Cross, Pisani, Munfakh, & Kleinman (2013) evaluated the

training across the *National Suicide Prevention Lifeline* network of hotlines over the period 2008-2009. Using data from 1,410 suicidal individuals who called 17 Lifeline centers, the researchers found that compared to callers who spoke to counselors that received the usual care training, individuals who spoke with counselors without training in *ASIST* were significantly more likely to feel depressed, suicidal, more overwhelmed, and less hopeful by the end of their call to the hotline compared to those with training in *ASIST*. Counselors trained in *ASIST* were also more skilled at keeping callers on the phone longer and establishing a connection with them. However, training in *ASIST* did not result in more comprehensive suicide risk assessments than usual care training (Gould et al., 2013).

Gatekeeper training has also been a primary component of the *Garret Lee Smith (GLS) Suicide Prevention Program*, which is in place in 49 states and 48 tribes. A multi-site evaluation assessed the impact of community gatekeeper training on suicide attempts and deaths by comparing the change in suicide rates and nonfatal suicidal behavior among young people aged 10-24 in counties implementing *GLS* trainings, with the trajectory observed in similar counties that did not implement these trainings. Counties that implemented *GLS* trainings had significantly lower youth suicide rates one year following the training implementation (Walrath, Garraza, Reid, Goldston, & McKeon, 2015). This finding equates to a decrease of 1 suicide death per 100,000 among youth ages 10 to 24, or the prevention of approximately 237 deaths in the age group, between 2007 and 2010. Counties implementing *GLS* program activities also had significantly lower suicide attempt rates among youth ages 16 to 23 in the year following implementation of the *GLS* program than did similar counties that did not implement *GLS* activities (4.9 fewer attempts per 1000 youths; Godoy Garraza, Walrath, Goldston, Reid, & McKeon, 2015). More than 79,000 suicide attempts may have been prevented during the period examined, following implementation of the *GLS* program.

- **Crisis intervention.** Suicide prevention hotlines are one way to provide crisis intervention. In an evaluation of the effectiveness of the *National Suicide Prevention Lifeline* to prevent suicide, 1,085 suicidal individuals who called the hotline completed a standard risk assessment for suicide, and 380 of those completed a follow-up assessment between 1 and 52 days (mean=13.5 days) after the initial assessment. Researchers found that over half of the initial sample were seriously considering suicide when they called, and they had a plan for their suicide. Researchers also found that among follow-up participants, there was a significant decrease in psychological pain, hopelessness, and intent to die between initiation of the call (time 1) to follow-up (time 3). Between time 2 (end of the call) to time 3, the effect remained for psychological pain and hopelessness, but was not significant for intent to die (Gould, Kalafat, Harrismunfakh, & Kleinman, 2007).



- **Treatment for people at-risk of suicide.** The *Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)* program aims to prevent suicide among older primary care patients by reducing suicide ideation and depression. *IMPACT* facilitates the development of a therapeutic alliance, a personalized treatment plan that includes patient preferences, as well as proactive follow-up (biweekly during an acute phase and monthly during continuation phase) by a depression care manager (Hunkeler et al., 2006). The program has been shown to significantly improve quality of life, and to reduce functional impairment, depression and suicidal ideation over 24-months of follow-up (Hunkeler et al., 2006; Unutzer et al., 2006) relative to patients who received care as usual.

*Collaborative Assessment and Management of Suicidality (CAMS)*, is a therapeutic approach for suicide-specific assessment and treatment. The program's flexible approach can be used across treatment settings and clinician theoretical orientations and involves the clinician and patient working together in an interactive assessment process to develop patient-specific treatment plans. Sessions are collaborative and involve constant patient input about what is and is not working with the ultimate goal of enhancing the therapeutic alliance and increasing treatment motivation in the suicidal patient. *CAMS* been tested and supported in 6 correlational studies (Jobes, 2012), in a variety of inpatient and outpatient settings, and in one RCT with several additional RCTs under way. A feasibility trial with a community-based sample of suicidal outpatients randomly assigned to *CAMS* or enhanced care as usual (intake with a psychiatrist or psychiatric nurse practitioner followed by 1-11 visits with a case manager and medication as needed) found better treatment retention among the *CAMS* group and significant improvements in suicidal ideation, overall symptom distress, and feelings of hopelessness at the 12 month follow-up (Comtois et al., 2011).

Other examples include *Dialectical Behavioral Therapy (DBT)* and *Attachment-Based Family Therapy (ABFT)*. *DBT* is a multicomponent therapy for individuals at high risk for suicide and who may struggle with impulsivity and emotional regulation. The components of *DBT* include individual therapy, group skills training, between-session telephone coaching and a therapist consultation team. In a randomized controlled trial of women with recent suicidal or self-injurious behavior, those receiving *DBT* were half as likely to make a suicide attempt at two-year follow-up than women receiving community treatment (23% vs 46%), required less hospitalization for suicide ideation, and had lower medical risk across all suicide attempts and self-injurious acts combined (Linehan et al., 2006).

*ABFT* is a program for adolescents aged 12-18 and is designed to treat clinically diagnosed major depressive disorder, eliminate suicidal ideation, and reduce dispositional anxiety (Diamond et al., 2010). A randomized controlled trial of *ABFT* found that suicidal adolescents assigned to *ABFT* experienced significantly greater improvement in suicidal ideation over 24 weeks of follow-up

than did adolescents assigned to enhanced usual care. Additionally, a significantly higher percentage of *ABFT* participants reported no suicidal ideation in the week prior to assessment at 12 weeks than did adolescents receiving enhanced usual care (69.2% vs. 34.6%) and at 24 weeks (82.1% vs. 46.2%) (Diamond et al., 2010).

The Veterans Affairs *Translating Initiatives for Depression into Effective Solutions* project (*TIDES*) uses a depression care liaison to link primary care and mental health services. The depression care liaison assesses and educates patients and follows up with both patients and providers between primary care visits to optimize treatment. This collaborative care increases the efficiency of providing mental health services by bringing mental health care to the primary care setting, where most patients are first detected and subsequently treated for many mental health conditions. An evaluation study of the *TIDES* project, specifically, found significant decreases in depression severity scores among 70% of primary care patients (Rubenstein et al., 2010). *TIDES* also demonstrated 85% and 95% compliance with medication and follow-up visits, respectively (Rubenstein et al., 2010).

- **Treatment to prevent re-attempts.** Several strategies that aim to prevent re-attempts have demonstrated impact on reducing suicide deaths. For example, *Emergency Department Brief Intervention with Follow-up Visits* is a program that involves a one-hour discharge information session that addresses suicidal ideation and **behavior attempts**, distress, risk and protective factors, alternatives to self-harm, and referral options, combined with nine follow-up contacts over 18 months (at 1, 2, 4, 7, 11 weeks and 4, 6, 12, 18 months). Follow-up contacts are either conducted by phone or through home visits according to a specific time line for up to 18-months. A randomized controlled trial that enrolled suicide attempters from eight hospital emergency departments in five countries (Brazil, India, Sri Lanka, Iran, and China) found that a brief intervention combined with 9 follow-up visits over 18-months was associated with significantly fewer deaths from suicide relative to a treatment-as-usual group (0.2% versus 2.2%, respectively) (Fleischmann et al., 2008).

Another example of treatment to prevent re-attempts involves *active follow-up contact approaches* such as postcards, letters, and telephone calls intended to increase a patient's sense of connectedness with health care providers and decrease isolation. These approaches include expression of care and support and typically invite patients to reconnect with their provider. Contacts are made periodically (e.g., monthly or every few months in the first 12 months post-discharge with some programs continuing contact for two or more years). In a meta-analysis conducted by Inagaki et al. (2015), interventions to prevent repeat suicide attempts in patients admitted to an emergency department for suicide attempt were found to reduce reattempts by approximately 17% for up to 12 months post-discharge; however, the effects of these approaches beyond 12 months on reattempts has not yet been demonstrated. Also, because the

Comment [A]: Attempts? Or should this say "self-harm"?



number of trials and associated sample sizes included in this meta-analysis were small, it was not possible to determine the effect of active contact and follow-up approaches on death by suicide.

In a randomized controlled trial of the post-crisis suicide prevention long-term follow-up contact approach, Motto and Bostrom (2001) found that patients who refused ongoing care but who were randomized to be contacted by letter four times per year had a lower rate of suicide over two years of follow-up than did patients in the control group who received no further contact. Other studies have also shown post-crisis letters and coping cards to be protective against suicide ideation and attempts (Hassanian-Moghaddam, Sarjami, Kolahi, & Carter, 2011; Wang et al., 2016).

Finally, *Cognitive Behavior Therapy for Suicide Prevention (CBT-SP)* is an example of a therapeutic approach to prevent re-attempts. It uses a risk-reduction, relapse prevention approach that includes an analysis of proximal risk factors and stressors (e.g., relationship problems, school or work-related difficulties) leading up to and following the suicidal event; safety plan development; skill building; and psychoeducation. *CBT-SP* also has family skill modules focused on family support and communication patterns as well as improving the family's problem solving skills. A randomized controlled trial of *CBT-SP* found that 10-session outpatient cognitive therapy designed to prevent repeat suicide attempts resulted in a 50% reduction in the likelihood of a suicide reattempt among adults who had been admitted to an emergency department for a suicide attempt relative to treatment as usual (Brown et al., 2005).

## Lessen Harms and Prevent Future Risk

### **(Rationale)**

Individuals who have experienced mental health challenges, suicidal ideation, who have made suicide attempts or engaged in non-suicidal self-injury are at increased risk of suicide (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). Millions of people are bereaved by suicide every year in the United States and throughout the world. Risk of suicide and suicide risk factors can also have been shown to increase among those people who have lost a friend/peer, family member, co-worker, or other acquaintance close contact to suicide (Pitman, Osborn, King, & Erlangsen, 2014). Care and attention to the bereaved is therefore of high importance. Despite the best of intentions, media and others responding to suicide may inadvertently add to this risk among the bereaved. For example, research suggests that exposure to sensationalized or otherwise uninformed reporting regarding suicide may heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to what is known as suicide contagion (Etzersdorfer & Sonneck, 1998; Niederkrotenthaler & Sonneck, 2007). Similarly, schools and other youth while the evidence is still being built in this area, particularly with regard to the impact of policy and practices on suicide and suicide attempts, taking effective measures to care for the bereaved population through such means as postvention interventions (e.g. counseling, support groups and debriefing sessions) and safe reporting on suicide may reduce risk of suicide.

### **Approaches**

There are a number of some approaches that can be used to lessen harms and reduce future risk of suicide including various therapeutic treatments and approaches providing continuity of care, caring for the bereaved, and safe reporting following a suicide.

- **Postvention** approaches are implemented *after* a suicide has taken place and may include debriefing sessions, counseling, and/or bereavement support groups for surviving friends and family members/loved ones. These programs have not typically been evaluated for their impact on suicide or suicidal behavior but may reduce survivors' guilt, feelings of depression, and complicated grief (Szumilas & Kutcher, 2011).
- **Safe reporting following a suicide.** The manner in which information on a recent suicide is communicated to the public (e.g. school assemblies, mass media, social media) can heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to suicide contagion. Therefore, responsible and safe reporting may help prevent suicide and suicide contagion.

**Comment [A]:** Need to modify the rationale so that it speaks to the primary approaches included below – perhaps starting with the second sentence and expanding on that a bit.

**Comment [A]:** This introductory statement needs to be modified now that this section only includes postvention and safe reporting following a suicide.

**Comment [A]:** Suggest fleshing this out a bit so that the reader has a good sense of what is meant by "safe reporting".



### Potential Outcomes

- Reductions in mental health-related sequelae
- Increases in connectedness
- Improvements in coping skills
- Improvements in messaging following suicide
- Reductions in re-attempts
- Reductions in contagion effects related to suicide

Comment [A]: Outcome section needs to be modified now that only postvention and safe reporting are included.

Comment [A]: Statement needs to be modified

### Evidence

Current evidence suggests that ~~therapeutic treatments and other approaches~~ for lessening harm through postvention and safe reporting can impact risk and protective factors for suicide.

- **Postvention** programs are implemented with the goal of providing support to survivors of others' suicide to reduce their own risk of suicide. One example of a postvention program, *StandBy Response Service (StandBy)*, provides clients with face-to-face outreach and telephone support through a professional crisis response team. Site coordinators develop customized case management plans, referring clients to other existing community services matched to their needs (Visser, Comans, & Scuffham, 2014). In a study by Visser et al. (2014), *StandBy* clients were significantly less likely to be at high risk for suicidality than a suicide bereaved comparison group who had not had contact with the *StandBy* program (48% and 64% respectively). Additionally, research suggests that active postvention approaches in which outreach to suicide survivors occurs at the scene of a suicide is associated with intake into treatment sooner, greater attendance at support group meetings, and attendance at more meetings compared to passive postvention (versus passive approaches where survivors self-refer for services) (Cerel & Campbell, 2008).
- **Safe reporting and messaging about suicide.** One way to ensure safe reporting and messaging about suicide is to encourage news media adhere to *Recommendations for Reporting on Suicide* (<http://www.reportingonsuicide.org>). Reports that are both inclusive of suicide prevention messages, stories of hope and resilience, risk and protective factors, and links to helping resources (e.g., hotline), and that avoid sensationalizing events or reducing suicide to one cause, can help reduce the likelihood of suicide contagion. The most compelling evidence supporting these recommendations for reporting comes from Austria. After a sharp increase in suicides on the Viennese subway, media guidelines were introduced and an interrupted time series design was used to evaluate the national impact of the guidelines on subsequent suicides. Changes in the quality and quantity of media reporting resulted in a nationwide significant reduction of 81 suicides annually (Niederkrotenthaler & Sonneck, 2007). Finally, research suggests that not only does reporting on suicide in a negative way (e.g., reporting on suicide myths and repetition) have



harmful effects on suicide, but reporting on positive coping skills in the face of adversity can also demonstrate protective effects against suicide (Niederkrotenthaler et al., 2010). Reports of individual suicidal ideation not accompanied by reports of suicide or suicide attempts, along with reports describing a “mastery” of a crisis situation where adversities were overcome, was associated with significant decreases in suicide rates in the time period immediately following such reports (Niederkrotenthaler et al., 2010).

## Sector Involvement

Public health can play an important and unique role in addressing suicide. Public health agencies, which typically place prevention at the forefront of efforts and work to create broad population-level impact, can bring critical leadership and resources to bear on this problem. For example, these agencies can serve as a convener, bringing together partners and stakeholders to plan, prioritize, and coordinate suicide prevention efforts. Public health agencies are also well positioned to collect and disseminate data, implement preventive measures, evaluate programs, and track progress. Although public health can play a leadership role in preventing suicide, the strategies and approaches outlined in this technical package cannot be accomplished by the public health sector alone. As noted in the National Strategy to Prevent Suicide, the integration and coordination of prevention activities across sectors and settings is critical for expanding the reach and impact of suicide prevention efforts.

Other sectors vital to implementing this package include, but are not limited to, education, government (local, state, and federal), social services, health services, business, labor, justice, housing, media, and organizations that comprise the civil society sector such as faith-based organizations, youth-serving organizations, foundations, and other non-governmental organizations. Collectively, these sectors can make a difference in preventing suicide by impacting the various contexts and underlying risks that contribute to suicide.

The strategies and approaches described in this technical package are summarized in Appendix A along with the relevant sectors that are well positioned to lead implementation efforts. For example, business and labor, the health sector (including insurers, ~~and~~ providers, and health systems), and government entities are in the best position to implement programs and policies that *Strengthen Economic Supports* and *Strengthen Access and Delivery of Suicide Care*. These types of supports go beyond individual behavior change and require commitment and support from those sectors that can directly address some of the underlying risks and the environmental contexts that increase the risk for suicide. Public health entities can play an important role by gathering and synthesizing information to inform policy, raise awareness, and evaluate the effectiveness of various policies. Moreover, partnerships with non-governmental and community organizations can be instrumental in increasing awareness of and garnering support for policies affecting individuals and families.



The public health sector has been at the forefront of many community-based prevention efforts, working collaboratively with schools and community-based organizations, to change social norms and positively impact health behavior. Public health is well suited to take on a similar leadership role in *Promoting Connectedness* through peer norm and community engagement activities and supporting the development, evaluation, and adoption of effective programs that *Teach Coping and Problem-Solving Skills* to prevent suicide from happening in the first place. These programs are often delivered in school and community settings, making education and non-governmental organizations vital partners in prevention.

Businesses, workplaces, and local and state government entities, on the other hand, are in the best position to establish policies and support practices that *Create Protective Environments* where people live, work, and play. Public health entities can play an important role by gathering and synthesizing information, working with other governmental agencies (e.g., criminal justice, defense) and agencies within the executive branch of their state or local government in support of policy and other approaches, and evaluating the effectiveness of measures taken. In a similar fashion, public health entities can partner with schools, workplaces, and community organizations to implement and evaluate prevention programs, policies and practices geared toward creating safe, healthy, and supportive environments.

Finally, this technical package includes a number of interventions delivered in hospital, primary care, behavioral health care, and community settings designed to *Identify and Support People At-Risk*. The intensity and activities for many of these interventions require the expertise of professionals who are licensed and trained to deliver critical intervention support. The health, social services, and justice sectors can work collaboratively to support individuals at high-risk for suicide and their families. These activities also require coordination of supports across various service providers and community organizations.

Regardless of strategy, action by many sectors will be necessary for the successful implementation of this package. In this regard, all sectors can play an important and influential role in preventing suicide from happening in the first place and lessening the immediate and long-term harms of suicidal behavior by helping those in times of crisis get the services and support they need.



## Monitoring and Evaluation

Monitoring and evaluation are necessary components of the public health approach to prevention. It is important to have timely and reliable data to monitor the extent of the problem and to evaluate the impact of prevention efforts. Data are also necessary for prevention planning and implementation.

Gathering ongoing and systematic data is important for prevention efforts. However, it is also important to gather data that are uniform and consistent across systems. Consistent data allow public health and other entities to better gauge the scope of the problem, identify high-risk groups, and monitor the effects of prevention programs and policies. Currently, it is common for different sectors, agencies, and organizations to employ varying definitions of suicidal ideation, behavior, and death that can make it difficult to consistently monitor specific outcomes across sectors and over time. For example, the manner in which deaths are classified can change from one jurisdiction to another, and can change based on local medical and/or medicolegal standards (A.E. Crosby, Ortega, et al., 2011). CDC's uniform definitions and recommended data elements for self-directed violence provide a useful framework to help ensure that data are collected in a consistent manner across surveillance systems (e.g., A.E. Crosby, Ortega, et al., 2011).

Surveillance systems exist at the federal, state, and local levels. It is important to assess the availability of surveillance data and data systems across these levels to identify and address gaps in the systems. CDC's *National Vital Statistics System (NVSS)* and the *National Violent Death Reporting System (NVDRS)* are examples of surveillance systems that provide data on deaths from suicide. *NVSS* is a nationwide surveillance system that collects demographic, geographic, and cause-of-death data from death certificates. *NVDRS* is a state-based surveillance system (currently in 40 states, the District of Columbia, and Puerto Rico) that combines data from death certificates, law enforcement reports, and coroner or medical examiner reports to provide detailed information on the circumstances of violent deaths, including suicide, which can assist communities in guiding prevention approaches (Blair, Fowler, Jack, & Crosby, 2016). Data from state and local Child Death Review teams and Suicide Death Review Teams (which are in a few states) offer another source to identify deaths and obtain insight into the gaps in services, systems, and modifiable risk factors for suicide.

The *National Electronic Injury Surveillance System-All Injury Program (NEISS-AIP)* provides nationally representative data about all types and causes of nonfatal injuries treated in U.S. hospital emergency departments, and can be used to assess national rates of, and trends in, self-harm injuries by cause (e.g., falls, poisoning, etc.), age, race/ethnicity, sex, disposition (where the injured person goes when released from the Emergency Department).

In addition to information on deaths and nonfatal injuries, there are also surveillance systems that provide national, state, and some local estimates of suicidal behavior. The *Youth Risk Behavior Surveillance System (YRBSS)* collects information from a nationally representative sample of 9-12 grade



students and is a key resource in monitoring health-risk behaviors among youth, including whether youth have seriously considered attempting suicide, attempted suicide, made a plan, or required treatment by a doctor or nurse for a suicide attempt that resulted in an injury, poisoning, or overdose (Brenner et al., 2013). The *YRBSS* data are obtained from a national school-based survey conducted by CDC as well as from state, territorial, tribal, and large urban school district surveys conducted by education and health agencies. The *National Survey on Drug Use and Health (NSDUH)* is an annual survey of the civilian, non-institutionalized population aged 12 years and older. *NSDUH* provides both national and state-level estimates of substance use (alcohol, tobacco, illicit drugs, and non-medical use of prescription drugs); mental health (past year mental illness, co-occurring illnesses); and service utilization, along with suicide ideation, suicide plans, and suicide attempts. *NSDUH* is a key resource to track trends in suicide-related risk factors in the population and to help identify groups at increased risk.

It is also important at all levels (local, state, and federal) to address gaps in responses, track progress of prevention efforts and evaluate the impact of those efforts, including the impact of this technical package. Evaluation data, produced through program implementation and monitoring, is essential to provide information on what does and does not work to reduce rates of suicide and its associated risk and protective factors. Theories of change and logic models that identify short, intermediate, and long-term outcomes are an important part of program evaluation.

The evidence-base for suicide prevention has advanced greatly over the last few decades. However, additional research is needed to understand the impact of programs, policies, and practices on suicide (and suicide attempts, at a minimum), as opposed to merely examining their effectiveness on risk factors.

More research is also needed to examine the effectiveness of primary prevention strategies (before risk occurs) and community-level strategies to prevent suicide at the population level. It will be important for researchers to test the effectiveness of combinations of the strategies and approaches included in this package. Most existing evaluations focus on approaches implemented in isolation, but there is potential to understand the synergistic effects within a comprehensive prevention approach. Lastly, there are also many potential opportunities to build and strengthen partnerships across program areas (e.g., violence prevention, substance abuse prevention) to evaluate the impact of different approaches on multiple outcomes.

**Comment [A]:** Last sentence added per suggestion of EDC. You can cite DVP's new Strategic Vision.

## Conclusion

Suicide is a serious public health problem whose rates have been on the rise for more than a decade and whose costs stretch well into the billions of dollars each year. While suicide is a rare outcome statistically, its human impact has a ripple effect that is far-reaching. Each of us likely interacts with suicide survivors, those with lived experience, and those with thoughts of suicide on a daily basis – at home, at work, and in our communities. Suicide and suicide attempts are public health issues of societal concern. There are a number of barriers that have impeded progress, including, for example, stigma related to help-seeking,

mental illness, being a survivor and fear related to asking someone about suicidal thoughts. Fortunately, like many public health problems, suicide is preventable, and more is being done to prevent suicide than ever before, as evidenced by the work of the National Action Alliance for Suicide Prevention, the release of the first world report on suicide, and more timely surveillance data, to name just a few examples.

In an effort to continue pushing the field and society further towards prevention, this technical package includes strategies and approaches that ideally would be used in a comprehensive, multi-level and multi-sectoral way. It includes strategies and approaches to prevent suicide from occurring in the first place, as well as strategies focused on lessening the immediate and long-term harms of suicidal behavior. It includes strategies that range from a focus on the whole population regardless of risk to strategies designed to support people at highest risk. Importantly, this technical package extends the bounds of the typical prevention strategies to consider approaches that go beyond individual behavior change to better address risk factors impacting communities and populations more broadly (e.g., economic policies to strengthen housing and financial security).

While the evidence base continues to emerge, the collection of programs, policies, and practices laid out here are available for implementation now. In keeping with good public health practice, the intent is that monitoring and evaluation will play a key role in that implementation. Moreover, as new evidence becomes available, this technical package can be refined to reflect the current state of the science.

In closing, and in keeping with a message of resilience as spoken by those with lived experience, ‘hope, help, and healing is possible.’



## References

- Archer, J., Bower, P., Gilbody, S., Lovell, K., Richards, D., Gask, L., . . . Coventry, P. (2012). Collaborative care for depression and anxiety problems. *The Cochrane Library*.
- Arsenault-Lapierre, G., Kim, C., & Turecki, G. (2004). Psychiatric diagnoses in 3275 suicides: a meta-analysis. *BMC Psychiatry*, 4, 37. doi:10.1186/1471-244X-4-37
- Bachynski, K. E., Canham-Chervak, M., Black, S. A., Dada, E. O., Millikan, A. M., & Jones, B. H. (2012). Mental health risk factors for suicides in the US Army, 2007–8. *Injury Prevention*, 18(6), 405-412.
- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*: Prentice-Hall, Inc.
- Barker, E., Kölves, K., & De Leo, D. (2014). Management of Suicidal and Self-Harming Behaviors in Prisons: Systematic Literature Review of Evidence-Based Activities. *Archives of Suicide Research*, 18(3), 227-240. doi:10.1080/13811118.2013.824830
- Beautrais, A. L. (2001). Effectiveness of barriers at suicide jumping sites: A case study. *Aust NZ J Psychiat*, 35. doi:10.1080/0004867010060501
- Beautrais, A. L., Gibb, S. J., Fergusson, D. M., Horwood, L. J., & Larkin, G. L. (2009). Removing bridge barriers stimulates suicides: An unfortunate natural experiment. *Aust NZ J Psychiat*, 43. doi:10.1080/00048670902873714
- Bellis, M. A., Hughes, K., Leckenby, N., Jones, L., Baban, A., Kachaeva, M., . . . Ulukol, B. (2014). Adverse childhood experiences and associations with health-harming behaviours in young adults: surveys in eight eastern European countries. *Bulletin of the World Health Organization*, 92(9), 641-655.
- Beyer, K. M., Layde, P. M., Hamberger, L. K., & Laud, P. W. (2015). Does neighborhood environment differentiate intimate partner femicides from other femicides? *Violence Against Women*, 21(1), 49-64. doi:10.1177/1077801214564075
- Blair, J. M., Fowler, K. A., Jack, S. P., & Crosby, A. E. (2016). The National Violent Death Reporting System: overview and future directions. *Inj Prev*, 22 Suppl 1, i6-i11. doi:10.1136/injuryprev-2015-041819
- Bossarte, R. M., Karras, E., Lu, N., Tu, X., Stephens, B., Draper, J., & Kemp, J. E. (2014). Associations between the Department of Veterans Affairs' suicide prevention campaign and calls to related crisis lines. *Public Health Rep*, 129(6), 516-525.
- Branas, C. C., Cheney, R. A., MacDonald, J. M., Tam, V. W., Jackson, T. D., & Ten Have, T. R. (2011). A difference-in-differences analysis of health, safety, and greening vacant urban space. *Am J Epidemiol*, 174(11), 1296-1306. doi:10.1093/aje/kwr273
- Brown, G. K., Ten Have, T., Henriques, G. R., Xie, S. X., Hollander, J. E., & Beck, A. T. (2005). Cognitive therapy for the prevention of suicide attempts: a randomized controlled trial. *JAMA*, 294(5), 563-570. doi:10.1001/jama.294.5.563
- Bruce, M. L., Ten Have, T. R., Reynolds III, C. F., Katz, I. I., Schulberg, H. C., Mulsant, B. H., . . . Alexopoulos, G. S. (2004). Reducing suicidal ideation and depressive symptoms in depressed older primary care patients: a randomized controlled trial. *JAMA*, 291(9), 1081-1091.
- Capaldi, D. M., Knoble, N. B., Shortt, J. W., & Kim, H. K. (2012). A Systematic Review of Risk Factors for Intimate Partner Violence. *Partner Abuse*, 3(2), 231-280. doi:10.1891/1946-6560.3.2.231
- Carter, M., McGee, R., Taylor, B., & Williams, S. (2007). Health outcomes in adolescence: associations with family, friends and school engagement. *J Adolesc*, 30(1), 51-62. doi:10.1016/j.adolescence.2005.04.002
- Centers for Disease Control and Prevention. (2009). Strategic direction for the prevention of suicidal behavior: Promoting individual, family, and community connectedness to prevent suicidal behavior. Retrieved from Available at: [http://www.cdc.gov/ViolencePrevention/pdf/Suicide\\_Strategic\\_Direction\\_Full\\_version-a.pdf](http://www.cdc.gov/ViolencePrevention/pdf/Suicide_Strategic_Direction_Full_version-a.pdf)
- Centers for Disease Control and Prevention. (2016). Web-Based Injury Statistics Query and Reporting System (WISQARS). Retrieved June 3, 2016 Available at: <http://www.cdc.gov/injury/wisqars/index.html>

- Cerel, J., & Campbell, F. R. (2008). Suicide survivors seeking mental health services: a preliminary examination of the role of an active postvention model. *Suicide Life Threat Behav*, 38(1), 30-34. doi:10.1521/suli.2008.38.1.30
- Cerel, J., Maple, M., De Venne, A., Moore, M., Flaherty, C., & Brown, M. (2016). Exposure to Suicide in the Community: Prevalence and Correlates in One US State. *Public Health Reports*, 131(1).
- Cerel, J., McIntosh, J. L., Neimeyer, R. A., Maple, M., & Marshall, D. (2014). The Continuum of "Survivorship": Definitional Issues in the Aftermath of Suicide. *Suicide and life-threatening behavior*, 44(6), 591-600. doi:10.1111/sltb.12093
- Chapman, A. L., & Dixon-Gordon, K. L. (2007). Emotional antecedents and consequences of deliberate self-harm and suicide attempts. *Suicide Life Threat Behav*, 37(5), 543-552. doi:10.1521/suli.2007.37.5.543
- Chapman, D. P., Whitfield, C. L., Felitti, V. J., Dube, S. R., Edwards, V. J., & Anda, R. F. (2004). Adverse childhood experiences and the risk of depressive disorders in adulthood. *J Affect Disord*, 82(2), 217-225.
- Cherpitel, C. J., Borges, G. L. G., & Wilcox, H. C. (2004). Acute alcohol use and suicidal behavior: A review of the literature. *Alcoholism: Clinical and Experimental Research*, 28(5 SUPPL.), 18S-28S.
- Classen, T. J., & Dunn, R. A. (2012). The effect of job loss and unemployment duration on suicide risk in the United States: a new look using mass-layoffs and unemployment duration. *Health Econ*, 21(3), 338-350. doi:10.1002/hecl.1719
- Coffey, C. E. (2006). Pursuing perfect depression care. *Psychiatr Serv*, 57(10), 1524-1526. doi:10.1176/ps.2006.57.10.1524
- Coffey, C. E. (2007). Building a system of perfect depression care in behavioral health. *Jt Comm J Qual Patient Saf*, 33(4), 193-199.
- Coffey, C. E., Coffey, M. J., & Ahmedani, B. K. (2013). An update on perfect depression care. *Psychiatr Serv*, 64(4), 396. doi:10.1176/appi.PS.640422
- Coffey, M., Coffey, C., & Ahmedani, B. K. (2015). Suicide in a health maintenance organization population. *JAMA Psychiatry*, 72(3), 294-296. doi:10.1001/jamapsychiatry.2014.2440
- Comtois, K. A., Jobes, D. A., S. O'Connor, S., Atkins, D. C., Janis, K., E. Chessen, C., . . . Yuodelis-Flores, C. (2011). Collaborative assessment and management of suicidality (CAMS): feasibility trial for next-day appointment services. *Depress Anxiety*, 28(11), 963-972. doi:10.1002/da.20895
- Cox, G. R., Owens, C., Robinson, J., Nicholas, A., Lockley, A., Williamson, M., . . . Pirkis, J. (2013). Interventions to reduce suicides at suicide hotspots: a systematic review. *BMC Public Health*, 13(1), 1-12. doi:10.1186/1471-2458-13-214
- Crosby, A. E., Espitia-Hardeman, V., Ortega, L., & Lozano, B. (2013). Alcohol and suicide. *Alcohol: Science, Policy and Public Health*, 190.
- Crosby, A. E., Han, B., Ortega, L., Parks, S. E., & Gfroerer, J. (2011). Suicidal Thoughts and Behaviors Among Adults Aged ≥18 Years — United States, 2008–2009. *MMWR*, 60(No. SS-13), 1-22.
- Crosby, A. E., Ortega, L., & Melanson, C. (2011). *Self-directed Violence Surveillance: Uniform Definitions and Recommended Data Elements, Version 1.0*. Retrieved from Atlanta, GA:
- Crosby, A. E., & Sacks, J. J. (2002). Exposure to Suicide: Incidence and Association with Suicidal Ideation and Behavior: United States, 1994. *Suicide and life-threatening behavior*, 32(3), 321-328. doi:10.1521/suli.32.3.321.22170
- Cunningham, P. J. (2009). Beyond parity: primary care physicians' perspectives on access to mental health care. *Health Aff (Millwood)*, 28(3), w490-501. doi:10.1377/hlthaff.28.3.w490
- Curtin, S. C., Warner, M., & Hedegaard, H. (2016). *Increase in suicide in the United States, 1999-2014*. ( ). Hyattsville, MD: National Center for Health Statistics Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/25116188>.
- Cylus, J., Glymour, M. M., & Avendano, M. (2014). Do generous unemployment benefit programs reduce suicide rates? A state fixed-effect analysis covering 1968-2008. *Am J Epidemiol*, 180(1), 45-52. doi:10.1093/aje/kwu106



- Dahlberg, L. L., & Krug, E. G. (2002). Violence-a global public health problem. In E. Krug, L. L. Dahlberg, J. A. Mercy, A. B. Zwi, & R. Lozano (Eds.), *World Report on Violence and Health* (pp. 1-56). Geneva, Switzerland: World Health Organization.
- Deisenhammer, E. A., Ing, C. M., Strauss, R., Kemmler, G., Hinterhuber, H., & Weiss, E. M. (2009). The duration of the suicidal process: how much time is left for intervention between consideration and accomplishment of a suicide attempt? *J Clin Psychiatry*, 70(1), 19-24.
- Diamond, G. S., Wintersteen, M. B., Brown, G. K., Diamond, G. M., Gallop, R., Shelef, K., & Levy, S. (2010). Attachment-based family therapy for adolescents with suicidal ideation: a randomized controlled trial. *J Am Acad Child Adolesc Psychiatry*, 49(2), 122-131.
- Doran, C. M., Ling, R., Gullestrup, J., Swannell, S., & Milner, A. (2016). The Impact of a Suicide Prevention Strategy on Reducing the Economic Cost of Suicide in the New South Wales Construction Industry. *Crisis*, 37(2), 121-129. doi:10.1027/0227-5910/a000362
- Dube, S. R., Anda, R. F., Felitti, V. J., Chapman, D. P., Williamson, D. F., & Giles, W. H. (2001). Childhood abuse, household dysfunction, and the risk of attempted suicide throughout the life span: findings from the Adverse Childhood Experiences Study. *JAMA*, 286(24), 3089-3096.
- Dunne, E. J., McIntosh, J. L., & Dunne-Maxim, K. (Eds.). (1987). *Suicide and its aftermath: Understanding and counseling the survivors*. New York: Norton.
- Durkheim, E. (1897/1951). *Suicide: A study in sociology* (JA Spaulding & G. Simpson, trans.). Glencoe, IL: Free Press. (Original work published 1897).
- Edwards, R. W., Jumper-Thurman, P., Plested, B. A., Oetting, E. R., & Swanson, L. (2000). Community readiness: Research to practice. *Journal of Community Psychology*, 28(3), 291-307.
- Escobedo, L. G., & Ortiz, M. (2002). The relationship between liquor outlet density and injury and violence in New Mexico. *Accid Anal Prev*, 34(5), 689-694.
- Etzersdorfer, E., & Sonneck, G. (1998). Preventing suicide by influencing mass-media reporting: The Viennese experience, 1980–1996. *Arch Suicide Res*, 4.
- Felitti, V. J., Anda, R. F., Nordenberg, D., Williamson, D. F., Spitz, A. M., Edwards, V., . . . Marks, J. S. (1998). Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: The Adverse Childhood Experiences (ACE) Study. *Am J Prev Med*, 14(4), 245-258.
- Ferdon, C., Crosby, A. E., Caine, E. D., Hindman J., Reed, G. A., & Iskander, J. (In press). CDC Public Health Grand Rounds: Preventing Suicide through a Comprehensive Public Health Approach. *MMWR*.
- Flavin, P., & Radcliff, B. (2009). Public policies and suicide rates in the American states. *Social Indicators Research*, 90(2), 195-209.
- Fleischmann, A., Bertolote, J. M., Wasserman, D., De Leo, D., Bolhari, J., Botega, N. J., . . . Thanh, H. T. (2008). Effectiveness of brief intervention and contact for suicide attempters: a randomized controlled trial in five countries. *Bulletin of the World Health Organization*, 86(9), 703-709. doi:S0042-96862008000900014 [pii]
- Florence, C., Simon, T., Haegerich, T., Luo, F., & Zhou, C. (2015). Estimated lifetime medical and work-loss costs of fatal injuries-United States, 2013. *MMWR: Morbidity and mortality weekly report*, 64(38), 1074-1077.
- Fowler, K. A., Gladden, R. M., Vagi, K. J., Barnes, J., & Frazier, L. (2015). Increase in suicides associated with home eviction and foreclosure during the US housing crisis: findings from 16 National Violent Death Reporting System States, 2005-2010. *Am J Public Health*, 105(2), 311-316. doi:10.2105/AJPH.2014.301945
- Frieden, T. R. (2014). Six components necessary for effective public health program implementation. *Am J Public Health*, 104(1), 17-22. doi:10.2105/AJPH.2013.301608
- Giesbrecht, N., Huguette, N., Ogden, L., Kaplan, M. S., McFarland, B. H., Caetano, R., . . . Nolte, K. B. (2015). Acute alcohol use among suicide decedents in 14 US states: impacts of off-premise and on-premise alcohol outlet density. *Addiction*, 110(2), 300-307. doi:10.1111/add.12762

- Gilbody, S., Bower, P., Fletcher, J., Richards, D., & Sutton, A. J. (2006). Collaborative care for depression: a cumulative meta-analysis and review of longer-term outcomes. *Archives of internal medicine*, 166(21), 2314-2321.
- Godoy Garraza, L., Walrath, C., Goldston, D. B., Reid, H., & McKeon, R. (2015). Effect of the Garrett Lee Smith Memorial Suicide Prevention Program on Suicide Attempts Among Youths. *JAMA Psychiatry*, 72(11), 1143-1149. doi:10.1001/jamapsychiatry.2015.1933
- Gould, M. S., Cross, W., Pisani, A. R., Munfakh, J. L., & Kleinman, M. (2013). Impact of Applied Suicide Intervention Skills Training on the National Suicide Prevention Lifeline. *Suicide Life Threat Behav*, 43(6), 676-691. doi:10.1111/sltb.12049
- Gould, M. S., Kalafat, J., Harrismunfakh, J. L., & Kleinman, M. (2007). An evaluation of crisis hotline outcomes. Part 2: Suicidal callers. *Suicide Life Threat Behav*, 37(3), 338-352. doi:10.1521/suli.2007.37.3.338
- Grossman, D. C., Mueller, B. A., Riedy, C., Dowd, M. D., Villaveces, A., Prodzinski, J., . . . Harruff, R. (2005). Gun storage practices and risk of youth suicide and unintentional firearm injuries. *JAMA*, 293(6), 707-714. doi:10.1001/jama.293.6.707
- Haddon, W. (1980). Advances in the epidemiology of injuries as a basis for public policy. *Public Health Reports*, 95(5), 411-421.
- Haegerich, T. M., & Dahlberg, L. L. (2011). Violence as a public health risk. *American Journal of Lifestyle Medicine*, 1559827611409127.
- Hailey, D., Roine, R., & Ohinmaa, A. (2008). The effectiveness of telemental health applications: a review. *The Canadian Journal of Psychiatry*, 53(11), 769-778.
- Hamby, S., & Grych, J. (2013). The web of violence: exploring connections among different forms of interpersonal violence and abuse *Briefs in Sociology*. New York, NY: Springer.
- Han, B., Crosby, A. E., Ortega, L. A., Parks, S. E., Compton, W. M., & Gfroerer, J. (2016). Suicidal ideation, suicide attempt, and occupations among employed adults aged 18–64 years in the United States. *Comprehensive psychiatry*, 66, 176-186.
- Harris, E. C., & Barraclough, B. (1997). Suicide as an outcome for mental disorders. A meta-analysis. *Br J Psychiatry*, 170, 205-228.
- Harris, E. C., & Barraclough, B. (1998). Excess mortality of mental disorder. *Br J Psychiatry*, 173, 11-53.
- Harris, K. M., Carpenter, C., & Bao, Y. (2006). The effects of state parity laws on the use of mental health care. *Med Care*, 44(6), 499-505. doi:10.1097/01.mlr.0000215813.16211.00
- Hassanian-Moghaddam, H., Sarjami, S., Kolahi, A. A., & Carter, G. L. (2011). Postcards in Persia: randomised controlled trial to reduce suicidal behaviours 12 months after hospital-treated self-poisoning. *British Journal of Psychiatry*, 198(4), 309-316.
- Hawkins, J. D., Catalano, R. F., & Kuklinski, M. R. (2014). Communities that care *Encyclopedia of Criminology and Criminal Justice* (pp. 393-408): Springer.
- Hawton, K. (2007). Restricting access to methods of suicide: Rationale and evaluation of this approach to suicide prevention. *Crisis*, 28. doi:10.1027/0227-5910.28.s1.4
- Hayes, L. M. (1995). Prison Suicide: An Overview and a Guide to Prevention. *The Prison Journal*, 75(4), 431-456. doi:10.1177/0032855595075004003
- Hayes, L. M. (2013). Suicide prevention in correctional facilities: reflections and next steps. *Int J Law Psychiatry*, 36(3-4), 188-194. doi:10.1016/j.ijlp.2013.04.010
- Herman, K. C., Borden, L. A., Reinke, W. M., & Webster-Stratton, C. (2011). The Impact of the Incredible Years Parent, Child, and Teacher Training Programs on Children's Co-Occurring Internalizing Symptoms. *Sch Psychol Q*, 26(3), 189-201. doi:10.1037/a0025228
- Houle, J. N., & Light, M. T. (2014). The home foreclosure crisis and rising suicide rates, 2005 to 2010. *Am J Public Health*, 104(6), 1073-1079. doi:10.2105/AJPH.2013.301774



- Hunkeler, E. M., Katon, W., Tang, L., Williams, J. W., Jr., Kroenke, K., Lin, E. H., . . . Unutzer, J. (2006). Long term outcomes from the IMPACT randomised trial for depressed elderly patients in primary care. *BMJ*, 332(7536), 259-263. doi:10.1136/bmj.38683.710255.BE
- Inagaki, M., Kawashima, Y., Kawanishi, C., Yonemoto, N., Sugimoto, T., Furuno, T., . . . Yamada, M. (2015). Interventions to prevent repeat suicidal behavior in patients admitted to an emergency department for a suicide attempt: a meta-analysis. *J Affect Disord*, 175, 66-78. doi:10.1016/j.jad.2014.12.048
- Jobes, D. A. (2012). The Collaborative Assessment and Management of Suicidality (CAMS): an evolving evidence-based clinical approach to suicidal risk. *Suicide Life Threat Behav*, 42(6), 640-653. doi:10.1111/j.1943-278X.2012.00119.x
- Johnson, F. W., Gruenewald, P. J., & Remer, L. G. (2009). Suicide and alcohol: do outlets play a role? *Alcohol Clin Exp Res*, 33(12), 2124-2133. doi:10.1111/j.1530-0277.2009.01052.x
- Kann, L., McManus, T., Harris, W. A., Shanklin, S. L., Flint, K. H., Hawkins, J., . . . Zaza, S. (2016). Youth Risk Behavior Surveillance - United States, 2015. *MMWR Surveill Summ*, 65(6), 1-174. doi:10.15585/mmwr.ss6506a1
- Kaplan, M. S., McFarland, B. H., Huguet, N., Conner, K., Caetano, R., Giesbrecht, N., & Nolte, K. B. (2013). Acute alcohol intoxication and suicide: a gender-stratified analysis of the National Violent Death Reporting System. *Inj Prev*, 19(1), 38-43. doi:10.1136/injuryprev-2012-040317
- Kellam, S. G., Brown, C. H., Poduska, J. M., Ialongo, N. S., Wang, W., Toyinbo, P., . . . Wilcox, H. C. (2008). Effects of a universal classroom behavior management program in first and second grades on young adult behavioral, psychiatric, and social outcomes. *Drug Alcohol Depend*, 95 Suppl 1, S5-S28. doi:10.1016/j.drugalcdep.2008.01.004
- Kessler, R. C., Demler, O., Frank, R. G., Olfson, M., Pincus, H. A., Walters, E. E., . . . Zaslavsky, A. M. (2005). Prevalence and treatment of mental disorders, 1990 to 2003. *N Engl J Med*, 352(24), 2515-2523. doi:10.1056/NEJMsa043266
- Kleiman, E. M., Riskind, J. H., Schaefer, K. E., & Weingarden, H. (2012). The moderating role of social support on the relationship between impulsivity and suicide risk. *Crisis*, 33(5), 273-279. doi:10.1027/0227-5910/a000136
- Klomek, A. B., Sourander, A., & Gould, M. (2010). The association of suicide and bullying in childhood to young adulthood: a review of cross-sectional and longitudinal research findings. *The Canadian Journal of Psychiatry*, 55(5), 282-288.
- Knox, K. L., Litts, D. A., Talcott, G. W., Feig, J. C., & Caine, E. D. (2003). Risk of suicide and related adverse outcomes after exposure to a suicide prevention programme in the US Air Force: cohort study. *BMJ*, 327(7428), 1376.
- Knox, K. L., Pflanz, S., Talcott, G. W., Campise, R. L., Lavigne, J. E., Bajorska, A., . . . Caine, E. D. (2010). The US Air Force suicide prevention program: implications for public health policy. *Am J Public Health*, 100(12), 2457-2463. doi:10.2105/ajph.2009.159871
- Lang, M. (2013). The impact of mental health insurance laws on state suicide rates. *Health Econ*, 22(1), 73-88. doi:10.1002/hecl.1816
- Leeb, R. T., Lewis, T., & Zolotor, A. J. (2011). A review of physical and mental health consequences of child abuse and neglect and implications for practice. *American Journal of Lifestyle Medicine*, 5(5), 454-468.
- Lineberry, T. W., & O'Connor, S. S. Suicide in the US Army. *Mayo Clinic Proceedings*, 87(9), 871-878. doi:10.1016/j.mayocp.2012.07.002
- Linehan, M. M., Comtois, K. A., Murray, A. M., Brown, M. Z., Gallop, R. J., Heard, H. L., . . . Lindenboim, N. (2006). Two-year randomized controlled trial and follow-up of dialectical behavior therapy vs therapy by experts for suicidal behaviors and borderline personality disorder. *Arch Gen Psychiatry*, 63(7), 757-766. doi:10.1001/archpsyc.63.7.757
- Losel, F., & Farrington, D. P. (2012). Direct protective and buffering protective factors in the development of youth violence. *Am J Prev Med*, 43(2 Suppl 1), S8-S23. doi:10.1016/j.amepre.2012.04.029

- Maimon, D., Browning, C. R., & Brooks-Gunn, J. (2010). Collective efficacy, family attachment, and urban adolescent suicide attempts. *J Health Soc Behav*, 51(3), 307-324. doi:10.1177/0022146510377878
- Mark, T. L., Shern, D. L., Bagalman, J. E., & Cao, Z. (2007). Ranking America's mental health: An analysis of depression across the states. Alexandria, VA: *Mental Health America*.
- McIntosh, W. L., Spies, E., Stone, D. M., Lokey, C. N., Trudeau, A. R., & Bartholow, B. (2016). Suicide Rates by Occupational Group - 17 States, 2012. *MMWR Morb Mortal Wkly Rep*, 65(25), 641-645. doi:10.15585/mmwr.mm6525a1
- Miller, M., Warren, M., Hemenway, D., & Azrael, D. (2015). Firearms and suicide in US cities. *Inj Prev*, 21(e1), e116-119. doi:10.1136/injuryprev-2013-040969
- Mishara, B. L. (Ed.) (1995). *The Impact of Suicide*. New York: Springer.
- Mishara, B. L., & Martin, N. (2012). Effects of a comprehensive police suicide prevention program. *Crisis: Journal of Crisis Intervention & Suicide*, 33(3), 162-168.
- Mitchell, A. M., Kim, Y., Prigerson, H. G., & Mortimer-Stephens, M. (2004). Complicated grief in survivors of suicide. *Crisis*, 25(1), 12-18. doi:10.1027/0227-5910.25.1.12
- Mohr, D. C., Vella, L., Hart, S., Heckman, T., & Simon, G. (2008). The effect of telephone-administered psychotherapy on symptoms of depression and attrition: A meta-analysis. *Clinical Psychology: Science and Practice*, 15(3), 243-253.
- Motto, J. A., & Bostrom, A. G. (2001). A randomized controlled trial of postcrisis suicide prevention. *Psychiatr Serv*, 52(6), 828-833.
- Muennig, P., Cohen, A. K., Palmer, A., & Zhu, W. (2013). The relationship between five different measures of structural social capital, medical examination outcomes, and mortality. *Soc Sci Med*, 85, 18-26. doi:10.1016/j.socscimed.2013.02.007
- National Action Alliance for Suicide Prevention. (2014). Research Prioritization Task Force.(2014). *A prioritized research agenda for suicide prevention: An action plan to save lives*.
- National Action Alliance for Suicide Prevention Workplace Task Force. (2015). *Comprehensive Blueprint for Workplace Suicide Prevention*. Washington, D.C. : Author.
- National Action Alliance for Suicide Prevention: Clinical Workforce Preparedness Task Force. (2014). *Suicide prevention and the clinical workforce: Guidelines for training*. Washington, D.C.: Author.
- National Action Alliance for Suicide Prevention: Suicide Attempt Survivors Task Force. (2014). *The Way Forward: Pathways to hope, recovery, and wellness with insights from lived experience*. Washington, D.C. : Author.
- National Action Alliance for Suicide Prevention: Survivors of Suicide Loss Task Force. (2015). *Responding to Grief, Trauma, and Distress After a Suicide: U.S. National Guidelines*. Washington, D.C. : Author.
- Niederkrotenthaler, T., & Sonneck, G. (2007). Assessing the impact of media guidelines for reporting on suicides in Austria: Interrupted time series analysis. *Aust N Z J Psychiatry*, 41. doi:10.1080/00048670701266680
- Niederkrotenthaler, T., Voracek, M., Herberth, A., Till, B., Strauss, M., Etzersdorfer, E., . . . Sonneck, G. (2010). Media and suicide. Papageno v Werther effect. *BMJ*, 341, c5841. doi:10.1136/bmj.c5841
- Olfson, M., Gerhard, T., Huang, C., Crystal, S., & Stroup, T. S. (2015). Premature Mortality Among Adults With Schizophrenia in the United States. *JAMA Psychiatry*, 72(12), 1172-1181. doi:10.1001/jamapsychiatry.2015.1737
- Owens, D. (2002). Fatal and non-fatal repetition of self-harm: Systematic review. *British Journal of Psychiatry*, 181(3), 193-199.
- Perron, S., Burrows, S., Fournier, M., Perron, P. A., & Ouellet, F. (2013). Installation of a bridge barrier as a suicide prevention strategy in Montreal, Quebec, Canada. *Am J Public Health*, 103(7), 1235-1239. doi:10.2105/ajph.2012.301089
- Pirkis, J., Too, L. S., Spittal, M. J., Krysinaka, K., Robinson, J., & Cheung, Y. T. D. (2015). Interventions to reduce suicides at suicide hotspots: a systematic review and meta-analysis. *The Lancet Psychiatry*, 2(11), 994-1001. doi:http://dx.doi.org/10.1016/S2215-0366(15)00266-7



- Pitman, A., Osborn, D., King, M., & Erlangsen, A. (2014). Effects of suicide bereavement on mental health and suicide risk. *Lancet Psychiatry*, 1, 86-94.
- Plested, B. A., Edwards, R. W., & Jumper-Thurman, P. (2006). Community readiness: A handbook for successful change. *Fort Collins, CO: Tri-Ethnic Center for Prevention Research*.
- Pollock, L. R., & Williams, J. M. (2004). Problem-solving in suicide attempters. *Psychol Med*, 34(1), 163-167.
- Reid, M. J., Webster-Stratton, C., & Hammond, M. (2003). Follow-up of children who received the Incredible Years intervention for oppositional-defiant disorder: Maintenance and prediction of 2-year outcome. *Behavior Therapy*, 34(4), 471-491.
- Rittenhouse, D. R., Fryer, G. E., Phillips, R. L., Miyoshi, T., Nielsen, C., Goodman, D. C., & Grumbach, K. (2008). Impact of Title VII training programs on community health center staffing and National Health Service Corps participation. *The Annals of Family Medicine*, 6(5), 397-405.
- Rowhani-Rahbar, A., Simonetti, J. A., & Rivara, F. P. (2016). Effectiveness of Interventions to Promote Safe Firearm Storage. *Epidemiol Rev*, 38(1), 111-124. doi:10.1093/epirev/mxv006
- Rubenstein, L. V., Chaney, E. F., Ober, S., Felker, B., Sherman, S. E., Lanto, A., & Vivell, S. (2010). Using evidence-based quality improvement methods for translating depression collaborative care research into practice. *Families, Systems, & Health*, 28(2), 91.
- Runyan, C. W., Becker, A., Brandspiegel, S., Barber, C., Trudeau, A., & Novins, D. (2016). Lethal Means Counseling for Parents of Youth Seeking Emergency Care for Suicidality. *West J Emerg Med*, 17(1), 8-14. doi:10.5811/westjem.2015.11.28590
- Russell, S. T., & Joyner, K. (2001). Adolescent sexual orientation and suicide risk: Evidence from a national study. *American Journal of Public Health*, 91(8), 1276-1281.
- Shepard, D. S., Gurewich, D., Lwin, A. K., Reed, G. A., Jr., & Silverman, M. M. (2016). Suicide and Suicidal Attempts in the United States: Costs and Policy Implications. *Suicide Life Threat Behav*, 46(3), 352-362. doi:10.1111/sltb.12225
- Silverman, M. M., & Maris, R. W. (1995). The prevention of suicidal behaviors: An overview. *Suicide and life-threatening behavior*, 25(1), 10-21.
- Simon, O. R., Swann, A. C., Powell, K. E., Potter, L. B., Kresnow, M. J., & O'Carroll, P. W. (2001). Characteristics of impulsive suicide attempts and attempters. *Suicide Life Threat Behav*, 32(1 Suppl), 49-59.
- Spoth, R. L., Gyll, M., & Day, S. X. (2002). Universal family-focused interventions in alcohol-use disorder prevention: cost-effectiveness and cost-benefit analyses of two interventions. *J Stud Alcohol*, 63(2), 219-228.
- Stack, S., & Wasserman, I. (2007). Economic strain and suicide risk: a qualitative analysis. *Suicide and life-threatening behavior*, 37(1), 103-112.
- Stokes, M. L., McCoy, K. P., Abram, K. M., Byck, G. R., & Teplin, L. A. (2015). Suicidal Ideation and Behavior in Youth in the Juvenile Justice System: A Review of the Literature. *J Correct Health Care*, 21(3), 222-242. doi:10.1177/1078345815587001
- Sudak, H., Maxim, K., & Carpenter, M. (2008). Suicide and stigma: a review of the literature and personal reflections. *Acad Psychiatry*, 32(2), 136-142. doi:10.1176/appi.ap.32.2.136
- Szumilas, M., & Kutcher, S. (2011). Post-suicide intervention programs: a systematic review. *Can J Public Health*, 102(1), 18-29.
- Toosi, M. (2015). *Labor force projections to 2024: The labor force is growing, but slowly*. Washington, D.C.: Bureau of Labor Statistics.
- Turecki, G. (2014). Epigenetics and suicidal behavior research pathways. *Am J Prev Med*, 47(3), S144-S151.
- Tyrer, P., Reed, G. M., & Crawford, M. J. (2015). Classification, assessment, prevalence, and effect of personality disorder. *Lancet*, 385(9969), 717-726. doi:10.1016/S0140-6736(14)61995-4
- U.S. Department of Health and Human Services Health Resources and Services Administrations. (2016a). *Designated Health Professional Shortage Areas Statistics, As of November 4, 2016*. Retrieved from <http://datawarehouse.hrsa.gov/topics/shortageAreas.aspx>.

- U.S. Department of Health and Human Services Health Resources and Services Administrations. (2016b). *NHSC Clinician Retention: A Story of Dedication and Commitment*. Retrieved from <https://nhsc.hrsa.gov/currentmembers/membersites/retainproviders/retentionbrief.pdf>.
- U.S. Office of the Surgeon General, & National Action Alliance for Suicide Prevention. (2012). *2012 National Strategy for Suicide Prevention: Goals and Objectives for Action*. Washington, D.C.: HHS.
- U.S. Public Health Service. (1999). *The Surgeon General's Call to Action to Prevent Suicide*. Washington, D.C.
- Unutzer, J., Tang, L., Oishi, S., Katon, W., Williams, J. W., Jr., Hunkeler, E., . . . Langston, C. (2006). Reducing suicidal ideation in depressed older primary care patients. *J Am Geriatr Soc*, 54(10), 1550-1556.
- Visser, V. S., Comans, T. A., & Scuffham, P. A. (2014). Evaluation Of The Effectiveness Of A Community-Based Crisis Intervention Program For People Bereaved By Suicide. *Journal of Community Psychology*, 42(1), 19-28. doi:10.1002/jcop.21586
- Walrath, C., Garraza, L. G., Reid, H., Goldston, D. B., & McKeon, R. (2015). Impact of the Garrett Lee Smith youth suicide prevention program on suicide mortality. *Am J Public Health*, 105(5), 986-993. doi:10.2105/AJPH.2014.302496
- Wang, Y. C., Hsieh, L. Y., Wang, M. Y., Chou, C. H., Huang, M. W., & Ko, H. C. (2016). Coping Card Usage can Further Reduce Suicide Reattempt in Suicide Attempter Case Management Within 3-Month Intervention. *Suicide Life Threat Behav*, 46(1), 106-120. doi:10.1111/sltb.12177
- Wasserman, D., Hoven, C. W., Wasserman, C., Wall, M., Eisenberg, R., Hadlaczky, G., . . . Carli, V. (2014). School-based suicide prevention programmes: The SEYLE cluster-randomised, controlled trial. *The Lancet*, 385(9977), 1536-1544. doi:10.1016/S0140-6736(14)61213-7
- Webster-Stratton, C., & Hammond, M. (1997). Treating children with early-onset conduct problems: a comparison of child and parent training interventions. *J Consult Clin Psychol*, 65(1), 93-109.
- Webster-Stratton, C., Reid, M. J., & Hammond, M. (2001). Preventing conduct problems, promoting social competence: a parent and teacher training partnership in head start. *J Clin Child Psychol*, 30(3), 283-302. doi:10.1207/S15374424JCCP3003\_2
- Webster-Stratton, C. H., Reid, M. J., & Beauchaine, T. (2011). Combining parent and child training for young children with ADHD. *Journal of Clinical Child & Adolescent Psychology*, 40(2), 191-203.
- Webster-Stratton, C., Jamila Reid, M., & Stoolmiller, M. (2008). Preventing conduct problems and improving school readiness: evaluation of the incredible years teacher and child training programs in high-risk schools. *Journal of child psychology and psychiatry*, 49(5), 471-488.
- Wilcox, H. C., Kellam, S. G., Brown, C. H., Poduska, J. M., Ialongo, N. S., Wang, W., & Anthony, J. C. (2008). The impact of two universal randomized first- and second-grade classroom interventions on young adult suicide ideation and attempts. *Drug Alcohol Depend*, 95 Suppl 1, S60-73.
- Wilkins, N., Tsao, B., Hertz, M., Davis, R., & Klevens, J. (2014). Atlanta, GA: National Center for Injury Prevention and Control, Centers for Disease Control and Prevention.
- World Health Organization. (2013). *Global and Regional Estimates of Violence Against Women: Prevalence and Health Effects of Intimate Partner Violence and Non-Partner Sexual Violence*. Geneva: World Health Organization.
- World Health Organization. (2014). *Suicide Prevention: A Global Imperative*. Geneva, Switzerland: WHO Press.
- Wyman, P. A., Brown, C. H., LoMurray, M., Schmeelk-Cone, K., Petrova, M., Yu, Q., . . . Wang, W. (2010). An outcome evaluation of the Sources of Strength suicide prevention program delivered by adolescent peer leaders in high schools. *Am J Public Health*, 100(9), 1653-1661. doi:
- Yip, P., Caine, E., Yousuf, S., Chang, S.-S., Wu, K., & Chen, Y.-Y. (2012). Means restriction for suicide prevention. *Lancet*, 379. doi:10.1016/s0140-6736(12)60521-2



## Appendix A: Summary of Strategies and Approaches to Prevent Suicide

Strategy	Approach/Program, Practice or Policy	Best Available Evidence			Lead Sectors <sup>1</sup>
		Suicide	Suicide Attempts or Ideation	Other Risk/Protective Factors for Suicide	
Strengthen economic supports	<b>Strengthen household financial security</b>				Government (local, state, Federal)
	<i>Unemployment benefit programs</i>	✓			
	<i>Other income supports</i>	✓			Business/labor
	<b>Housing stabilization policies</b>				Government (local, state, Federal)
	<i>The National Neighborhood Stabilization Program</i>			✓	
Strengthen access and delivery of suicide care	<b>Coverage of mental health conditions in health insurance policies</b>				Government (local, state, Federal)
	<i>Mental Health Parity Laws</i>	✓		✓	
	<b>Reduce provider shortages in underserved areas</b>				Healthcare
	<i>National Health Service Corps (NHSC)</i>			✓	
	<i>Telemental health (TMH)</i>			✓	Social services
	<b>Safer suicide care through systems change</b>				
	<i>Henry Ford Perfect Depression Care (Precursor to Zero Suicide)</i>	✓		✓	
Create protective environments	<b>Reduce access to lethal means among persons at-risk</b>				Government (local, state)
	<i>Intervening at suicide hot spots</i>	✓			
	<i>Safe storage practices</i>		✓	✓	Public Health

		Best Available Evidence			
	<b>Organizational policies and culture</b>				Business/Labor
	<i>Together for Life</i>	✓			Justice
	<i>US Air Force Suicide Prevention Program</i>	✓		✓	Government (local, state, Federal)
	<b>Community-based policies to reduce excessive alcohol use</b>				Government (local, state)
	<i>Alcohol outlet density</i>	✓		✓	Business/labor
<b>Promote connectedness</b>	<b>Peer norm programs</b>				Public Health
	<i>Sources of Strength</i>			✓	Education
	<b>Community engagement activities</b>				Public Health
	<i>Greening vacant urban spaces</i>			✓	Government (local)
<b>Teach coping and problem-solving skills</b>	<b>Social emotional learning programs</b>				Public Health
	<i>Youth Aware of Mental Health Program</i>		✓		Education
	<i>Good Behavior Game</i>		✓	✓	
	<b>Parenting skill and family relationship approaches</b>				Public Health
	<i>The Incredible Years</i>			✓	Education



		Best Available Evidence			
	<i>Strengthening Families 10–14</i>			✓	
Identify and support people at-risk	<b>Gatekeeper training</b>				Public Health
	<i>Applied Suicide Intervention Skills Training</i>			✓	Healthcare
	<b>Crisis Intervention</b>				Public Health
	<i>National Suicide Prevention Lifeline</i>		✓	✓	Social Services
	<b>Treatment for people at risk of suicide</b>				Healthcare
	<i>Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)</i>		✓	✓	Social Services
	<i>Collaborative Assessment and Management of Suicidality (CAMS)</i>		✓	✓	Justice
	<i>Dialectical Behavioral Therapy (DBT)</i>		✓	✓	
	<i>Attachment-Based Family Therapy (ABFT)</i>		✓		
	<i>Translating Initiatives for Depression into Effective Solutions project (TIDES)</i>			✓	
	<b>Treatment to prevent re-attempts</b>				Healthcare
	<i>ED Brief Intervention with Follow-up Visits</i>	✓			Social services
	<i>Active follow-up contact approaches</i>	✓	✓		
	<i>CBT for Suicide Prevention</i>		✓		

		Best Available Evidence			
Lessen harms and prevent future risk	<b>Postvention</b>				Healthcare
	<i>StandBy Response Service</i>		✓		
	<b>Safe reporting following a suicide</b>				Public Health
	<i>Media Guidelines</i>	✓			Media

<sup>1</sup>This column refers to the lead sectors well positioned to bring leadership and resources to implementation efforts. For each strategy, there are many other sectors such as non-governmental organizations that are instrumental to prevention planning and implementing specific activities.



DRAFT NARRATIVE FOR CDC CLEARANCE

The information in this narrative has not been cleared for dissemination.  
Please do not cite, copy or disseminate

**Preventing Suicide:  
A Technical Package of Policy, Programs, and Practices**

**Prepared by:**

Deb Stone, ScD, MSW, MPH  
Kristin Holland, PhD, MPH  
Brad Bartholow, PhD  
Alex Crosby, MD, MPH  
Shane Davis, PhD  
Natalie Wilkins, PhD

**Division of Violence Prevention  
National Center for Injury Prevention and Control (NCIPC)  
Centers for Disease Control and Prevention**

**2017**

***Preventing Suicide: A Technical Package of Policies, Programs, and Practices* is a publication of the  
National Center for Injury Prevention and Control of the Centers for Disease Control and  
Prevention.**

Centers for Disease Control and Prevention  
Thomas R. Frieden, MD, MPH, Director

National Center for Injury Prevention and Control  
Debra E. Houry, MD, MPH, Director

Division of Violence Prevention  
James A. Mercy, PhD, Director

*Suggested Citation:* Stone, D.M., Holland, K.M., Bartholow, B., Crosby, A.E., Davis, S., and Wilkins, N.  
*Preventing Suicide: A Technical Package of Policies, Programs, and Practices*. Atlanta, GA: National  
Center for Injury Prevention and Control, Centers for Disease Control and Prevention, 2017.



## Contents

Acknowledgements.....	4
External Reviewers.....	5
Overview of Technical Package.....	6
Strengthen Economic Supports.....	14
Strengthen Access and Delivery of Suicide Care.....	17
Create Protective Environments.....	21
Promote Connectedness.....	26
Teach Coping and Problem-Solving Skills.....	28
Identify and Support People At-Risk.....	31
Lessen Harms and Prevent Future Risk.....	37
Sector Involvement.....	39
Monitoring and Evaluation.....	41
Conclusion.....	42
References.....	44
Appendix A.....	50

## Acknowledgments

We would like to thank the following individuals who contributed in specific ways to the development of this technical package. We give special thanks to Linda Dahlberg for her vision, guidance, and support throughout the development of this package. We thank Division, Center, and CDC leadership for their careful review and helpful feedback on earlier iterations of this document. We thank Alida Knuth for her formatting and design expertise. Last but definitely not least, we extend our thanks and gratitude to all the external reviewers for their helpful feedback, support and encouragement for this resource.



## External Reviewers

Casey Castaldi  
Prevention Institute

Carmen Clelland  
Office for State, Tribal, Local and Territorial  
Support, Centers for Disease Control and  
Prevention

Amalia Corby-Edwards  
American Psychological Association

Rachel Davis  
Prevention Institute

Pamela End of Horn  
Indian Health Service Headquarters

Craig Fisher  
American Psychological Association

Keita Franklin  
Department of Defense

Jill M. Harkavy Friedman  
American Foundation for Suicide Prevention

Jarrold Hindman  
Colorado Department of Public Health and  
Environment

Linda Langford  
Education Development Center, Inc.

Richard McKeon  
Substance Abuse and Mental Health Services  
Administration

Doreen S. Marshall  
American Foundation for Suicide Prevention

Christine Moutier  
American Foundation for Suicide Prevention

Jason H. Padgett  
Education Development Center, Inc.

Jerry Reed  
Education Development Center, Inc.

Christine Schuler  
National Institute for Occupational Safety and  
Health, Centers for Disease Control and  
Prevention

Morton Silverman  
Education Development Center, Inc.

Ellyson Stout  
Education Development Center, Inc.

Hope M. Tiesman  
National Institute for Occupational Safety and  
Health, Centers for Disease Control and  
Prevention

Dan Reidenberg  
Suicide Awareness Voices for Education (SAVE)

The experts above are listed with their affiliations at the time this document was reviewed.

## Overview

This technical package represents a select group of strategies based on the best available evidence to help communities and states sharpen their focus on prevention activities with the greatest potential to prevent suicide. These strategies include: strengthening economic supports; strengthening access ~~to mental health~~ and delivery of suicide care; creating protective environments; promoting connectedness; teaching coping and problem-solving skills; identifying and supporting people at-risk; and ~~intervening to~~ lessen harms and prevent future risk. The strategies represented in this package include those with a focus on preventing suicide from happening in the first place as well as approaches to lessen the immediate and long-term harms of suicidal behavior for individuals, families, communities, and society. The strategies in the technical package support the goals and objectives of the National Strategy for Suicide Prevention and the National Action Alliance for Suicide Prevention's priority to strengthen community-based prevention. Commitment, cooperation, and leadership from numerous sectors, including public health, education, justice, health care, social services, business, labor, and government can bring about the successful implementation of this package.

### What is a Technical Package?

A technical package is a compilation of a core set of strategies to achieve and sustain substantial reductions in a specific risk factor or outcome (Frieden, 2014). Technical packages help communities and states prioritize prevention activities based on the best available evidence. This technical package has three components. The first component is the **strategy** or the preventive direction or actions to achieve the goal of preventing suicide. The second component is the **approach**. The approach includes the specific ways to advance the strategy. This can be accomplished through *programs, policies, and practices*. The approaches included come primarily from studies based in the United States. The **evidence** for each of the approaches in preventing suicide or its associated risk factors is included as the third component. This package is intended as a resource to guide and inform prevention decision-making in communities and states.

### Preventing Suicide is a Priority

Suicide, as defined by the Centers for Disease Control and Prevention (CDC), is part of a broader class of behavior called *self-directed violence*. Self-directed violence refers to behavior directed at oneself that deliberately results in injury or the *potential* for injury (A.E. Crosby, Ortega, & Melanson, 2011). Self-directed violence may be *suicidal* or *non-suicidal* in nature. For the purposes of this document, we refer only to behavior where suicide is intended:

- **Suicide** is a death caused by self-directed injurious behavior with any intent to die as a result of the behavior.



- **Suicide attempt** is defined as a *non-fatal* self-directed and potentially injurious behavior with any intent to die as a result of the behavior. A suicide attempt may or may not result in injury.

**Suicide is highly prevalent.** Suicide presents a major challenge to public health in the United States and worldwide. It contributes to premature death, morbidity, lost productivity, and health care costs (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014). In 2014 (the most recent year of available death data), suicide was responsible for 42,773 deaths in the U.S., which is approximately one suicide every 12 minutes (Centers for Disease Control and Prevention, 2016). In 2014, suicide ranked as the 10th leading cause of death and has been among the top 12 leading causes of death since 1975 in the U.S (Centers for Disease Control and Prevention, 2016). Overall suicide rates increased 24% from 1999 to 2014 (Curtin, Warner, & Hedegaard, 2016). Suicide is a problem throughout the life span; it is the second leading cause of death among those aged 10–34 years; it is the fourth leading cause among persons in their 40s and seventh among persons in their 50s.

Suicide rates vary by race/ethnicity, age, and other population characteristics, with the highest rates across the lifespan occurring among non-Hispanic American Indian/Alaska Native (AI/AN) and non-Hispanic White population groups. In 2014, the rates for these groups were 17.8 and 16.4 per 100,000 population, respectively (Centers for Disease Control and Prevention, 2016). Other population groups disproportionately impacted by suicide include middle-aged adults (whose rates increased 48% from 1999 to 2014, with steep increases seen among both males (43%) and females (63%) aged 45-64 years; (Curtin et al., 2016); Veterans and other military personnel (whose suicide rate nearly doubled from 2003 to 2008, surpassing the rate of suicide among civilians for the first time in decades;(Bachynski et al., 2012; Lineberry & O'Connor); workers in certain occupational groups (e.g., protective service occupations; workers in farming, fishing, and forestry; McIntosh et al., 2016); and lesbian, gay, bisexual, and/or queer (LGBQ) youth, who experience increased suicidal ideation and behavior compared to their heterosexual counterparts (Kann et al., 2016; Russell & Joyner, 2001).

Suicides reflect only a portion of the problem (A.E. Crosby, Han, Ortega, Parks, & Gfroerer, 2011). Substantially more people are hospitalized as a result of nonfatal suicidal behavior (i.e. suicide attempts) than are fatally injured, and an even greater number are either treated in ambulatory settings (e.g., emergency departments) or not treated at all (A.E. Crosby, Han, et al., 2011). For example, during 2014, among adults aged 18 years and older, for every one suicide there were 9 adults treated in hospital emergency departments for self-harm injuries, 27 who reported making a suicide attempt, and over 227 who reported seriously considering suicide (i.e. ideation) (Ferdon et al., In press).

**Suicide is associated with several risk and protective factors.** Suicide, like other human behaviors, has no single determining cause. Instead, suicide occurs in response to multiple biological, psychological, interpersonal, environmental and societal influences that interact with one another, often over time.

The social-ecological model – encompassing multiple levels of focus from the individual, relationship, community, and societal – is a useful framework for viewing and understanding suicide risk factors identified in the literature (Dahlberg & Krug, 2002). Risk and protective factors for suicide exist at each level. For example, risk factors include:

- **Individual level:** history of depression and other mental illnesses, hopelessness, substance abuse, certain health conditions, previous suicide attempt, violence victimization and perpetration, and genetic and biological determinants
- **Relationship level:** high conflict or violent relationships, sense of isolation and lack of social support, family/loved one's history of suicide, financial and work stress
- **Community level:** inadequate community connectedness, barriers to health care (e.g., lack of access to providers and medications)
- **Societal level:** availability of lethal means of suicide, unsafe media portrayals of suicide, stigma associated with help-seeking and mental illness (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014).

It is important to recognize that the vast majority of individuals who are depressed, attempt suicide, or who have other risk factors noted, do *not* die by suicide. Furthermore, the relevance of each risk factor can vary by age, race, gender, sexual orientation, residential geography, and socio-cultural and economic status (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014).

Protective factors, or those influences that buffer against the risk for suicide, can also be found across the different levels of the social-ecological model. Protective factors identified in the literature include: effective coping and problem solving skills, moral objections to suicide, strong and supportive relationships with partners, friends, and family; connectedness to school, community, and other social institutions; availability of quality and ongoing physical and mental health care, and reduced access to lethal means (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014). These protective factors can either counter a specific risk factor or buffer against a number of risks associated with suicide.

**Suicide is connected to other forms of violence.** Exposure to violence (e.g., child abuse and neglect, bullying, peer violence, dating violence, sexual violence, and intimate partner violence) increases the risk of depression, post-traumatic stress disorder (PTSD), anxiety, suicide, and suicide attempts (Bossarte et al., 2014; D. P. Chapman et al., 2004; Dube et al., 2001; Felitti et al., 1998; Klomek, Sourander, & Gould, 2010; Leeb, Lewis, & Zolotor, 2011; World Health Organization, 2013). Women exposed to partner violence are nearly 5 times more likely to attempt suicide as women not exposed to partner violence (WHO, 2013). Exposure to adverse experiences in childhood, such as physical, sexual, emotional abuse and neglect, and living in homes with violence, mental health, substance abuse problems and other



instability, increases the risk for suicide and suicide attempts several fold (Bellis et al., 2014; Dube et al., 2001). The psychosocial effects of violence in childhood and adolescence can be observed decades later, including severe problems with finances, family, jobs, and stress – factors that increase the risk for suicide. Suicide and other forms of violence often share the same individual, relationship, community, and societal risk factors suggesting that efforts to prevent interpersonal violence may also prove beneficial in preventing suicide (Haegerich & Dahlberg, 2011; Hamby & Grych, 2013; Wilkins, Tsao, Hertz, Davis, & Klevens, 2014). Further, just as risk factors may be shared across suicide and interpersonal violence, so too may protective factors overlap. For example, connectedness to one's community (Kleiman, Riskind, Schaefer, & Weingarden, 2012), school (Carter, McGee, Taylor, & Williams, 2007), family (Maimon, Browning, & Brooks-Gunn, 2010), caring adults (Capaldi, Knoble, Shortt, & Kim, 2012; Losel & Farrington, 2012), and pro-social peers (Wyman et al., 2010) enhances resilience to suicide and other forms of violence.

**The health and economic consequences of suicide are substantial.** Suicide and suicide attempts have far reaching consequences for individuals, families, and communities (Dunne, McIntosh, & Dunne-Maxim, 1987; Mishara, 1995; National Action Alliance for Suicide Prevention: Suicide Attempt Survivors Task Force, 2014; National Action Alliance for Suicide Prevention: Survivors of Suicide Loss Task Force, 2015). In an early study, Crosby and Sacks (2002) estimated that 7% of the U.S. adult population, or 13.2 million adults, knew someone in the prior 12 months who had died by suicide. They also estimated that for each suicide, 425 adults were exposed, or knew about the death. In a more recent study, in one state, Cerel et al (2016) found that 48% of the population knew at least one person who died by suicide in their lifetime. Research indicates that the impact of knowing someone who died by suicide and/or having lived experience (i.e., personally have attempted suicide, have had suicidal thoughts, or have been impacted by suicidal loss) is much more extensive than injury and death. People with lived experience may suffer long-term health and mental health consequences ranging from anger, guilt, and physical impairment, depending on the means and severity of the attempt (A. L. Chapman & Dixon-Gordon, 2007). Similarly, survivors of a loved one's suicide may experience ongoing pain and suffering including complicated grief (Mitchell, Kim, Prigerson, & Mortimer-Stephens, 2004), stigma, depression, anxiety, post-traumatic stress disorder, and increased risk of suicidal ideation and suicide (Cerel, McIntosh, Neimeyer, Maple, & Marshall, 2014; Sudak, Maxim, & Carpenter, 2008). Less discussed but no less important, are the financial and occupational effects for those left behind (Florence, Simon, Haegerich, Luo, & Zhou, 2015).

The economic toll of suicide is immense as well. According to conservative estimates, in 2013, suicide cost \$50.8 billion in estimated lifetime medical and work-loss costs alone (Florence et al., 2015). Adjusting for potential under-reporting of suicide and drawing upon health expenditures per capita, GDP per capita, and variability among states in per capita health care expenditures and income, another study estimated the total lifetime costs associated with nonfatal injuries and deaths caused by self-directed violence to be approximately \$93.5 billion in 2013 (Shepard, Gurewich, Lwin, Reed, & Silverman, 2016). The overwhelming burden of these costs were from lost productivity over the life course, with the

average cost per suicide being over \$1.3 million (Shepard et al., 2016). The true economic costs are likely higher, as neither study included monetary figures related to other societal costs such as those associated with the pain and suffering of family members or other impacts.

**Suicide can be prevented.** Like most public health problems, suicide is preventable (U.S. Public Health Service, 1999). While progress will continue to be made into the future, evidence for numerous programs, practices, and policies currently exists, and many programs are ready to be implemented now. Just as suicide is not caused by a single factor, research suggests that reductions in suicide will not be prevented by any single strategy or approach (Silverman & Maris, 1995; U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). Rather, suicide prevention is best achieved by a focus across the individual, relationship, family, community, and societal-levels and across all sectors, private and public (e.g., business, public health, physical and behavioral healthcare, justice, education, and labor; National Action Alliance for Suicide Prevention, 2014; World Health Organization, 2014).

### Assessing the Evidence

This technical package includes programs, practices, and policies with evidence of impact on suicide or risk or protective factors for suicide. To be considered for inclusion in the technical package, the program, practice, or policy selected had to meet at least one of these criteria: a) meta-analyses or systematic reviews showing impact on suicide; b) evidence from at least one rigorous (e.g., randomized controlled trial [RCT] or quasi-experimental design) evaluation study that found significant preventive effects on suicide; c) meta-analyses or systematic reviews showing impact on risk or protective factors for suicide, or d) evidence from at least one rigorous (e.g., RCT or quasi-experimental design) evaluation study that found significant impacts on risk or protective factors for suicide. Finally, consideration was also given to the likelihood of achieving beneficial effects on multiple forms of violence; no evidence of harmful effects on specific outcomes or with particular subgroups; and feasibility of implementation in a U.S. context if the program, policy, or practice has been evaluated in another country.

Within this technical package, some approaches do not yet have research evidence demonstrating impact on rates of suicide but instead are supported by evidence indicating impacts on risk or protective factors for suicide (e.g., help-seeking, stigma reduction, depression, connectedness). In terms of the strength of the evidence, programs that have demonstrated effects on suicidal behavior (e.g., reductions in deaths, attempts) provide a higher-level of evidence, but the evidence base is not that strong in all areas. For instance, there has been less evaluation of community engagement and family programs on suicidal behavior. Thus, approaches in this package that have effects on risk or protective factors reflect the developing nature of the evidence base and the use of the best available evidence at a given time.

It is also important to note that there is often significant heterogeneity among the programs, policies, or practices that fall within one approach or strategy area in terms of the nature and quality of the available



evidence. Not all programs, policies, or practices that utilize the same approach are equally effective, and even those that are effective may not work across all populations. Tailoring programs and more evaluation may be necessary to address different population groups. The evidence-based programs, practices, or policies included in the package are not intended to be a comprehensive list for each approach, but rather to serve as examples that have been shown to impact suicide or have beneficial effects on risk or protective factors for suicide.

### Context and Cross-Cutting Themes

One important feature of the package is the complementary, but potentially synergistic impact of the strategies and approaches. The strategies and approaches included in this technical package represent different levels of the social ecology, with efforts intended to impact community and societal levels, as well individual and relationship levels. The strategies and approaches are intended to work in combination and reinforce each other to prevent suicide (see box below). The strategies are arranged in order such that those strategies hypothesized to have the greatest potential for broad public health impact on suicide are included first, followed by those that might impact more select populations (e.g., persons who have already made a suicide attempt).

Preventing Suicide	
Strategy	Approach
Strengthen economic supports	<ul style="list-style-type: none"> <li>Strengthen household financial security</li> <li>Housing stabilization policies</li> </ul>
Strengthen access and delivery of suicide care	<ul style="list-style-type: none"> <li>Coverage of mental health conditions in health insurance policies</li> <li>Reduce provider shortages in underserved areas</li> <li>Safer suicide care through systems change</li> </ul>
Create protective environments	<ul style="list-style-type: none"> <li>Reduce access to lethal means among persons at-risk of suicide</li> <li>Organizational policies and culture</li> <li>Community-based policies to reduce excessive alcohol use</li> </ul>
Promote connectedness	<ul style="list-style-type: none"> <li>Peer norm programs</li> <li>Community engagement activities</li> </ul>
Teach coping and problem-solving skills	<ul style="list-style-type: none"> <li>Social-emotional learning programs</li> <li>Parenting skill and family relationship approaches</li> </ul>
Identify and support people at risk	<ul style="list-style-type: none"> <li>Gatekeeper training</li> <li>Crisis Intervention</li> <li>Screening and treatment for people at risk of suicide</li> <li>Treatment to prevent re-attempts</li> </ul>
Lessen harms and prevent future risk	<ul style="list-style-type: none"> <li>Postvention</li> <li>Safe reporting following a suicide</li> </ul>



It is important to note that these strategies are not mutually exclusive but each has an immediate focus. For instance, social emotional learning programs, an approach under the *Teach Coping and Problem-Solving Skills* strategy, sometimes include components to change peer norms and the broader environment. The primary focus of these programs, however, is to provide children and youth with skills to resolve problems in relationships, school, and with peers, and to help youth address other negative influences (e.g., substance use) associated with suicide.

The goal of this package is to stress the importance of comprehensive prevention efforts and to provide examples of effective programs addressing each level of the social ecology, with the knowledge that some programs, practices, and policies may impact multiple levels. Further, those that involve multiple sectors and that impact multiple levels of the social ecology are more likely to have a greater impact on the overall burden of suicide.

Suicide ideation, thoughts, attempts, and deaths vary by gender, race/ethnicity, age, occupation, and other important population characteristics. Further, certain transition periods are also associated with higher rates of suicide (e.g., transition from working into retirement, transition from active duty military status to civilian status). In fact, suicide risk can change along with dynamic risk factors. For example, individuals' coping skills may change during periods of crisis and heightened stress, limiting their normal ability to effectively solve problems and cope. Research indicates that suicide risk changes as a result of the number and intensity of key risk and protective factors experienced (Turecki, 2014). Ideally, the availability of multiple strategies and approaches tailored to the social, economic, cultural, and environmental context of individuals and communities are desirable as they may increase the likelihood of removing barriers to supportive and effective care and provide opportunities to develop individual and community resilience.

Identifying programs, practices, and policies with evidence of impact on suicide, suicide attempts, or beneficial effects on risk or protective factors for suicide is only the first step. In practice, the effectiveness of the programs, policies and practices identified in this package will be strongly dependent on how well programs are implemented, as well as the partners and communities in which they are implemented. Practitioners in the field may be in the best position to assess the needs and strengths of their communities and work with community members to make decisions about the combination of approaches included here that are best suited to their context.

Data-driven strategic planning processes can help communities with this work (e.g., see Edwards, Jumper-Thurman, Plested, Oetting, & Swanson, 2000; Hawkins, Catalano, & Kuklinski, 2014; Plested, Edwards, & Jumper-Thurman, 2006). These planning processes engage and guide community stakeholders through a prevention planning process designed to address a community's profile of risk and protective factors with evidence-based programs, practices, and policies. These processes can also be used to monitor implementation, track outcomes, and make adjustments as indicated by the data. The readiness of the program for broad dissemination and implementation (e.g., availability of program



materials, training and technical assistance) can also influence program effects. Implementation guidance to assist practitioners, organizations and communities will be developed separately.

This package includes strategies where public health agencies are well positioned to bring leadership and resources to implementation efforts. It also includes strategies where public health can serve as an important collaborator (e.g., strategies addressing community and societal level risks), but where leadership and commitment from other sectors such as business, labor or health care is critical to implement a particular policy or program (e.g., workplace policies; [treatment to prevent re-attempts](#)). The role of various sectors in the implementation of a strategy or approach in preventing suicide is described further in the section on *Sector Involvement*.

In the sections that follow, the strategies and approaches with the best available evidence for preventing suicide are described.

## Strengthen Economic Supports

### Rationale

Studies from the U.S. examining historical trends indicate that suicide rates increase during economic recessions marked by high unemployment rates, job losses, and economic instability and decrease during economic expansions and periods marked by low unemployment rates, particularly for working-age individuals 25 to 64 years old (Luo et al., 2011; Fowler et al., 2015). Economic and financial strain, such as job loss, long periods of unemployment, reduced income, difficulty covering medical, food, and housing expenses, and even the anticipation of such financial stress may increase an individual's risk for suicide or may indirectly increase risk by exacerbating related physical and mental health problems. Buffering these risks can, therefore, potentially protect against suicide (Stack & Wasserman, 2007). For example, strengthening economic support systems can help people stay in their homes or obtain affordable housing while also paying for necessities such as food and medical care, job training, child care, among other expenses required for daily living. In providing this support, stress and anxiety and the potential for a crisis situation may be reduced, thereby preventing suicide. Although more research is needed to understand how economic factors interact with other factors to increase suicide risk, the available evidence suggests that strengthening economic supports may be one opportunity to buffer suicide risk.

### Approaches

Economic supports for individuals and families can be strengthened by targeting household financial security and ensuring stability in housing during periods of economic stress.

- **Strengthening household financial security** can potentially buffer the risk of suicide by providing individuals with the financial means to lessen the stress and hardship associated with a job loss or other unanticipated financial problems. The provision of unemployment benefits and other forms of temporary assistance, livable wages, medical benefits, and retirement and disability insurance to help cover the cost of necessities or to offset costs in the event of disability, are examples of ways to strengthen household financial security.
- **Housing stabilization policies** aim to keep people in their homes and provide housing options for those in need during times of financial insecurity. This may occur through programs that provide affordable housing such as through government subsidies or through other options available to potential homebuyers such as loan modification programs, move-out planning, or financial counseling services that help minimize the risk or impact of foreclosures and eviction.



## Potential Outcomes

- Reductions in foreclosure rates
- Reductions in eviction rates
- Reductions in emotional distress
- Reductions in suicide

## Evidence

There is evidence suggesting that strengthening household financial security and stabilizing housing can reduce suicide risk.

- **Strengthen household financial security.** The *Federal-State Unemployment Insurance Program* allows states to define the maximum amount and duration of unemployment benefits that workers are entitled to receive after a job loss (Cylus, Glymour, & Avendano, 2014). An examination of variations in *unemployment benefit programs* across states demonstrated that the impact of unemployment on rates of suicide was offset in those states that provided greater than average unemployment benefits (mean level: \$7,990 per person in U.S. constant dollars; Cylus et al., 2014). The effects of *unemployment benefit programs* were also consistent by sex and age group. Another U.S. study examining the link between unemployment and suicide rates using monthly suicide data, length of unemployment (less than 5 weeks, 5-14 weeks, 15-26 weeks, and greater than 26 weeks), and job losses found that the duration of unemployment, as opposed to just the loss of job, predicted suicide risk (Classen & Dunn, 2012). Together, these results suggest that not only should state unemployment benefit programs be generous in their financial allocations, but also in their duration.

Other measures to strengthen household financial security (e.g., transfer payments related to retirement and disability insurance, unemployment insurance compensation, medical benefits, and other forms of family assistance) have also shown an impact on rates of suicide. A study by Flavin and Radcliff (2009) examined the impact of states' per capita spending on transfer payments, medical benefits, and family assistance (Temporary Assistance to Needy Families – TANF) and total state spending on suicide rates between 1990-2000, controlling for a number of suicide risk factors (e.g., residential mobility, divorce rate, unemployment rate) at the state level. As per capita spending on total transfer payments, medical benefits, and family assistance increased there was an associated decrease in state suicide rates. Moreover, it wasn't spending in general that was associated with the reduction but spending on these types of assistance. In terms of lives saved, Flavin & Radcliff calculated the cost of reducing a state's suicide rate by a full point for the years studied. At the national level, they estimated that 3,000 fewer suicides would occur per year nationwide if every state increased its per capita spending on these types of assistance by \$45 per year (Flavin & Radcliff, 2009). Although this was a correlational study,

the results demonstrate the potential benefits of policies that reach particularly vulnerable individuals during periods of great need and increased risk for suicide. More evaluation studies are needed to further understand the outcomes impacted by programs such as these.

- **Housing stabilization policies.** The *National Neighborhood Stabilization Program* was designed to help neighborhoods suffering from high rates of foreclosure and abandonment by slowing the deterioration of the neighborhoods and providing affordable housing options for low, moderate, and middle-income homebuyers. This program also offers financial assistance to eligible individuals for the purchase of a new home. Although this program has not been rigorously evaluated for its impact on suicide outcomes, it addresses foreclosure and eviction, which are risk factors for suicide. A longitudinal analysis of annual data on suicides and foreclosures demonstrated that as the proportion of foreclosed properties increased in U.S. states, so did the state suicide rate, particularly among working-aged adults (Houle & Light, 2014). Another study of data from 16 U.S. states participating in the National Violent Death Reporting System found that suicides precipitated by home foreclosures and evictions increased more than 100% from 2005 (before the housing crisis began) to 2010 (after it had peaked; Fowler, Gladden, Vagi, Barnes, and Frazier (2015)). Most of these suicides occurred prior to the actual loss of the decedent's home. These findings suggest that integrating suicide prevention resources, messaging, and referrals into financial, foreclosure, and move-out planning and counseling services may help to prevent suicide.



## Strengthen Access and Delivery of Suicide Care

### Rationale

While most people with mental health problems do not attempt or die by suicide (Olfson, Gerhard, Huang, Crystal, & Stroup, 2015; Owens, 2002), and the level of risk conferred by different types of mental illness varies (Arsenault-Lapierre, Kim, & Turecki, 2004; E. C. Harris & Barraclough, 1997; Tyrer, Reed, & Crawford, 2015), previous research indicates that mental illness is an important risk factor for suicide (E. C. Harris & Barraclough, 1998; World Health Organization, 2014). State-level suicide rates have also been found to be correlated with general mental health measures such as depression (Lang, 2013; Mark, Shern, Bagalman, & Cao, 2007). Findings from the National Comorbidity Survey indicate that relatively few people in the U.S. with mental health disorders receive treatment for those conditions (Kessler et al., 2005). Lack of access to mental health care is one of the contributing factors related to the underuse of mental health services (Cunningham, 2009). Identifying ways to improve access to timely, affordable, and quality mental health and suicide care for people in need is a critical component to prevention (World Health Organization, 2014). Additionally, research suggests that services provided are maximized when health and behavioral health care systems are set up to effectively and efficiently deliver such care (C.E. Coffey, 2007). Apart from treatment benefits, these approaches can also normalize help-seeking behavior and increase the use of such services.

### Approaches

There are a number of approaches that can be used to strengthen access and delivery of suicide care, including:

- **Coverage of mental health conditions in health insurance policies.** Federal and state laws include provisions for equal coverage of mental health services in health insurance plans that is on par with coverage for other health concerns (i.e., mental health parity). Benefits and services covered include such things as the number of visits, co-pays, deductibles, inpatient/outpatient services, prescription drugs, and hospitalizations. If a state has a stronger mental health parity law than the federal parity law, then insurance plans regulated by the state must follow the state parity law. If a state has a weaker parity law than the federal parity law (e.g., includes coverage for some mental health conditions but not others), then the federal parity law will replace the state law. Equal coverage does not necessarily imply good coverage as health insurance plans vary in the extent to which benefits and services are offered to address various health conditions. Rather it helps to ensure that mental health services are covered on par with other health concerns.
- **Reduce provider shortages in underserved areas.** Access to effective and state-of-the-art mental health care is largely dependent upon the training and the size of the mental health care workforce. Over 85 million Americans live in areas with an insufficient number of mental health

providers; this shortage is particularly severe among low-income urban and rural communities (U.S. Department of Health and Human Services Health Resources and Services Administrations, 2016a). There are a number of ways to increase the number and distribution of practicing mental health providers in underserved areas including offering financial incentives through existing state and federal programs (e.g., loan repayment programs) and expanding telemental health services. Such approaches can increase the likelihood that those in need will be able to access affordable, quality care for mental health problems, which can reduce risk for suicide.

- **Safer suicide care through systems change.** Access to health and behavioral health care services is critical for people at risk of suicide; however this is just one piece of the puzzle. Care being accessed must should also be *delivered* efficiently and effectively. More specifically, care should take place within a system that supports suicide prevention and patient safety through strong leadership, workforce training, systematic identification and assessment of suicide risk, implementation of evidence-based treatments (see *Identify and Support People At-Risk*, p.31), continuity of care, and continuous quality improvement. Care that is patient-centered and promotes equity for all patients is also of critical importance (National Action Alliance for Suicide Prevention: Clinical Workforce Preparedness Task Force, 2014).

### Potential Outcomes

- Increases in access to mental health services
- Increase in utilization of mental health services
- Reductions in symptoms of mental illnesses and suicidality
- Reductions in rates of suicide attempts
- Reductions in rates of suicide

### Evidence

There is evidence suggesting that coverage of mental health conditions in health insurance policies and improving access and the delivery of care can reduce risk factors associated with suicide and may directly impact suicide rates.

- **Coverage of mental health conditions in health insurance policies.** The National Survey of Drug Use and Health is a nationally representative survey of the U.S. population that provides data on substance use, mental health conditions, and services utilization. Using data from this survey, K. M. Harris, Carpenter, and Bao (2006) found that 12 months after states enacted *mental health parity laws*, self-reported use of mental healthcare services significantly increased. Moreover, subsequent research by Lang (2013) examined state mental health laws and suicide rates between 1990 and 2004 and found that mental health parity laws, specifically, were associated

**Comment [A]:** Cross-check the outcomes with the evidence presented and make sure everything is consistent.



with an approximate 5% reduction in suicide rates. This reduction, in the 29 states with parity laws, equated to the prevention of 592 suicides per year (Lang, 2013).

- **Reduce provider shortages in underserved areas.** One example of a program to improve access to mental health care providers is the *National Health Service Corps (NHSC)*, which offers financial incentives to attract mental/behavioral health clinicians to underserved areas. Programs such as *NHSC* encourage individuals to work in the mental health profession in locations designated as Health Professional Shortage Areas (HPSAs) in exchange for student loan debt repayment. A 2012 retention survey conducted by the Health Resources and Services Administration (HRSA), found that 61% of mental and behavioral health care providers continued to practice in designated mental health shortage areas after their four year commitment to The National Health Service Corps (U.S. Department of Health and Human Services Health Resources and Services Administrations, 2016b). Although this program has not been evaluated for impact on suicide, it addresses access to care, which is a critical component to suicide prevention. ~~NHSC is made possible by Title VII (Section 747, Primary Care Training) funding which improves the educational infrastructure of medical schools and residency programs to encourage physicians to work with underserved populations. Using data from the 2004 American Medical Association's Physician Masterfile and from Medicare claims data, one study demonstrated that attending a medical school or residency program that received Title VII training was positively associated with both participation in the NHSC loan repayment program and with staffing of community health centers serving underserved populations (Rittenhouse et al., 2008). While this evaluation focused on the commitment of primary care physicians to these programs, examination of the impact of such programs on improved care in underserved settings, among specialty physicians, such as psychiatrists, is still needed. Moreover, between 2003 and 2008, Title VII funds were reduced by almost 50%—from \$92 million per year to \$48 million, so additional study on the program's impact is needed.~~

**Comment [A]:** Suggest dropping this piece. It mostly speaks to primary care physicians and the funding is precarious.

*Telemental health (TMH)* services refer to the use of telephone, video and web-based technologies for providing psychiatric or psychological care at a distance. *TMH* can be used in a variety of settings (e.g. outpatient clinics, hospitals, military treatment facilities) to treat a wide range of mental health conditions. It can also improve access to care for patients in isolated areas, as well as reduce travel time and expenses, reduce delays in receiving care, and improve satisfaction interacting with the mental health care system. A systematic review of *TMH* services found that services rated as high or good quality were ~~associated with effectiveness~~ in treating mental health conditions such as depression, schizophrenia, substance abuse, and suicidal ideation and suicide ~~deathsmortality~~ among other outcomes (Hailey, Roine, & Ohinmaa, 2008).

Further, Mohr and colleagues (2008) conducted a meta-analysis examining the effect of psychotherapy delivered specifically via telephone and found that it significantly reduced depressive symptoms in comparison to face-to-face psychotherapy. They also found that treatment attrition rates were significantly lower among patients receiving telephone-administered psychotherapy compared to patients receiving face-to-face therapy. Thus, *TMH* may not only offer improved access to mental health care, but it may also ensure continuity of care, and thereby further reduce the risk for suicide.

- **Safer suicide care through systems change.** *Henry Ford* healthcare system, which is a large health maintenance organization (HMO) in the state of Michigan pioneered the *Perfect Depression Care* program, the pre-cursor to what is now called *Zero Suicide*. The overall goal of *Perfect Depression Care* was to eliminate suicide among HMO members. More broadly, the goal of the program was to redesign delivery of depression care to achieve “breakthrough improvement” in quality and safety by focusing on effectiveness, safety, patient centeredness, timeliness, efficiency, and equity among patients. The program screened and assessed each patient for suicide risk and implemented coordinated continuous follow-up care system wide (C. E. Coffey, 2006). An examination of the impact of the program found that there was a dramatic and statistically significant decrease in the rate of suicide between the baseline years, 1999 and 2000, prior to the intervention to the intervention years, 2002-2009. During this time period, the suicide rate fell by 82% (C. E. Coffey, 2006; C. E. Coffey, Coffey, & Ahmedani, 2013). Further, among HMO members who received mental health specialty services, the suicide rate significantly decreased over time from 1999 to 2010 (110.3 to 47.6 per 100,000;  $p < .04$ ) with a mean of 36.2 per 100,000 over the period. Additionally, for those HMO members who accessed only general medical services as opposed to specialty mental health services, the suicide rate increased from 2.7 to 5.6 per 100,000 ( $p < .01$ ). Similarly, in the state of Michigan, rates of suicide in the general population increased over the period from 9.8 to 12.5 per 100,000 ( $p < .001$ ) (M. Coffey, Coffey, & Ahmedani, 2015).



## Create Protective Environments

### Rationale

Prevention efforts that focus not only on individual behavior change (e.g., help-seeking, treatment interventions) but on changes to the environment can increase the likelihood of positive behavioral and health outcomes (Haddon, 1980). Creating environments that address risk and protective factors where individuals live, work, and play, can help prevent suicide (Dahlberg & Krug, 2002; U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). For example, rates of suicide are high among middle-aged adults (who comprise 42.6% of the workforce; Toosi, 2015); among certain occupational groups (e.g., farming, fishing, forestry, and construction; Han et al., 2016; McIntosh et al., 2016), and among people in detention facilities (e.g. jail, prison), to name a few. Thus, settings where these populations work and reside are ideal for implementing programs, practices and policies to buffer against suicide. Changes to organizational culture through the implementation of supportive policies, for instance, can change social norms, encourage help-seeking, and demonstrate that good health and mental health are valued and that stigma and other risk factors for suicide are not (Knox et al., 2010; National Action Alliance for Suicide Prevention Workplace Task Force, 2015). Similarly, modifying the characteristics of the physical environment to prevent harmful behavior such as access to lethal means can reduce suicide rates, particularly in times of crisis or transition (Beautrais, Gibb, Fergusson, Horwood, & Larkin, 2009; A.E. Crosby, Espitia-Hardeman, Ortega, & Lozano, 2013; Kaplan et al., 2013; Miller, Warren, Hemenway, & Azrael, 2015; Runyan et al., 2016; Stokes, McCoy, Abram, Byck, & Teplin, 2015).

### Approaches

The current evidence suggests three potential approaches for creating environments that protect against suicide.

- **Reduce access to lethal means among persons at-risk of suicide.** Means of suicide such as firearms, hanging/suffocation, or jumping from heights provide little opportunity for rescue and, as such, have high case fatality rates (e.g., about 85% of people who use a firearm in a suicide attempt will die from the injury). Research also indicates that: 1) the interval between deciding to act and attempting suicide can be as short as 5 or 10 minutes (Deisenhammer et al., 2009; Simon et al., 2001), and 2) that people tend *not* to substitute a different method when a highly lethal method is unavailable or difficult to access (Hawton, 2007; Yip et al., 2012). Therefore, increasing the time interval between deciding to act and the suicide attempt, for example, by making it more difficult to access lethal means, can be lifesaving. The following are examples of approaches reducing access to lethal means for persons at-risk of suicide:

- *Intervening at Suicide Hotspots.* Suicide hotspots, or places where suicides may take place relatively easily, include tall structures (e.g., bridges, cliffs, balconies, and rooftops), railway tracks, and isolated locations such as parks. Efforts to prevent suicide at these locations include erecting barriers or limiting access to prevent jumping, and installing signs and telephones to encourage individuals who are considering suicide, to seek help (Cox et al., 2013).
- *Safe Storage Practices.* Safe storage of medications, firearms, and other household products can reduce the risk for suicide by separating vulnerable individuals from easy access to lethal means. Such practices may include education and counseling around storing firearms--locked in a secure place (e.g., in a gun safe or lock box), unloaded and separate from the ammunition--and keeping medicines in a locked cabinet or other secure location away from people who may be at risk or who have made prior attempts (Rowhani-Rahbar, Simonetti, & Rivara, 2016; Runyan et al., 2016).

- **Organizational policies and culture** that promote protective environments may be implemented in places of employment, detention facilities, and other secured environments (e.g. residential programs/settings). Such policies and cultural values encourage leadership from the top down and may promote prosocial behavior (e.g., asking for help), skill building, positive social norms, assessment, referral and access to helping services (e.g. mental health, substance abuse treatment, financial counseling), and development of crisis response plans, postvention and other measures to foster a safe physical environment. Such policies and cultural shifts can positively impact organizational climate and morale and help prevent suicide and its related risk factors (e.g. depression, social isolation) (Hayes, 2013; National Action Alliance for Suicide Prevention Workplace Task Force, 2015).
- **Community-based policies to reduce excessive alcohol use.** Research studies in the United States have found that greater alcohol availability is positively associated with alcohol-involved suicides (Escobedo & Ortiz, 2002; Giesbrecht et al., 2015). Policies to reduce excessive alcohol use broadly include zoning to limit alcohol outlet locations and density, taxes on alcohol, and bans on the sale of alcohol for individuals under the legal drinking age. These policies are important because acute alcohol use has been found to be associated with more than one-third of suicides and approximately 40% of suicide attempts (Cherpitel, Borges, & Wilcox, 2004).

#### Potential Outcomes

- Increases in safe storage of lethal means
- Reductions in rates of suicide
- Reductions in suicide attempts

**Comment [A]:** Program doesn't seem to be the right word here. Are you referring to residential care facilities or something along those lines?

**Comment [A]:** Be sure to do a cross-walk between the outcomes listed here and the evidence described in the next section.



- Reductions in suicide deaths
- Increases in help-seeking
- Reductions in alcohol-related suicide deaths

## Evidence

The evidence suggests that creating protective environments can reduce suicide and suicide attempts and increase protective behaviors.

- **Reduce access to lethal means among persons at-risk of suicide.** A meta-analysis examining the impact of *suicide hotspot interventions* implemented in combination or in isolation, both in the U.S. and abroad, found associated reduced rates of suicide (Cox et al., 2013; Pirkis et al., 2015). For example, after erecting a barrier on the Jacques-Cartier bridge in Canada, the suicide rate from jumping from the bridge decreased from about 10 suicide deaths per year to about 3 deaths per year (Perron, Burrows, Fournier, Perron, & Ouellet, 2013). Moreover, the reduction in suicides by jumping was sustained even when all bridges and nearby jumping sites were considered, suggesting little to no displacement of suicides to other jumping sites (Perron et al., 2013). Further evidence for the effectiveness of bridge barriers was demonstrated by a study examining the impact of the *removal* of safety barriers from the Grafton Bridge in Auckland, New Zealand. After removal of the barrier, both the number and rate of suicide increased fivefold (Beautrais, 2001; Beautrais et al., 2009).

Another form of means reduction involves implementation of *safe storage practices*. In a case-control study of firearm-related events identified from 37 counties in Washington, Oregon, and Missouri, and from 5 trauma centers, Grossman et al. (2005) found that storing firearms unloaded, separate from ammunition, in a locked place or secured with a safety device was protective of suicide attempts among adolescents. Further, a recent systematic review of clinic and community-based education and counseling interventions suggested that the provision of safety devices significantly increased safe firearm storage practices compared to counseling alone or compared to the provision of economic incentives to acquire safety devices on one's own (Rowhani-Rahbar et al., 2016).

Another program, The *Emergency Department Counseling on Access to Lethal Means (ED CALM)*, trained psychiatric emergency clinicians in a large children's hospital to provide lethal means counseling and safe storage boxes to parents of patients under age 18 receiving care for suicidal behavior. In a pre-post quality improvement project, Runyan et al. (2016) found that at post-test 76% (of the 55% of parents followed up, n=114) reported that all medications in the home were locked up as compared to fewer than 10% at the time of the initial emergency department visit. Among parents who indicated the presence of guns in the home at pre-test (i.e. 67%), all (100%) reported guns were currently locked up at post-test (Runyan et al., 2016).



- **Organizational policies and culture.** *Together for Life* is a workplace program of the Montreal Police Force implemented to address suicide among officers. Policy and program components were designed to foster an organizational culture that promoted mutual support and solidarity among all members of the Force. The program included training of supervisors, managers and all units to improve competencies in identifying suicidal risk and to improve use and awareness of existing resources. The program also included an education campaign to improve awareness and help-seeking (Mishara & Martin, 2012). Police suicides were tracked over 12 years and compared to rates in the control city of Quebec. The suicide rate in the intervention group decreased significantly by 78.9% to a rate of 6.4 suicides per 100,000 population per year compared to an 11% increase in the control city (29.0 per 100,000; Mishara & Martin, 2012).

Another example of this approach is the *United States Air Force Suicide Prevention Program*. The program included 11 policy and education initiatives and was designed to change the culture of the Air Force surrounding suicide. The program uses leaders as role models and agents of change, establishes expectations for behavior related to awareness of suicide risk, develops population skills and knowledge (i.e., education and training), and investigates every suicide (i.e., outcomes measurement). The program represents a fundamental shift from viewing suicide and mental illness solely as medical problem and instead sees them as larger service-wide problems impacting the whole community (Knox, Litts, Talcott, Feig, & Caine, 2003). Using a time-series design to examine the impact of the program on various violence-related outcomes, researchers found that the program was associated with a 33% relative risk reduction in suicide (Knox et al., 2003). The program was also associated with relative risk reductions in related outcomes including moderate and severe family violence (30% and 54%, respectively), homicide (51%), and accidental death (18%) (Knox et al., 2003). A longitudinal assessment of the program over the period 1981 to 2008 (16 years before the 1997 launch of the program and 11 years post-launch) found significantly lower rates of suicide after the program was launched than before (Knox et al., 2010). These effects were sustained over time, except in 2004, which the authors found was associated with less rigorous implementation in that year than in the other years (Knox et al., 2010).

*Mates in Construction (MATES)* is another example of a program designed to raise awareness of suicide as a safety issue facing workplace health, improve help-seeking, and link those in need to appropriate care. The program includes general awareness training for all construction workers on-site; training for "connectors" who serve to keep coworkers safe while connecting them to help; a 24-hour telephone response line and online counseling; and applied suicide intervention skills training for other individuals who are formally trained on-site to identify and respond to suicidal ideation and behavior. An examination of suicide rates among male construction workers in Queensland prior to the program (2003-2007) compared with rates for the five years of the

**Comment [A]:** I don't think the evidence is strong enough to include this example. I found a study in addition to the economic study you cite below, but the relative reduction among construction workers was not significant. Just mentioned this to Jim and he doesn't think it is strong enough to include.



program (2008-2012) and to general rates of male suicide in Queensland and Australia for the two time periods, found a relative reduction of 7.9% among construction industry workers during the years of the program (Martin, Swannell, Milner, & Gullestrup, 2016). The age-adjusted male suicide rate, by comparison, increased during the period 2008-2012. An evaluation of the potential economic impact of widespread implementation of the program (Doran, Ling, Gullestrup, Swannell, & Milner, 2016) found that it could potentially avert 0.4 suicides, 1.01 full incapacity cases, and almost 5 short absences per year in the construction industry, generating an annual savings of \$3.66 million AU. They further indicated that every Australian dollar invested in the program would result in a \$4.60 return (Doran, Ling, Gullestrup, Swannell, & Milner, 2016).

Finally, while the evidence is still being built for suicide prevention in correctional facilities, preliminary evidence suggests that organizational policies and practices that include routine suicide prevention training for all staff, standardized intake screening and risk assessment, provision of shared information between staff members, especially in transitioning or transferring of inmates, varying levels of observation, safe physical environment, emergency response protocols, notification of suicidal behavior/suicide through the chain of command, and critical incident stress debriefing and death review can potentially reduce suicide. When these policies and practices were implemented across 11 state prisons in Louisiana, suicide rates dropped from a rate of 23.1 per 100,000 before the intervention to 12.4 per 100,000 the following year (Hayes, 1995). Other similar programs have seen declines in suicide both in the United States and internationally (Barker, Kölves, & De Leo, 2014).

- **Community-based policies to reduce excessive alcohol use.** While multiple policies to limit excessive use of alcohol exist, several studies on alcohol outlet *density*, specifically, suggest that measures to reduce alcohol outlet density can potentially reduce alcohol-involved suicides. Additionally, a longitudinal analysis of alcohol outlet density, suicide mortality, and hospitalizations for suicide attempts over 6 years in 581 California zip codes indicated that the density of bars, specifically, is inversely related to suicide and suicide attempts, particularly in rural areas (Johnson, Gruenewald, & Remer, 2009).

**Comment [A]:** Non-significant reduction – they believe the study was underpowered.

**Comment [A]:** Martin G, Swannell S, Milner A, Gullestrup J (2016) Mates in Construction Suicide Prevention Program: A Five Year Review. J Community Medicine and Health Education, 6:465. doi:10.4172/2161-0711.1000465

## Promote Connectedness

### Rationale

Sociologist, Emile Durkheim theorized in 1897 that weak social bonds, i.e. lack of connectedness, are among the chief causes for suicidality (Durkheim, 1897/1951). *Connectedness* is the degree to which an individual or group of individuals are socially close, interrelated, or share resources with others (Centers for Disease Control and Prevention, 2009). Social connections can be formed within and between multiple levels of the social ecology (Dahlberg & Krug, 2002), for instance between individuals (e.g. peers, neighbors, co-workers), families, schools, neighborhoods, workplace, faith communities, cultural groups, and society as a whole. Related to connectedness, *social capital* refers to a sense of trust in one's community and neighborhood, social integration, and also the availability and participation in social organizations (Beyer, Layde, Hamberger, & Laud, 2015; Muennig, Cohen, Palmer, & Zhu, 2013). Many ecological cross-sectional and longitudinal studies have examined the impact of aspects of social capital on depression symptoms, depressive disorder, mental health more generally, and suicide. While the evidence is limited, existing studies suggest the pattern is towards a positive association between social capital measured by social trust, community/neighborhood engagement, and improved mental health. Connectedness and social capital together can serve to protect against suicidal behaviors by decreasing isolation, encouraging adaptive coping behaviors, increasing belongingness, personal value and worth all of which helps individuals to build resilience in the face of adversity. Connectedness can also provide individuals with better access to formal supports and resources, mobilize communities to meet the needs of its members and provide collective primary prevention activities to the community as a whole (Centers for Disease Control and Prevention, 2009).

### Approaches

Promoting connectedness among individuals and within communities through modeling peer norms and enhancing community engagement may protect against suicide.

- **Peer norm programs** seek to normalize protective factors for suicide such as help-seeking, reaching out and talking to trusted adults, and promote peer connectedness. By leveraging the leadership qualities and social influence of peers, these approaches can be used to shift group-level beliefs and promote positive social and behavioral change. These approaches typically target youth and are delivered in school settings but can also be implemented in community settings.
- **Community engagement activities.** Community engagement is an aspect of social capital. Community engagement approaches may involve residents participating in a range of activities, including religious activities, community clean-up and greening activities, and physical exercise. These activities provide opportunities for residents to become more involved in the community and to connect with other community members, organizations, and resources, resulting in



enhanced overall physical health, reduced stress, and decreased depressive symptoms, thereby reducing risk of suicide.

### Potential Outcomes

- Reductions in maladaptive coping attitudes and behaviors
- Increases in healthy coping attitudes and behaviors
- Increases in referrals for youth in distressed
- Increases help-seeking behaviors
- Increases in positive perceptions of adult support

### Evidence

Current evidence suggests a number of positive benefits of peer norm and community engagement activities, although more evaluation research is needed to examine whether these improvements in factors that protect against suicidal behavior translate into reduced suicide attempts and deaths.

- **Peer norm programs.** Evaluations show that programs such as *Sources of Strength* can improve school norms and beliefs about suicide that are created and disseminated by student peers. In a randomized controlled trial of *Sources of Strength* conducted with 18 high-schools (6 metropolitan, 12 rural), Wyman et al. (2010) found that the program improved adaptive norms regarding suicide among peer leaders, connectedness to adults, and school engagement. Peer leaders were also more likely than controls to refer a suicidal friend to an adult. For students, the program resulted in increased perceptions of adult support for suicidal youths, particularly among those with a history of suicidal ideation, and the acceptability of help-seeking behaviors. Finally, trained peer leaders also reported a greater decrease in maladaptive coping attitudes compared with untrained leaders (Wyman et al., 2010).
- **Community engagement activities.** A vacant lot greening initiative was undertaken in Philadelphia between 1999 and 2008. Local residents and community members worked together to green 4,436 lots (or 7.8 million square feet) in 4 areas of the city. Researchers found significant reductions in community residents' self-reported level of stress, which is a risk factor for suicide, and engagement in more physical exercise, a protective factor for suicide, than residents in control vacant lot areas. Other benefits included reductions in firearm assaults and vandalism (Branas et al., 2011).

## Teach Coping and Problem-Solving Skills

### Rationale

Building life skills prepares individuals to successfully tackle every day challenges and adapt to stress and adversity. Life skills encompasses many concepts, but most often include coping and problem-solving skills, emotional regulation, conflict resolution, and critical thinking. Life skills are important in shielding individuals from suicidal behaviors (World Health Organization, 2014). Suicide prevention programs that focus on life and social skills training are drawn from social cognitive theories (Bandura, 1986), surmising that suicidal behavior is attributed to either direct learning and modeling or environmental and individual (e.g. hopelessness) characteristics. The inability to employ adequate strategies to cope with immediate stressors or identify and find solutions for problems has been characterized among suicide attempters (Pollock & Williams, 2004). Teaching and providing youth with the skills to tackle every day challenges and stressors is, therefore, an important developmental component to suicide prevention.

### Approaches

Social emotional learning programs and parenting skill and family relationship programs are two approaches for teaching coping and problem-solving skills.

- **Social emotional learning programs** focus on developing and strengthening communication and problem-solving skills, emotion regulation, conflict resolution, help seeking and coping skills. These approaches address a range of risk and protective factors for suicidal behavior. They provide children and youth with skills to resolve problems in relationships, school, and with peers, and help youth to address other negative influences (e.g., substance use) associated with suicide. These approaches are typically delivered to all students in a particular grade or school, although some programs also focus on groups of students considered to be at high risk for suicide. Opportunities to practice and reinforce skills are an important part of programs that work (Herman, Borden, Reinke, & Webster-Stratton, 2011).
- **Parenting skill and family relationship programs** provide caregivers with support and are designed to strengthen parenting skills, enhance positive parent-child interactions, and improve children's behavioral and emotional skills and abilities. Programs are typically designed for parents or caregivers with children in a specific age range and can be self-directed or delivered to individual families or groups of families. Some programs have sessions primarily with parents or caregivers while others include sessions for parents or caregivers, youth, and the family. Specific program content typically varies by the age of the child but often has consistent themes of child development, parent-child communication and relationships, and youth's interpersonal and problem-solving skills.



## Potential Outcomes

- Reductions in suicide attempts and suicide ideation
- Reductions in suicide risk behaviors (i.e., depression, anxiety, conduct problems, substance abuse)
- Improvements in help-seeking behavior
- Improvements in social competence and emotional regulation skills
- Improvements in problem-solving and conflict management skills

## Evidence

Several social emotional learning and parenting and family relationship programs have been shown in rigorous evaluations to improve resilience and reduce problem behavior and risk factors for various behaviors, including ones closely related to suicide, such as depression, internalizing behaviors, and substance abuse (M. S. Knox, Burkhart, & Hunter, 2010).

- **Social emotional learning programs.** The *Youth Aware of Mental Health Program (YAM)* is a program developed for teenagers aged 14-16 that uses interactive dialogue and role-playing to teach adolescents about the risk and protective factors associated with suicide (including knowledge about depression and anxiety) and enhances their problem-solving skills for dealing with adverse life events, stress, school and other problems (Wasserman et al., 2014). In a cluster-randomized controlled trial conducted across 10 European Union countries and 168 schools, students in schools randomized to *YAM* were significantly less likely to attempt suicide and have severe suicidal ideation at the 12-month follow-up compared to students in control schools which received educational materials and care as usual. Overall, the relative risk of youth suicide attempts among the *YAM* group was reduced by over 50% demonstrating that out of 1000 students, five attempted suicide in the *YAM* group compared to 11 in the control group. Additionally, related to severe suicide ideation, in the *YAM* group absolute risk fell by 0.50% and relative risk fell by 49.6% (Wasserman et al., 2014).

Another example is the *Good Behavior Game (GBG)*, which is a classroom-based program for elementary school children aged 6-10. The program uses a team-based behavior management strategy that promotes good behavior by setting clear expectations for good behavior and consequences for maladaptive behavior. The goal of the *GBG* program is to create an integrated classroom social system that is supportive of all children being able to learn with little aggressive or disruptive behavior (Wilcox et al., 2008). Two cohorts of youths participated in the program in 1985-86 and 1986-87 school years when they were in the first and second grades. A number of proximal and distal outcomes were assessed among the two cohorts over time. With respect to distal suicide-related outcomes, an outcome evaluation of the *GBG* indicated that individuals in the first cohort who were assigned to participate in *GBG* when they were in the first grade reported half the adjusted odds of suicidal ideation

and suicide attempts when assessed approximately 15 years later, between the ages of 19 to 21, compared to peers who had been in a standard classroom setting. The beneficial effect of the program was consistent for suicidal ideation regardless of whether baseline covariates were included. The *GBG* effect on attempts was less robust in some adjusted models including caregiver mental health. In the second cohort of *GBG* students, neither suicidal ideation nor suicide attempts were significantly different between *GBG* and the control interventions (Wilcox et al., 2008). The researchers believed this may have been due to a lack of implementation fidelity. *GBG* was also found to be associated with reduced risk of later substance abuse, a risk factor for suicide (Kellam et al., 2008).

- **Parenting skill and family relationship programs.** Parenting and family skills training approaches have shown promising impacts in preventing key risk factors associated with suicide. For example, the *Incredible Years (IY)* is a comprehensive group training program for parents, teachers and children designed to reduce conduct and substance abuse problems, two important suicide risk factors in youth by improving protective factors such as responsive and positive parent-teacher-child interactions and relationships, emotion self-regulation and social competence (all protective factors for suicide) (Herman et al., 2011). The program includes 9-20 sessions offered in community-based settings (e.g., religious, recreation centers, mental health treatment centers, and hospitals). Several studies have demonstrated the effect of the *IY* program on reducing internalizing symptoms, such as anxiety and depression, and child conduct problems (C. H. Webster-Stratton, Reid, & Beauchaine, 2011; Webster-Stratton, Jamila Reid, & Stoolmiller, 2008). The program is also associated with improved problem-solving and conflict management; these skills were maintained at 1-year follow-up (Reid, Webster-Stratton, & Hammond, 2003; C. Webster-Stratton & Hammond, 1997; C. Webster-Stratton, Reid, & Hammond, 2001). The program demonstrated greater benefits as the dosage of the intervention increased (Herman et al., 2011).

Additionally, *Strengthening Families 10–14* is a program that involves sessions between parents, youth, and family with the goal of improving parents' skills for disciplining, managing emotions and conflict, and communicating with their children; promoting youths' interpersonal and problem-solving skills; and creating family activities to build cohesion and positive parent-child interactions. The premise of the program is that developing these skills for both parents and children will reduce internalizing behavior and adolescent substance abuse, two important risk factors for suicide (Spoth, Gyll, & Day, 2002). *Strengthening Families* has been shown to significantly decrease externalizing behaviors, such as aggression, alcohol use, and drug use among youth participants, as well as reduce depression, alcohol use, and drug use among participating families (Spoth et al., 2002).



## Identify and Support People At-Risk

### Rationale

In order to decrease suicide, ~~care of, and~~ attention to, ~~people at increased risk~~ vulnerable populations is necessary, as these ~~individuals groups~~ tend to experience suicidal behavior at higher than average rates. ~~These~~ Such vulnerable populations include, but are not limited to, individuals with lower socio-economic status or who are living with a mental health problem; people who have ~~previously~~ attempted suicide ~~previously~~; Veterans and active duty military personnel; individuals who are institutionalized, have been victims of violence, or are homeless; individuals of sexual minority status; and members of certain racial and ethnic minority groups (Bachynski et al., 2012; Centers for Disease Control and Prevention, 2016; Curtin et al., 2016; Kann et al., 2016; Lineberry & O'Connor; Russell & Joyner, 2001). Supporting these ~~vulnerable~~ groups requires proactive case finding ~~and effective response, crisis intervention, and evidence-based treatment~~ ~~along with access to, and retention in, mental health services~~. Finding ~~effective optimal~~ ways of identifying at-risk ~~or vulnerable groups~~ individuals, customizing services to make them ~~more~~ accessible (e.g., ~~internet-based services when appropriate~~) and engaging ~~people~~ in evidence-based care (e.g. through such measures as collaborative treatment), remain key challenges. ~~For example, S~~ simply improving ~~or expanding~~ services does not guarantee that those services will be used by ~~those people~~ most in need of them, nor will it necessarily increase the number of people who follow ~~treatments that are~~ recommended referrals or treatment. ~~For example, some p~~ People living in ~~economically (disadvantaged) communities areas may~~ face social and economic issues that ~~can~~ adversely affect their ability to ~~access supportive services~~.

Comment [A]: Not sure the rationale fully captures the treatment pieces; seems a bit heavy on access.

Comment [A]: Made edits below

Comment [A]: This sentence seemed problematic because we were saying we need to pay attention to people at increased risk because they have higher rates of suicidal behavior—that appeared circular so changed.

Comment [A]: This now falls under the second strategy.

Comment [A]: I revised the wording here, so that it is more clear that we are talking about economically disadvantaged areas and not “disadvantaged people”.

Comment [A]: I thought it sounded odd to use economic twice so changed first mention to low income.

### Approaches

The following approaches focus on identifying and supporting people at increased risk.

- **Gatekeeper training** is designed to train teachers, coaches, clergy, emergency responders, primary and urgent care providers, and others in the community to identify people who may be at risk of suicide and to respond effectively, including facilitating treatment seeking and support services. Gatekeeper training may be implemented in a variety of settings to identify and support people at risk.
- **Crisis intervention.** These approaches provide support and referral services, typically by connecting a person in crisis (or a friend or family member of someone at-risk) to trained volunteers or professional staff via telephone hotline, online chat, text messaging, or in-person. Crisis intervention approaches are intended to impact key risk factors for suicide, including feelings of depression, hopelessness, and subsequent mental health care utilization. Similar to means reduction, crisis interventions can put space or time between an individual who may be considering suicide and harmful behavior.

- **Treatment for people at-risk of suicide** can include various forms of psychotherapy delivered by licensed providers to help individuals with mental health problems and other suicide risk factors with problem-solving and emotion regulation. Treatment usually takes place in a one on one or group format between patients and clinicians and can vary in duration from several weeks to ongoing therapy, as needed. Treatment that employs collaborative (i.e., between patient and therapist or care manager) and/or integrated care (e.g., linkage between primary care and behavioral health care) can help engage and motivate patients, thereby increasing retention in therapy and decreasing suicide risk (Archer et al., 2012; Bruce et al., 2004; Gilbody, Bower, Fletcher, Richards, & Sutton, 2006).
- **Treatment to prevent re-attempts.** These approaches typically include follow-up contact and use diverse modalities (e.g., home visits, mail, telephone, e-mail) to engage recent suicide attempt survivors in continued treatment to prevent re-attempts. Treatment may focus on improved coping skills, mindfulness, and other emotional regulation skills, and may include case management home visits to increase adherence to treatment and continuity of care; and one-on-one interpersonal therapy and/or group therapy. Approaches that engage and connect attempters to peers and providers are especially important because many attempters do not present to aftercare; 12%-25% reattempt within a year, and 3%-9% of attempt survivors die by suicide within 1 to 5 years of their initial attempt (Inagaki et al., 2015)

**Comment [A]:** Need to do a cross-walk with the evidence presented for each approach to make sure all relevant outcomes are included here (and not just the ones that were there before the revision).

### Potential Outcomes

- Reductions in suicide attempts
- Reductions in suicide deaths
- Reductions in symptoms of mental illnesses and suicidal ideation
- Reductions in mental health-related sequelae
- Reductions in re-attempts
- Increases in connectedness
- Improvements in coping skills
- Increases in identification of individuals at-risk for suicidal behavior
- Increases in at-risk individuals in treatment
- Increases in community members trained to identify at-risk individuals
- Increases in referrals for health care

### Evidence

The current evidence suggests that identifying people at risk of suicide and the continued provision of treatment and support for these individuals can positively impact suicide and its associated risk factors.



- **Gatekeeper training.** *Applied Suicide Intervention Skills Training (ASIST)* is a widely implemented training program that helps hotline counselors, emergency workers, and other gatekeepers to identify and connect with suicidal individuals, understand their reasoning for living and dying, and assist with safely connecting those in need to available resources. In a study employing a randomized controlled trial, Gould, Cross, Pisani, Munfakh, & Kleinman (2013) evaluated the training across the *National Suicide Prevention Lifeline* network of hotlines over the period 2008-2009. Using data from 1,410 suicidal individuals who called 17 Lifeline centers, the researchers found that compared to callers who spoke to counselors that received the usual care training, individuals who spoke with counselors without training in *ASIST* were significantly more likely to feel depressed, suicidal, more overwhelmed, and less hopeful by the end of their call to the hotline compared to those with training in *ASIST*. Counselors trained in *ASIST* were also more skilled at keeping callers on the phone longer and establishing a connection with them. However, training in *ASIST* did not result in more comprehensive suicide risk assessments than usual care training (Gould et al., 2013).

Gatekeeper training has also been a primary component of the *Garret Lee Smith (GLS) Suicide Prevention Program*, which is in place in 49 states and 48 tribes. A multi-site evaluation assessed the impact of community gatekeeper training on suicide attempts and deaths by comparing the change in suicide rates and nonfatal suicidal behavior among young people aged 10-24 in counties implementing *GLS* trainings, with the trajectory observed in similar counties that did not implement these trainings. Counties that implemented *GLS* trainings had significantly lower youth suicide rates one year following the training implementation (Walrath, Garraza, Reid, Goldston, & McKeon, 2015). This finding equates to a decrease of 1 suicide death per 100,000 among youth ages 10 to 24, or the prevention of approximately 237 deaths in the age group, between 2007 and 2010. Counties implementing *GLS* program activities also had significantly lower suicide attempt rates among youth ages 16 to 23 in the year following implementation of the *GLS* program than did similar counties that did not implement *GLS* activities (4.9 fewer attempts per 1000 youths; Godoy Garraza, Walrath, Goldston, Reid, & McKeon, 2015). More than 79,000 suicide attempts may have been prevented during the period examined, following implementation of the *GLS* program.

- **Crisis intervention.** Suicide prevention hotlines are one way to provide crisis intervention. In an evaluation of the effectiveness of the *National Suicide Prevention Lifeline* to prevent suicide, 1,085 suicidal individuals who called the hotline completed a standard risk assessment for suicide, and 380 of those completed a follow-up assessment between 1 and 52 days (mean=13.5 days) after the initial assessment. Researchers found that over half of the initial sample were seriously considering suicide when they called, and they had a plan for their suicide. Researchers also found that among follow-up participants, there was a significant decrease in psychological

pain, hopelessness, and intent to die between initiation of the call (time 1) to follow-up (time 3). Between time 2 (end of the call) to time 3, the effect remained for psychological pain and hopelessness, but was not significant for intent to die (Gould, Kalafat, Harrismunfakh, & Kleinman, 2007).

Comment [A]: Formatting is weird here.

- **Treatment for people at-risk of suicide.** The *Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)* program aims to prevent suicide among older primary care patients by reducing suicide ideation and depression. *IMPACT* facilitates the development of a therapeutic alliance, a personalized treatment plan that includes patient preferences, as well as proactive follow-up (biweekly during an acute phase and monthly during continuation phase) by a depression care manager (Hunkeler et al., 2006). The program has been shown to significantly improve quality of life, and to reduce functional impairment, depression and suicidal ideation over 24-months of follow-up (Hunkeler et al., 2006; Unutzer et al., 2006) relative to patients who received care as usual.

*Collaborative Assessment and Management of Suicidality (CAMS)*, is a therapeutic approach for suicide-specific assessment and treatment. The program's flexible approach can be used across treatment settings and clinician theoretical orientations and involves the clinician and patient working together in an interactive assessment process to develop patient-specific treatment plans. Sessions are collaborative and involve constant patient input about what is and is not working with the ultimate goal of enhancing the therapeutic alliance and increasing treatment motivation in the suicidal patient. *CAMS* been tested and supported in 6 correlational studies (Jobes, 2012), in a variety of inpatient and outpatient settings, and in one RCT with several additional RCTs under way. A feasibility trial with a community-based sample of suicidal outpatients randomly assigned to *CAMS* or enhanced care as usual (intake with a psychiatrist or psychiatric nurse practitioner followed by 1-11 visits with a case manager and medication as needed) found better treatment retention among the *CAMS* group and significant improvements in suicidal ideation, overall symptom distress, and feelings of hopelessness at the 12 month follow-up (Comtois et al., 2011).

Other examples include *Dialectical Behavioral Therapy (DBT)* and *Attachment-Based Family Therapy (ABFT)*. *DBT* is a multicomponent therapy for individuals at high risk for suicide and who may struggle with impulsivity and emotional regulation. The components of *DBT* include individual therapy, group skills training, between-session telephone coaching and a therapist consultation team. In a randomized controlled trial of women with recent suicidal or self-injurious behavior, those receiving *DBT* were half as likely to make a suicide attempt at two-year follow-up than women receiving community treatment (23% vs 46%), required less hospitalization for suicide ideation, and had lower medical risk across all suicide attempts and self-injurious acts combined (Linehan et al., 2006).



ABFT is a program for adolescents aged 12-18 and is designed to treat clinically diagnosed major depressive disorder, eliminate suicidal ideation, and reduce dispositional anxiety (Diamond et al., 2010). A randomized controlled trial of ABFT found that suicidal adolescents assigned to ABFT experienced significantly greater improvement in suicidal ideation over 24 weeks of follow-up than did adolescents assigned to enhanced usual care. Additionally, a significantly higher percentage of ABFT participants reported no suicidal ideation in the week prior to assessment at 12 weeks than did adolescents receiving enhanced usual care (69.2% vs. 34.6%) and at 24 weeks (82.1% vs. 46.2%) (Diamond et al., 2010).

The Veterans Affairs *Translating Initiatives for Depression into Effective Solutions* project (TIDES) uses a depression care liaison to link primary care and mental health services. The depression care liaison assesses and educates patients and follows up with both patients and providers between primary care visits to optimize treatment. This collaborative care increases the efficiency of providing mental health services by bringing mental health care to the primary care setting, where most patients are first detected and subsequently treated for many mental health conditions. An evaluation study of the TIDES project, specifically, found significant decreases in depression severity scores among 70% of primary care patients (Rubenstein et al., 2010). TIDES also demonstrated 85% and 95% compliance with medication and follow-up visits, respectively (Rubenstein et al., 2010).

- **Treatment to prevent re-attempts.** Several strategies that aim to prevent re-attempts have demonstrated impact on reducing suicide deaths. For example, *Emergency Department Brief Intervention with Follow-up Visits* is a program that involves a one-hour discharge information session that addresses suicidal ideation and behavior attempts, distress, risk and protective factors, alternatives to self-harm, and referral options, combined with nine follow-up contacts over 18 months (at 1, 2, 4, 7, 11 weeks and 4, 6, 12, 18 months). Follow-up contacts are either conducted by phone or through home visits according to a specific time line for up to 18-months. A randomized controlled trial that enrolled suicide attempters from eight hospital emergency departments in five countries (Brazil, India, Sri Lanka, Iran, and China) found that a brief intervention combined with 9 follow-up visits over 18-months was associated with significantly fewer deaths from suicide relative to a treatment-as-usual group (0.2% versus 2.2%, respectively) (Fleischmann et al., 2008).

Another example of treatment to prevent re-attempts involves *active follow-up contact approaches* such as postcards, letters, and telephone calls intended to increase a patient's sense of connectedness with health care providers and decrease isolation. These approaches include expression of care and support and typically invite patients to reconnect with their provider. Contacts are made periodically (e.g., monthly or every few months in the first 12 months post-discharge with some programs continuing contact for two or more years). In a meta-analysis

Comment [A]: Attempts? Or should this say "self-harm"?

conducted by Inagaki et al. (2015), interventions to prevent repeat suicide attempts in patients admitted to an emergency department for suicide attempt were found to reduce reattempts by approximately 17% for up to 12 months post-discharge; however, the effects of these approaches beyond 12 months on reattempts has not yet been demonstrated. Also, because the number of trials and associated sample sizes included in this meta-analysis were small, it was not possible to determine the effect of active contact and follow-up approaches on death by suicide.

In a randomized controlled trial of the post-crisis suicide prevention long-term follow-up contact approach, Motto and Bostrom (2001) found that patients who refused ongoing care but who were randomized to be contacted by letter four times per year had a lower rate of suicide over two years of follow-up than did patients in the control group who received no further contact. Other studies have also shown post-crisis letters and coping cards to be protective against suicide ideation and attempts (Hassanian-Moghaddam, Sarjami, Kolahi, & Carter, 2011; Wang et al., 2016).

Finally, *Cognitive Behavior Therapy for Suicide Prevention (CBT-SP)* is an example of a therapeutic approach to prevent re-attempts. It uses a risk-reduction, relapse prevention approach that includes an analysis of proximal risk factors and stressors (e.g., relationship problems, school or work-related difficulties) leading up to and following the suicidal event; safety plan development; skill building; and psychoeducation. *CBT-SP* also has family skill modules focused on family support and communication patterns as well as improving the family's problem solving skills. A randomized controlled trial of *CBT-SP* found that 10-session outpatient cognitive therapy designed to prevent repeat suicide attempts resulted in a 50% reduction in the likelihood of a suicide reattempt among adults who had been admitted to an emergency department for a suicide attempt relative to treatment as usual (Brown et al., 2005).



## Lessen Harms and Prevent Future Risk

### **(Rationale)**

~~Individuals who have experienced mental health challenges, suicidal ideation, who have made suicide attempts or engaged in non-suicidal self-injury are at increased risk of suicide (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). Millions of people are bereaved by suicide every year in the United States and throughout the world. Risk of suicide and suicide risk factors can also have been shown to increase among those people who have lost a friend/peer, family member, co-worker, or other acquaintance close contact to suicide (Pitman, Osborn, King, & Erlangsen, 2014). Care and attention to the bereaved is therefore of high importance. Despite the best of often good intentions, media and others responding to suicide may inadvertently add to this risk among the bereaved. For example, research suggests that exposure to sensationalized or otherwise uninformed reporting regarding suicide may heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to what is known as suicide contagion (Etzersdorfer & Sonneck, 1998; Niederkrotenthaler & Sonneck, 2007). Similarly, schools and other youth While the evidence is still being built in this area, particularly with regard to the impact of policy and practices on suicide and suicide attempts in the United States, taking effective measures to care for the bereaved population through such means as postvention interventions (e.g. counseling, support groups and debriefing sessions) and safe reporting on suicide may reduce risk of suicide have shown impacts in other countries.~~

**Comment [A]:** Need to modify the rationale so that it speaks to the primary approaches included below – perhaps starting with the second sentence and expanding on that a bit.

**Comment [A]:** This introductory statement needs to be modified now that this section only includes postvention and safe reporting following a suicide.

### **Approaches**

~~There are a number of Some approaches that can be used to lessen harms and reduce future risk of suicide including various therapeutic treatments and approaches providing continuity of care, caring for the bereaved, and safe reporting following a suicide.~~

- **Postvention** approaches are implemented *after* a suicide has taken place and may include debriefing sessions, counseling, and/or bereavement support groups for surviving friends and family members/loved ones. These programs have not typically been evaluated for their impact on suicide or suicidal behavior but may reduce survivors' guilt, feelings of depression, and complicated grief (Szumilas & Kutcher, 2011).
- **Safe reporting following a suicide.** The manner in which information on a recent suicide is communicated to the public (e.g. school assemblies, mass media, social media) can heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to suicide contagion. Reports that are both inclusive of suicide prevention messages, stories of hope and resilience, risk and protective factors, and links to helping resources (e.g., hotline), and that avoid sensationalizing events or reducing suicide to one cause, can help reduce the likelihood of suicide

contagion. ~~(Therefore, responsible and safe reporting may help prevent suicide and suicide contagion.)~~

**Comment [A]:** Suggest fleshing this out a bit so that the reader has a good sense of what is meant by "safe reporting".

### Potential Outcomes

- ~~Reductions in mental health-related sequelae~~
- ~~Increases in connectedness~~
- ~~Improvements in coping skills~~
- ~~Reductions in suicidality (ideation/attempts)~~
- ~~Reductions in psychological distress~~
- ~~Increases in treatment seeking~~
- Improvements in messaging-reporting following suicide
- ~~Reductions in re-attempts~~
- Reductions in contagion effects related to suicide

**Comment [A]:** Outcome section needs to be modified now that only postvention and safe reporting are included.

**Comment [A]:** Statement needs to be modified

### Evidence

~~(Current evidence suggests that therapeutic treatments and other approaches)~~ for lessening harm through postvention and safe reporting can impact risk and protective factors for suicide.

- **Postvention** programs are implemented with the goal of providing support to survivors of others' suicide to reduce their own risk of suicide. One example of a postvention program, *StandBy Response Service (StandBy)*, provides clients with face-to-face outreach and telephone support through a professional crisis response team. Site coordinators develop customized case management plans, referring clients to other existing community services matched to their needs (Visser, Comans, & Scuffham, 2014). In a study by Visser et al. (2014), *StandBy* clients were significantly less likely to be at high risk for suicidality (suicide ideation and attempts) and had less psychological distress than a suicide bereaved comparison group who had not had contact with the *StandBy* program (48% and 64% respectively). Additionally, research suggests that active postvention approaches in which outreach to suicide survivors occurs at the scene of a suicide is associated with intake into treatment sooner, greater attendance at support group meetings, and attendance at more meetings compared to passive postvention (versus passive approaches where survivors self-refer for services) (Cerel & Campbell, 2008).
- **Safe reporting and messaging about suicide.** One way to ensure safe reporting and messaging about suicide is to encourage news media adhere to *Recommendations for Reporting on Suicide* (<http://www.reportingonsuicide.org>). Reports that are both inclusive of suicide prevention messages, stories of hope and resilience, risk and protective factors, and links to helping resources (e.g., hotline), and that avoid sensationalizing events or reducing suicide to one cause,



can help reduce the likelihood of suicide contagion. The most compelling evidence supporting these recommendations for reporting comes from Austria. After a sharp increase in suicides on the Viennese subway, media guidelines were introduced and an interrupted time series design was used to evaluate the national impact of the guidelines on subsequent suicides. Changes in the quality and quantity of media reporting resulted in a nationwide significant reduction of 81 suicides annually (Niederkrotenthaler & Sonneck, 2007). Finally, research suggests that not only does reporting on suicide in a negative way (e.g., reporting on suicide myths and repetition) have harmful effects on suicide, but reporting on positive coping skills in the face of adversity can also demonstrate protective effects against suicide (Niederkrotenthaler et al., 2010). Reports of individual suicidal ideation not accompanied by reports of suicide or suicide attempts, along with reports describing a “mastery” of a crisis situation where adversities were overcome, was associated with significant decreases in suicide rates in the time period immediately following such reports (Niederkrotenthaler et al., 2010).

## Sector Involvement

Public health can play an important and unique role in addressing suicide. Public health agencies, which typically place prevention at the forefront of efforts and work to create broad population-level impact, can bring critical leadership and resources to bear on this problem. For example, these agencies can serve as a convener, bringing together partners and stakeholders to plan, prioritize, and coordinate suicide prevention efforts. Public health agencies are also well positioned to collect and disseminate data, implement preventive measures, evaluate programs, and track progress. Although public health can play a leadership role in preventing suicide, the strategies and approaches outlined in this technical package cannot be accomplished by the public health sector alone. As noted in the National Strategy to Prevent Suicide, the integration and coordination of prevention activities across sectors and settings is critical for expanding the reach and impact of suicide prevention efforts.

Other sectors vital to implementing this package include, but are not limited to, education, government (local, state, and federal), social services, health services, business, labor, justice, housing, media, and organizations that comprise the civil society sector such as faith-based organizations, youth-serving organizations, foundations, and other non-governmental organizations. Collectively, these sectors can make a difference in preventing suicide by impacting the various contexts and underlying risks that contribute to suicide.

The strategies and approaches described in this technical package are summarized in Appendix A along with the relevant sectors that are well positioned to lead implementation efforts. For example, business and labor, the health sector (including insurers, and providers, and health systems), and government entities are in the best position to implement programs and policies that *Strengthen Economic Supports* and *Strengthen Access and Delivery of Suicide Care*. These types of supports go beyond individual behavior change and require commitment and support from those sectors that can directly address



some of the underlying risks and the environmental contexts that increase the risk for suicide. Public health entities can play an important role by gathering and synthesizing information to inform policy, raise awareness, and evaluate the effectiveness of various policies. Moreover, partnerships with non-governmental and community organizations can be instrumental in increasing awareness of and garnering support for policies affecting individuals and families.

The public health sector has been at the forefront of many community-based prevention efforts, working collaboratively with schools and community-based organizations, to change social norms and positively impact health behavior. Public health is well suited to take on a similar leadership role in *Promoting Connectedness* through peer norm and community engagement activities and supporting the development, evaluation, and adoption of effective programs that *Teach Coping and Problem-Solving Skills* to prevent suicide from happening in the first place. These programs are often delivered in school and community settings, making education and non-governmental organizations vital partners in prevention.

Businesses, workplaces, and local and state government entities, on the other hand, are in the best position to establish policies and support practices that *Create Protective Environments* where people live, work, and play. Public health entities can play an important role by gathering and synthesizing information, working with other governmental agencies (e.g., criminal justice, defense) and agencies within the executive branch of their state or local government in support of policy and other approaches, and evaluating the effectiveness of measures taken. In a similar fashion, public health entities can partner with schools, workplaces, and community organizations to implement and evaluate prevention programs, policies and practices geared toward creating safe, healthy, and supportive environments.

Finally, this technical package includes a number of interventions delivered in hospital, primary care, behavioral health care, and community settings designed to *Identify and Support People At-Risk*. The intensity and activities for many of these interventions require the expertise of professionals who are licensed and trained to deliver critical intervention support. The health, social services, and justice sectors can work collaboratively to support individuals at high-risk for suicide and their families. These activities also require coordination of supports across various service providers and community organizations.

Regardless of strategy, action by many sectors will be necessary for the successful implementation of this package. In this regard, all sectors can play an important and influential role in preventing suicide from happening in the first place and lessening the immediate and long-term harms of suicidal behavior by helping those in times of crisis get the services and support they need.



## Monitoring and Evaluation

Monitoring and evaluation are necessary components of the public health approach to prevention. It is important to have timely and reliable data to monitor the extent of the problem and to evaluate the impact of prevention efforts. Data are also necessary for prevention planning and implementation.

Gathering ongoing and systematic data is important for prevention efforts. However, it is also important to gather data that are uniform and consistent across systems. Consistent data allow public health and other entities to better gauge the scope of the problem, identify high-risk groups, and monitor the effects of prevention programs and policies. Currently, it is common for different sectors, agencies, and organizations to employ varying definitions of suicidal ideation, behavior, and death that can make it difficult to consistently monitor specific outcomes across sectors and over time. For example, the manner in which deaths are classified can change from one jurisdiction to another, and can change based on local medical and/or medicolegal standards (A.E. Crosby, Ortega, et al., 2011). CDC's uniform definitions and recommended data elements for self-directed violence provide a useful framework to help ensure that data are collected in a consistent manner across surveillance systems (e.g., A.E. Crosby, Ortega, et al., 2011).

Surveillance systems exist at the federal, state, and local levels. It is important to assess the availability of surveillance data and data systems across these levels to identify and address gaps in the systems. CDC's *National Vital Statistics System (NVSS)* and the *National Violent Death Reporting System (NVDRS)* are examples of surveillance systems that provide data on deaths from suicide. *NVSS* is a nationwide surveillance system that collects demographic, geographic, and cause-of-death data from death certificates. *NVDRS* is a state-based surveillance system (currently in 40 states, the District of Columbia, and Puerto Rico) that combines data from death certificates, law enforcement reports, and coroner or medical examiner reports to provide detailed information on the circumstances of violent deaths, including suicide, which can assist communities in guiding prevention approaches (Blair, Fowler, Jack, & Crosby, 2016). Data from state and local Child Death Review teams and Suicide Death Review Teams (which are in a few states) offer another source to identify deaths and obtain insight into the gaps in services, systems, and modifiable risk factors for suicide.

The *National Electronic Injury Surveillance System-All Injury Program (NEISS-AIP)* provides nationally representative data about all types and causes of nonfatal injuries treated in U.S. hospital emergency departments, and can be used to assess national rates of, and trends in, self-harm injuries by cause (e.g., falls, poisoning, etc.), age, race/ethnicity, sex, disposition (where the injured person goes when released from the Emergency Department).

In addition to information on deaths and nonfatal injuries, there are also surveillance systems that provide national, state, and some local estimates of suicidal behavior. The *Youth Risk Behavior Surveillance System (YRBSS)* collects information from a nationally representative sample of 9-12 grade



students and is a key resource in monitoring health-risk behaviors among youth, including whether youth have seriously considered attempting suicide, attempted suicide, made a plan, or required treatment by a doctor or nurse for a suicide attempt that resulted in an injury, poisoning, or overdose (Brenner et al., 2013). The *YRBSS* data are obtained from a national school-based survey conducted by CDC as well as from state, territorial, tribal, and large urban school district surveys conducted by education and health agencies. The *National Survey on Drug Use and Health (NSDUH)* is an annual survey of the civilian, non-institutionalized population aged 12 years and older. *NSDUH* provides both national and state-level estimates of substance use (alcohol, tobacco, illicit drugs, and non-medical use of prescription drugs); mental health (past year mental illness, co-occurring illnesses); and service utilization, along with suicide ideation, suicide plans, and suicide attempts. *NSDUH* is a key resource to track trends in suicide-related risk factors in the population and to help identify groups at increased risk.

It is also important at all levels (local, state, and federal) to address gaps in responses, track progress of prevention efforts and evaluate the impact of those efforts, including the impact of this technical package. Evaluation data, produced through program implementation and monitoring, is essential to provide information on what does and does not work to reduce rates of suicide and its associated risk and protective factors. Theories of change and logic models that identify short, intermediate, and long-term outcomes are an important part of program evaluation.

The evidence-base for suicide prevention has advanced greatly over the last few decades. However, additional research is needed to understand the impact of programs, policies, and practices on suicide (and suicide attempts, at a minimum), as opposed to merely examining their effectiveness on risk factors.

More research is also needed to examine the effectiveness of primary prevention strategies (before risk occurs) and community-level strategies to prevent suicide at the population level. It will be important for researchers to test the effectiveness of combinations of the strategies and approaches included in this package. Most existing evaluations focus on approaches implemented in isolation, but there is potential to understand the synergistic effects within a comprehensive prevention approach. Lastly, there are also many potential opportunities to build and strengthen partnerships across program areas (e.g., violence prevention, substance abuse prevention) to evaluate the impact of different approaches on multiple outcomes.

**Comment [A]:** Last sentence added per suggestion of EDC. You can cite DVP's new Strategic Vision.

## Conclusion

Suicide is a serious public health problem whose rates have been on the rise for more than a decade and whose costs stretch well into the billions of dollars each year. While suicide is a rare outcome statistically, its human impact has a ripple effect that is far-reaching. Each of us likely interacts with suicide survivors, those with lived experience, and those with thoughts of suicide on a daily basis – at home, at work, and in our communities. Suicide and suicide attempts are public health issues of societal concern. There are a number of barriers that have impeded progress, including, for example, stigma related to help-seeking,



mental illness, being a survivor and fear related to asking someone about suicidal thoughts. Fortunately, like many public health problems, suicide is preventable, and more is being done to prevent suicide than ever before, as evidenced by the work of the National Action Alliance for Suicide Prevention, the release of the first world report on suicide, and more timely surveillance data, to name just a few examples.

In an effort to continue pushing the field and society further towards prevention, this technical package includes strategies and approaches that ideally would be used in a comprehensive, multi-level and multi-sectoral way. It includes strategies and approaches to prevent suicide from occurring in the first place, as well as strategies focused on lessening the immediate and long-term harms of suicidal behavior. It includes strategies that range from a focus on the whole population regardless of risk to strategies designed to support people at highest risk. Importantly, this technical package extends the bounds of the typical prevention strategies to consider approaches that go beyond individual behavior change to better address risk factors impacting communities and populations more broadly (e.g., economic policies to strengthen housing and financial security).

While the evidence base continues to emerge, the collection of programs, policies, and practices laid out here are available for implementation now. In keeping with good public health practice, the intent is that monitoring and evaluation will play a key role in that implementation. Moreover, as new evidence becomes available, this technical package can be refined to reflect the current state of the science.

In closing, and in keeping with a message of resilience as spoken by those with lived experience, ‘hope, help, and healing is possible.’

## References

- Archer, J., Bower, P., Gilbody, S., Lovell, K., Richards, D., Gask, L., . . . Coventry, P. (2012). Collaborative care for depression and anxiety problems. *The Cochrane Library*.
- Arsenault-Lapierre, G., Kim, C., & Turecki, G. (2004). Psychiatric diagnoses in 3275 suicides: a meta-analysis. *BMC Psychiatry*, 4, 37. doi:10.1186/1471-244X-4-37
- Bachynski, K. E., Canham-Chervak, M., Black, S. A., Dada, E. O., Millikan, A. M., & Jones, B. H. (2012). Mental health risk factors for suicides in the US Army, 2007–8. *Injury Prevention*, 18(6), 405-412.
- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*: Prentice-Hall, Inc.
- Barker, E., Kölves, K., & De Leo, D. (2014). Management of Suicidal and Self-Harming Behaviors in Prisons: Systematic Literature Review of Evidence-Based Activities. *Archives of Suicide Research*, 18(3), 227-240. doi:10.1080/13811118.2013.824830
- Beautrais, A. L. (2001). Effectiveness of barriers at suicide jumping sites: A case study. *Aust NZ J Psychiat*, 35. doi:10.1080/0004867010060501
- Beautrais, A. L., Gibb, S. J., Fergusson, D. M., Horwood, L. J., & Larkin, G. L. (2009). Removing bridge barriers stimulates suicides: An unfortunate natural experiment. *Aust NZ J Psychiat*, 43. doi:10.1080/00048670902873714
- Bellis, M. A., Hughes, K., Leckenby, N., Jones, L., Baban, A., Kachaeva, M., . . . Ulukol, B. (2014). Adverse childhood experiences and associations with health-harming behaviours in young adults: surveys in eight eastern European countries. *Bulletin of the World Health Organization*, 92(9), 641-655.
- Beyer, K. M., Layde, P. M., Hamberger, L. K., & Laud, P. W. (2015). Does neighborhood environment differentiate intimate partner femicides from other femicides? *Violence Against Women*, 21(1), 49-64. doi:10.1177/1077801214564075
- Blair, J. M., Fowler, K. A., Jack, S. P., & Crosby, A. E. (2016). The National Violent Death Reporting System: overview and future directions. *Inj Prev*, 22 Suppl 1, i6-i11. doi:10.1136/injuryprev-2015-041819
- Bossarte, R. M., Karras, E., Lu, N., Tu, X., Stephens, B., Draper, J., & Kemp, J. E. (2014). Associations between the Department of Veterans Affairs' suicide prevention campaign and calls to related crisis lines. *Public Health Rep*, 129(6), 516-525.
- Branas, C. C., Cheney, R. A., MacDonald, J. M., Tam, V. W., Jackson, T. D., & Ten Have, T. R. (2011). A difference-in-differences analysis of health, safety, and greening vacant urban space. *Am J Epidemiol*, 174(11), 1296-1306. doi:10.1093/aje/kwr273
- Brown, G. K., Ten Have, T., Henriques, G. R., Xie, S. X., Hollander, J. E., & Beck, A. T. (2005). Cognitive therapy for the prevention of suicide attempts: a randomized controlled trial. *JAMA*, 294(5), 563-570. doi:10.1001/jama.294.5.563
- Bruce, M. L., Ten Have, T. R., Reynolds III, C. F., Katz, I. I., Schulberg, H. C., Mulsant, B. H., . . . Alexopoulos, G. S. (2004). Reducing suicidal ideation and depressive symptoms in depressed older primary care patients: a randomized controlled trial. *JAMA*, 291(9), 1081-1091.
- Capaldi, D. M., Knoble, N. B., Shortt, J. W., & Kim, H. K. (2012). A Systematic Review of Risk Factors for Intimate Partner Violence. *Partner Abuse*, 3(2), 231-280. doi:10.1891/1946-6560.3.2.231
- Carter, M., McGee, R., Taylor, B., & Williams, S. (2007). Health outcomes in adolescence: associations with family, friends and school engagement. *J Adolesc*, 30(1), 51-62. doi:10.1016/j.adolescence.2005.04.002
- Centers for Disease Control and Prevention. (2009). Strategic direction for the prevention of suicidal behavior: Promoting individual, family, and community connectedness to prevent suicidal behavior. Retrieved from Available at: [http://www.cdc.gov/ViolencePrevention/pdf/Suicide\\_Strategic\\_Direction\\_Full\\_version-a.pdf](http://www.cdc.gov/ViolencePrevention/pdf/Suicide_Strategic_Direction_Full_version-a.pdf)
- Centers for Disease Control and Prevention. (2016). Web-Based Injury Statistics Query and Reporting System (WISQARS). Retrieved June 3, 2016 Available at: <http://www.cdc.gov/injury/wisqars/index.html>



- Cerel, J., & Campbell, F. R. (2008). Suicide survivors seeking mental health services: a preliminary examination of the role of an active postvention model. *Suicide Life Threat Behav*, 38(1), 30-34. doi:10.1521/suli.2008.38.1.30
- Cerel, J., Maple, M., De Venne, A., Moore, M., Flaherty, C., & Brown, M. (2016). Exposure to Suicide in the Community: Prevalence and Correlates in One US State. *Public Health Reports*, 131(1).
- Cerel, J., McIntosh, J. L., Neimeyer, R. A., Maple, M., & Marshall, D. (2014). The Continuum of "Survivorship": Definitional Issues in the Aftermath of Suicide. *Suicide and life-threatening behavior*, 44(6), 591-600. doi:10.1111/sltb.12093
- Chapman, A. L., & Dixon-Gordon, K. L. (2007). Emotional antecedents and consequences of deliberate self-harm and suicide attempts. *Suicide Life Threat Behav*, 37(5), 543-552. doi:10.1521/suli.2007.37.5.543
- Chapman, D. P., Whitfield, C. L., Felitti, V. J., Dube, S. R., Edwards, V. J., & Anda, R. F. (2004). Adverse childhood experiences and the risk of depressive disorders in adulthood. *J Affect Disord*, 82(2), 217-225.
- Cherpitel, C. J., Borges, G. L. G., & Wilcox, H. C. (2004). Acute alcohol use and suicidal behavior: A review of the literature. *Alcoholism: Clinical and Experimental Research*, 28(5 SUPPL.), 18S-28S.
- Classen, T. J., & Dunn, R. A. (2012). The effect of job loss and unemployment duration on suicide risk in the United States: a new look using mass-layoffs and unemployment duration. *Health Econ*, 21(3), 338-350. doi:10.1002/hecl.1719
- Coffey, C. E. (2006). Pursuing perfect depression care. *Psychiatr Serv*, 57(10), 1524-1526. doi:10.1176/ps.2006.57.10.1524
- Coffey, C. E. (2007). Building a system of perfect depression care in behavioral health. *Jt Comm J Qual Patient Saf*, 33(4), 193-199.
- Coffey, C. E., Coffey, M. J., & Ahmedani, B. K. (2013). An update on perfect depression care. *Psychiatr Serv*, 64(4), 396. doi:10.1176/appi.PS.640422
- Coffey, M., Coffey, C., & Ahmedani, B. K. (2015). Suicide in a health maintenance organization population. *JAMA Psychiatry*, 72(3), 294-296. doi:10.1001/jamapsychiatry.2014.2440
- Comtois, K. A., Jobes, D. A., S. O'Connor, S., Atkins, D. C., Janis, K., E. Chessen, C., . . . Yuodelis-Flores, C. (2011). Collaborative assessment and management of suicidality (CAMS): feasibility trial for next-day appointment services. *Depress Anxiety*, 28(11), 963-972. doi:10.1002/da.20895
- Cox, G. R., Owens, C., Robinson, J., Nicholas, A., Lockley, A., Williamson, M., . . . Pirkis, J. (2013). Interventions to reduce suicides at suicide hotspots: a systematic review. *BMC Public Health*, 13(1), 1-12. doi:10.1186/1471-2458-13-214
- Crosby, A. E., Espitia-Hardeman, V., Ortega, L., & Lozano, B. (2013). Alcohol and suicide. *Alcohol: Science, Policy and Public Health*, 190.
- Crosby, A. E., Han, B., Ortega, L., Parks, S. E., & Gfroerer, J. (2011). Suicidal Thoughts and Behaviors Among Adults Aged ≥18 Years — United States, 2008–2009. *MMWR*, 60(No. SS-13), 1-22.
- Crosby, A. E., Ortega, L., & Melanson, C. (2011). *Self-directed Violence Surveillance: Uniform Definitions and Recommended Data Elements, Version 1.0*. Retrieved from Atlanta, GA:
- Crosby, A. E., & Sacks, J. J. (2002). Exposure to Suicide: Incidence and Association with Suicidal Ideation and Behavior: United States, 1994. *Suicide and life-threatening behavior*, 32(3), 321-328. doi:10.1521/suli.32.3.321.22170
- Cunningham, P. J. (2009). Beyond parity: primary care physicians' perspectives on access to mental health care. *Health Aff (Millwood)*, 28(3), w490-501. doi:10.1377/hlthaff.28.3.w490
- Curtin, S. C., Warner, M., & Hedegaard, H. (2016). *Increase in suicide in the United States, 1999-2014*. ( ). Hyattsville, MD: National Center for Health Statistics Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/25116188>.
- Cylus, J., Glymour, M. M., & Avendano, M. (2014). Do generous unemployment benefit programs reduce suicide rates? A state fixed-effect analysis covering 1968-2008. *Am J Epidemiol*, 180(1), 45-52. doi:10.1093/aje/kwu106

- Dahlberg, L. L., & Krug, E. G. (2002). Violence-a global public health problem. In E. Krug, L. L. Dahlberg, J. A. Mercy, A. B. Zwi, & R. Lozano (Eds.), *World Report on Violence and Health* (pp. 1-56). Geneva, Switzerland: World Health Organization.
- Deisenhammer, E. A., Ing, C. M., Strauss, R., Kemmler, G., Hinterhuber, H., & Weiss, E. M. (2009). The duration of the suicidal process: how much time is left for intervention between consideration and accomplishment of a suicide attempt? *J Clin Psychiatry*, 70(1), 19-24.
- Diamond, G. S., Wintersteen, M. B., Brown, G. K., Diamond, G. M., Gallop, R., Shelef, K., & Levy, S. (2010). Attachment-based family therapy for adolescents with suicidal ideation: a randomized controlled trial. *J Am Acad Child Adolesc Psychiatry*, 49(2), 122-131.
- Doran, C. M., Ling, R., Gullestrup, J., Swannell, S., & Milner, A. (2016). The Impact of a Suicide Prevention Strategy on Reducing the Economic Cost of Suicide in the New South Wales Construction Industry. *Crisis*, 37(2), 121-129. doi:10.1027/0227-5910/a000362
- Dube, S. R., Anda, R. F., Felitti, V. J., Chapman, D. P., Williamson, D. F., & Giles, W. H. (2001). Childhood abuse, household dysfunction, and the risk of attempted suicide throughout the life span: findings from the Adverse Childhood Experiences Study. *JAMA*, 286(24), 3089-3096.
- Dunne, E. J., McIntosh, J. L., & Dunne-Maxim, K. (Eds.). (1987). *Suicide and its aftermath: Understanding and counseling the survivors*. New York: Norton.
- Durkheim, E. (1897/1951). *Suicide: A study in sociology* (JA Spaulding & G. Simpson, trans.). Glencoe, IL: Free Press. (Original work published 1897).
- Edwards, R. W., Jumper-Thurman, P., Plested, B. A., Oetting, E. R., & Swanson, L. (2000). Community readiness: Research to practice. *Journal of Community Psychology*, 28(3), 291-307.
- Escobedo, L. G., & Ortiz, M. (2002). The relationship between liquor outlet density and injury and violence in New Mexico. *Accid Anal Prev*, 34(5), 689-694.
- Etzersdorfer, E., & Sonneck, G. (1998). Preventing suicide by influencing mass-media reporting: The Viennese experience, 1980–1996. *Arch Suicide Res*, 4.
- Felitti, V. J., Anda, R. F., Nordenberg, D., Williamson, D. F., Spitz, A. M., Edwards, V., . . . Marks, J. S. (1998). Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: The Adverse Childhood Experiences (ACE) Study. *Am J Prev Med*, 14(4), 245-258.
- Ferdon, C., Crosby, A. E., Caine, E. D., Hindman J., Reed, G. A., & Iskander, J. (In press). CDC Public Health Grand Rounds: Preventing Suicide through a Comprehensive Public Health Approach. *MMWR*.
- Flavin, P., & Radcliff, B. (2009). Public policies and suicide rates in the American states. *Social Indicators Research*, 90(2), 195-209.
- Fleischmann, A., Bertolote, J. M., Wasserman, D., De Leo, D., Bolhari, J., Botega, N. J., . . . Thanh, H. T. (2008). Effectiveness of brief intervention and contact for suicide attempters: a randomized controlled trial in five countries. *Bulletin of the World Health Organization*, 86(9), 703-709. doi:S0042-96862008000900014 [pii]
- Florence, C., Simon, T., Haegerich, T., Luo, F., & Zhou, C. (2015). Estimated lifetime medical and work-loss costs of fatal injuries-United States, 2013. *MMWR: Morbidity and mortality weekly report*, 64(38), 1074-1077.
- Fowler, K. A., Gladden, R. M., Vagi, K. J., Barnes, J., & Frazier, L. (2015). Increase in suicides associated with home eviction and foreclosure during the US housing crisis: findings from 16 National Violent Death Reporting System States, 2005-2010. *Am J Public Health*, 105(2), 311-316. doi:10.2105/AJPH.2014.301945
- Frieden, T. R. (2014). Six components necessary for effective public health program implementation. *Am J Public Health*, 104(1), 17-22. doi:10.2105/AJPH.2013.301608
- Giesbrecht, N., Huguette, N., Ogden, L., Kaplan, M. S., McFarland, B. H., Caetano, R., . . . Nolte, K. B. (2015). Acute alcohol use among suicide decedents in 14 US states: impacts of off-premise and on-premise alcohol outlet density. *Addiction*, 110(2), 300-307. doi:10.1111/add.12762



- Gilbody, S., Bower, P., Fletcher, J., Richards, D., & Sutton, A. J. (2006). Collaborative care for depression: a cumulative meta-analysis and review of longer-term outcomes. *Archives of internal medicine*, 166(21), 2314-2321.
- Godoy Garraza, L., Walrath, C., Goldston, D. B., Reid, H., & McKeon, R. (2015). Effect of the Garrett Lee Smith Memorial Suicide Prevention Program on Suicide Attempts Among Youths. *JAMA Psychiatry*, 72(11), 1143-1149. doi:10.1001/jamapsychiatry.2015.1933
- Gould, M. S., Cross, W., Pisani, A. R., Munfakh, J. L., & Kleinman, M. (2013). Impact of Applied Suicide Intervention Skills Training on the National Suicide Prevention Lifeline. *Suicide Life Threat Behav*, 43(6), 676-691. doi:10.1111/sltb.12049
- Gould, M. S., Kalafat, J., Harrismunfakh, J. L., & Kleinman, M. (2007). An evaluation of crisis hotline outcomes. Part 2: Suicidal callers. *Suicide Life Threat Behav*, 37(3), 338-352. doi:10.1521/suli.2007.37.3.338
- Grossman, D. C., Mueller, B. A., Riedy, C., Dowd, M. D., Villaveces, A., Prodzinski, J., . . . Harruff, R. (2005). Gun storage practices and risk of youth suicide and unintentional firearm injuries. *JAMA*, 293(6), 707-714. doi:10.1001/jama.293.6.707
- Haddon, W. (1980). Advances in the epidemiology of injuries as a basis for public policy. *Public Health Reports*, 95(5), 411-421.
- Haegerich, T. M., & Dahlberg, L. L. (2011). Violence as a public health risk. *American Journal of Lifestyle Medicine*, 1559827611409127.
- Hailey, D., Roine, R., & Ohinmaa, A. (2008). The effectiveness of telemental health applications: a review. *The Canadian Journal of Psychiatry*, 53(11), 769-778.
- Hamby, S., & Grych, J. (2013). The web of violence: exploring connections among different forms of interpersonal violence and abuse *Briefs in Sociology*. New York, NY: Springer.
- Han, B., Crosby, A. E., Ortega, L. A., Parks, S. E., Compton, W. M., & Gfroerer, J. (2016). Suicidal ideation, suicide attempt, and occupations among employed adults aged 18–64 years in the United States. *Comprehensive psychiatry*, 66, 176-186.
- Harris, E. C., & Barraclough, B. (1997). Suicide as an outcome for mental disorders. A meta-analysis. *Br J Psychiatry*, 170, 205-228.
- Harris, E. C., & Barraclough, B. (1998). Excess mortality of mental disorder. *Br J Psychiatry*, 173, 11-53.
- Harris, K. M., Carpenter, C., & Bao, Y. (2006). The effects of state parity laws on the use of mental health care. *Med Care*, 44(6), 499-505. doi:10.1097/01.mlr.0000215813.16211.00
- Hassanian-Moghaddam, H., Sarjami, S., Kolahi, A. A., & Carter, G. L. (2011). Postcards in Persia: randomised controlled trial to reduce suicidal behaviours 12 months after hospital-treated self-poisoning. *British Journal of Psychiatry*, 198(4), 309-316.
- Hawkins, J. D., Catalano, R. F., & Kuklinski, M. R. (2014). Communities that care *Encyclopedia of Criminology and Criminal Justice* (pp. 393-408): Springer.
- Hawton, K. (2007). Restricting access to methods of suicide: Rationale and evaluation of this approach to suicide prevention. *Crisis*, 28. doi:10.1027/0227-5910.28.s1.4
- Hayes, L. M. (1995). Prison Suicide: An Overview and a Guide to Prevention. *The Prison Journal*, 75(4), 431-456. doi:10.1177/0032855595075004003
- Hayes, L. M. (2013). Suicide prevention in correctional facilities: reflections and next steps. *Int J Law Psychiatry*, 36(3-4), 188-194. doi:10.1016/j.ijlp.2013.04.010
- Herman, K. C., Borden, L. A., Reinke, W. M., & Webster-Stratton, C. (2011). The Impact of the Incredible Years Parent, Child, and Teacher Training Programs on Children's Co-Occurring Internalizing Symptoms. *Sch Psychol Q*, 26(3), 189-201. doi:10.1037/a0025228
- Houle, J. N., & Light, M. T. (2014). The home foreclosure crisis and rising suicide rates, 2005 to 2010. *Am J Public Health*, 104(6), 1073-1079. doi:10.2105/AJPH.2013.301774

- Hunkeler, E. M., Katon, W., Tang, L., Williams, J. W., Jr., Kroenke, K., Lin, E. H., . . . Unutzer, J. (2006). Long term outcomes from the IMPACT randomised trial for depressed elderly patients in primary care. *BMJ*, 332(7536), 259-263. doi:10.1136/bmj.38683.710255.BE
- Inagaki, M., Kawashima, Y., Kawanishi, C., Yonemoto, N., Sugimoto, T., Furuno, T., . . . Yamada, M. (2015). Interventions to prevent repeat suicidal behavior in patients admitted to an emergency department for a suicide attempt: a meta-analysis. *J Affect Disord*, 175, 66-78. doi:10.1016/j.jad.2014.12.048
- Jobes, D. A. (2012). The Collaborative Assessment and Management of Suicidality (CAMS): an evolving evidence-based clinical approach to suicidal risk. *Suicide Life Threat Behav*, 42(6), 640-653. doi:10.1111/j.1943-278X.2012.00119.x
- Johnson, F. W., Gruenewald, P. J., & Remer, L. G. (2009). Suicide and alcohol: do outlets play a role? *Alcohol Clin Exp Res*, 33(12), 2124-2133. doi:10.1111/j.1530-0277.2009.01052.x
- Kann, L., McManus, T., Harris, W. A., Shanklin, S. L., Flint, K. H., Hawkins, J., . . . Zaza, S. (2016). Youth Risk Behavior Surveillance - United States, 2015. *MMWR Surveill Summ*, 65(6), 1-174. doi:10.15585/mmwr.ss6506a1
- Kaplan, M. S., McFarland, B. H., Huguet, N., Conner, K., Caetano, R., Giesbrecht, N., & Nolte, K. B. (2013). Acute alcohol intoxication and suicide: a gender-stratified analysis of the National Violent Death Reporting System. *Inj Prev*, 19(1), 38-43. doi:10.1136/injuryprev-2012-040317
- Kellam, S. G., Brown, C. H., Poduska, J. M., Ialongo, N. S., Wang, W., Toyinbo, P., . . . Wilcox, H. C. (2008). Effects of a universal classroom behavior management program in first and second grades on young adult behavioral, psychiatric, and social outcomes. *Drug Alcohol Depend*, 95 Suppl 1, S5-S28. doi:10.1016/j.drugalcdep.2008.01.004
- Kessler, R. C., Demler, O., Frank, R. G., Olfson, M., Pincus, H. A., Walters, E. E., . . . Zaslavsky, A. M. (2005). Prevalence and treatment of mental disorders, 1990 to 2003. *N Engl J Med*, 352(24), 2515-2523. doi:10.1056/NEJMsa043266
- Kleiman, E. M., Riskind, J. H., Schaefer, K. E., & Weingarden, H. (2012). The moderating role of social support on the relationship between impulsivity and suicide risk. *Crisis*, 33(5), 273-279. doi:10.1027/0227-5910/a000136
- Klomek, A. B., Sourander, A., & Gould, M. (2010). The association of suicide and bullying in childhood to young adulthood: a review of cross-sectional and longitudinal research findings. *The Canadian Journal of Psychiatry*, 55(5), 282-288.
- Knox, K. L., Litts, D. A., Talcott, G. W., Feig, J. C., & Caine, E. D. (2003). Risk of suicide and related adverse outcomes after exposure to a suicide prevention programme in the US Air Force: cohort study. *BMJ*, 327(7428), 1376.
- Knox, K. L., Pflanz, S., Talcott, G. W., Campise, R. L., Lavigne, J. E., Bajorska, A., . . . Caine, E. D. (2010). The US Air Force suicide prevention program: implications for public health policy. *Am J Public Health*, 100(12), 2457-2463. doi:10.2105/ajph.2009.159871
- Lang, M. (2013). The impact of mental health insurance laws on state suicide rates. *Health Econ*, 22(1), 73-88. doi:10.1002/hecl.1816
- Leeb, R. T., Lewis, T., & Zolotor, A. J. (2011). A review of physical and mental health consequences of child abuse and neglect and implications for practice. *American Journal of Lifestyle Medicine*, 5(5), 454-468.
- Lineberry, T. W., & O'Connor, S. S. Suicide in the US Army. *Mayo Clinic Proceedings*, 87(9), 871-878. doi:10.1016/j.mayocp.2012.07.002
- Linehan, M. M., Comtois, K. A., Murray, A. M., Brown, M. Z., Gallop, R. J., Heard, H. L., . . . Lindenboim, N. (2006). Two-year randomized controlled trial and follow-up of dialectical behavior therapy vs therapy by experts for suicidal behaviors and borderline personality disorder. *Arch Gen Psychiatry*, 63(7), 757-766. doi:10.1001/archpsyc.63.7.757
- Losel, F., & Farrington, D. P. (2012). Direct protective and buffering protective factors in the development of youth violence. *Am J Prev Med*, 43(2 Suppl 1), S8-S23. doi:10.1016/j.amepre.2012.04.029



- Maimon, D., Browning, C. R., & Brooks-Gunn, J. (2010). Collective efficacy, family attachment, and urban adolescent suicide attempts. *J Health Soc Behav*, 51(3), 307-324. doi:10.1177/0022146510377878
- Mark, T. L., Shern, D. L., Bagalman, J. E., & Cao, Z. (2007). Ranking America's mental health: An analysis of depression across the states. *Alexandria, VA: Mental Health America*.
- McIntosh, W. L., Spies, E., Stone, D. M., Lokey, C. N., Trudeau, A. R., & Bartholow, B. (2016). Suicide Rates by Occupational Group - 17 States, 2012. *MMWR Morb Mortal Wkly Rep*, 65(25), 641-645. doi:10.15585/mmwr.mm6525a1
- Miller, M., Warren, M., Hemenway, D., & Azrael, D. (2015). Firearms and suicide in US cities. *Inj Prev*, 21(e1), e116-119. doi:10.1136/injuryprev-2013-040969
- Mishara, B. L. (Ed.) (1995). *The Impact of Suicide*. New York: Springer.
- Mishara, B. L., & Martin, N. (2012). Effects of a comprehensive police suicide prevention program. *Crisis: Journal of Crisis Intervention & Suicide*, 33(3), 162-168.
- Mitchell, A. M., Kim, Y., Prigerson, H. G., & Mortimer-Stephens, M. (2004). Complicated grief in survivors of suicide. *Crisis*, 25(1), 12-18. doi:10.1027/0227-5910.25.1.12
- Mohr, D. C., Vella, L., Hart, S., Heckman, T., & Simon, G. (2008). The effect of telephone-administered psychotherapy on symptoms of depression and attrition: A meta-analysis. *Clinical Psychology: Science and Practice*, 15(3), 243-253.
- Motto, J. A., & Bostrom, A. G. (2001). A randomized controlled trial of postcrisis suicide prevention. *Psychiatr Serv*, 52(6), 828-833.
- Muennig, P., Cohen, A. K., Palmer, A., & Zhu, W. (2013). The relationship between five different measures of structural social capital, medical examination outcomes, and mortality. *Soc Sci Med*, 85, 18-26. doi:10.1016/j.socscimed.2013.02.007
- National Action Alliance for Suicide Prevention. (2014). Research Prioritization Task Force.(2014). *A prioritized research agenda for suicide prevention: An action plan to save lives*.
- National Action Alliance for Suicide Prevention Workplace Task Force. (2015). *Comprehensive Blueprint for Workplace Suicide Prevention*. Washington, D.C. : Author.
- National Action Alliance for Suicide Prevention: Clinical Workforce Preparedness Task Force. (2014). *Suicide prevention and the clinical workforce: Guidelines for training*. Washington, D.C.: Author.
- National Action Alliance for Suicide Prevention: Suicide Attempt Survivors Task Force. (2014). *The Way Forward: Pathways to hope, recovery, and wellness with insights from lived experience*. Washington, D.C. : Author.
- National Action Alliance for Suicide Prevention: Survivors of Suicide Loss Task Force. (2015). *Responding to Grief, Trauma, and Distress After a Suicide: U.S. National Guidelines*. Washington, D.C. : Author.
- Niederkrotenthaler, T., & Sonneck, G. (2007). Assessing the impact of media guidelines for reporting on suicides in Austria: Interrupted time series analysis. *Aust N Z J Psychiatry*, 41. doi:10.1080/00048670701266680
- Niederkrotenthaler, T., Voracek, M., Herberth, A., Till, B., Strauss, M., Etzersdorfer, E., . . . Sonneck, G. (2010). Media and suicide. Papageno v Werther effect. *BMJ*, 341, c5841. doi:10.1136/bmj.c5841
- Olfson, M., Gerhard, T., Huang, C., Crystal, S., & Stroup, T. S. (2015). Premature Mortality Among Adults With Schizophrenia in the United States. *JAMA Psychiatry*, 72(12), 1172-1181. doi:10.1001/jamapsychiatry.2015.1737
- Owens, D. (2002). Fatal and non-fatal repetition of self-harm: Systematic review. *British Journal of Psychiatry*, 181(3), 193-199.
- Perron, S., Burrows, S., Fournier, M., Perron, P. A., & Ouellet, F. (2013). Installation of a bridge barrier as a suicide prevention strategy in Montreal, Quebec, Canada. *Am J Public Health*, 103(7), 1235-1239. doi:10.2105/ajph.2012.301089
- Pirkis, J., Too, L. S., Spittal, M. J., Krysinaka, K., Robinson, J., & Cheung, Y. T. D. (2015). Interventions to reduce suicides at suicide hotspots: a systematic review and meta-analysis. *The Lancet Psychiatry*, 2(11), 994-1001. doi:http://dx.doi.org/10.1016/S2215-0366(15)00266-7

- Pitman, A., Osborn, D., King, M., & Erlangsen, A. (2014). Effects of suicide bereavement on mental health and suicide risk. *Lancet Psychiatry*, 1, 86-94.
- Plested, B. A., Edwards, R. W., & Jumper-Thurman, P. (2006). Community readiness: A handbook for successful change. *Fort Collins, CO: Tri-Ethnic Center for Prevention Research*.
- Pollock, L. R., & Williams, J. M. (2004). Problem-solving in suicide attempters. *Psychol Med*, 34(1), 163-167.
- Reid, M. J., Webster-Stratton, C., & Hammond, M. (2003). Follow-up of children who received the Incredible Years intervention for oppositional-defiant disorder: Maintenance and prediction of 2-year outcome. *Behavior Therapy*, 34(4), 471-491.
- Rittenhouse, D. R., Fryer, G. E., Phillips, R. L., Miyoshi, T., Nielsen, C., Goodman, D. C., & Grumbach, K. (2008). Impact of Title VII training programs on community health center staffing and National Health Service Corps participation. *The Annals of Family Medicine*, 6(5), 397-405.
- Rowhani-Rahbar, A., Simonetti, J. A., & Rivara, F. P. (2016). Effectiveness of Interventions to Promote Safe Firearm Storage. *Epidemiol Rev*, 38(1), 111-124. doi:10.1093/epirev/mxv006
- Rubenstein, L. V., Chaney, E. F., Ober, S., Felker, B., Sherman, S. E., Lanto, A., & Vivell, S. (2010). Using evidence-based quality improvement methods for translating depression collaborative care research into practice. *Families, Systems, & Health*, 28(2), 91.
- Runyan, C. W., Becker, A., Brandspiegel, S., Barber, C., Trudeau, A., & Novins, D. (2016). Lethal Means Counseling for Parents of Youth Seeking Emergency Care for Suicidality. *West J Emerg Med*, 17(1), 8-14. doi:10.5811/westjem.2015.11.28590
- Russell, S. T., & Joyner, K. (2001). Adolescent sexual orientation and suicide risk: Evidence from a national study. *American Journal of Public Health*, 91(8), 1276-1281.
- Shepard, D. S., Gurewich, D., Lwin, A. K., Reed, G. A., Jr., & Silverman, M. M. (2016). Suicide and Suicidal Attempts in the United States: Costs and Policy Implications. *Suicide Life Threat Behav*, 46(3), 352-362. doi:10.1111/sltb.12225
- Silverman, M. M., & Maris, R. W. (1995). The prevention of suicidal behaviors: An overview. *Suicide and life-threatening behavior*, 25(1), 10-21.
- Simon, O. R., Swann, A. C., Powell, K. E., Potter, L. B., Kresnow, M. J., & O'Carroll, P. W. (2001). Characteristics of impulsive suicide attempts and attempters. *Suicide Life Threat Behav*, 32(1 Suppl), 49-59.
- Spoth, R. L., Gyll, M., & Day, S. X. (2002). Universal family-focused interventions in alcohol-use disorder prevention: cost-effectiveness and cost-benefit analyses of two interventions. *J Stud Alcohol*, 63(2), 219-228.
- Stack, S., & Wasserman, I. (2007). Economic strain and suicide risk: a qualitative analysis. *Suicide and life-threatening behavior*, 37(1), 103-112.
- Stokes, M. L., McCoy, K. P., Abram, K. M., Byck, G. R., & Teplin, L. A. (2015). Suicidal Ideation and Behavior in Youth in the Juvenile Justice System: A Review of the Literature. *J Correct Health Care*, 21(3), 222-242. doi:10.1177/1078345815587001
- Sudak, H., Maxim, K., & Carpenter, M. (2008). Suicide and stigma: a review of the literature and personal reflections. *Acad Psychiatry*, 32(2), 136-142. doi:10.1176/appi.ap.32.2.136
- Szumilas, M., & Kutcher, S. (2011). Post-suicide intervention programs: a systematic review. *Can J Public Health*, 102(1), 18-29.
- Toosi, M. (2015). *Labor force projections to 2024: The labor force is growing, but slowly*. Washington, D.C.: Bureau of Labor Statistics.
- Turecki, G. (2014). Epigenetics and suicidal behavior research pathways. *Am J Prev Med*, 47(3), S144-S151.
- Tyrer, P., Reed, G. M., & Crawford, M. J. (2015). Classification, assessment, prevalence, and effect of personality disorder. *Lancet*, 385(9969), 717-726. doi:10.1016/S0140-6736(14)61995-4
- U.S. Department of Health and Human Services Health Resources and Services Administrations. (2016a). *Designated Health Professional Shortage Areas Statistics, As of November 4, 2016*. Retrieved from <http://datawarehouse.hrsa.gov/topics/shortageAreas.aspx>.



- U.S. Department of Health and Human Services Health Resources and Services Administrations. (2016b). *NHSC Clinician Retention: A Story of Dedication and Commitment*. Retrieved from <https://nhsc.hrsa.gov/currentmembers/membersites/retainproviders/retentionbrief.pdf>.
- U.S. Office of the Surgeon General, & National Action Alliance for Suicide Prevention. (2012). *2012 National Strategy for Suicide Prevention: Goals and Objectives for Action*. Washington, D.C.: HHS.
- U.S. Public Health Service. (1999). *The Surgeon General's Call to Action to Prevent Suicide*. Washington, D.C.
- Unutzer, J., Tang, L., Oishi, S., Katon, W., Williams, J. W., Jr., Hunkeler, E., . . . Langston, C. (2006). Reducing suicidal ideation in depressed older primary care patients. *J Am Geriatr Soc*, 54(10), 1550-1556.
- Visser, V. S., Comans, T. A., & Scuffham, P. A. (2014). Evaluation Of The Effectiveness Of A Community-Based Crisis Intervention Program For People Bereaved By Suicide. *Journal of Community Psychology*, 42(1), 19-28. doi:10.1002/jcop.21586
- Walrath, C., Garraza, L. G., Reid, H., Goldston, D. B., & McKeon, R. (2015). Impact of the Garrett Lee Smith youth suicide prevention program on suicide mortality. *Am J Public Health*, 105(5), 986-993. doi:10.2105/AJPH.2014.302496
- Wang, Y. C., Hsieh, L. Y., Wang, M. Y., Chou, C. H., Huang, M. W., & Ko, H. C. (2016). Coping Card Usage can Further Reduce Suicide Reattempt in Suicide Attempter Case Management Within 3-Month Intervention. *Suicide Life Threat Behav*, 46(1), 106-120. doi:10.1111/sltb.12177
- Wasserman, D., Hoven, C. W., Wasserman, C., Wall, M., Eisenberg, R., Hadlaczky, G., . . . Carli, V. (2014). School-based suicide prevention programmes: The SEYLE cluster-randomised, controlled trial. *The Lancet*, 385(9977), 1536-1544. doi:10.1016/S0140-6736(14)61213-7
- Webster-Stratton, C., & Hammond, M. (1997). Treating children with early-onset conduct problems: a comparison of child and parent training interventions. *J Consult Clin Psychol*, 65(1), 93-109.
- Webster-Stratton, C., Reid, M. J., & Hammond, M. (2001). Preventing conduct problems, promoting social competence: a parent and teacher training partnership in head start. *J Clin Child Psychol*, 30(3), 283-302. doi:10.1207/S15374424JCCP3003\_2
- Webster-Stratton, C. H., Reid, M. J., & Beauchaine, T. (2011). Combining parent and child training for young children with ADHD. *Journal of Clinical Child & Adolescent Psychology*, 40(2), 191-203.
- Webster-Stratton, C., Jamila Reid, M., & Stoolmiller, M. (2008). Preventing conduct problems and improving school readiness: evaluation of the incredible years teacher and child training programs in high-risk schools. *Journal of child psychology and psychiatry*, 49(5), 471-488.
- Wilcox, H. C., Kellam, S. G., Brown, C. H., Poduska, J. M., Ialongo, N. S., Wang, W., & Anthony, J. C. (2008). The impact of two universal randomized first- and second-grade classroom interventions on young adult suicide ideation and attempts. *Drug Alcohol Depend*, 95 Suppl 1, S60-73.
- Wilkins, N., Tsao, B., Hertz, M., Davis, R., & Klevens, J. (2014). Atlanta, GA: National Center for Injury Prevention and Control, Centers for Disease Control and Prevention.
- World Health Organization. (2013). *Global and Regional Estimates of Violence Against Women: Prevalence and Health Effects of Intimate Partner Violence and Non-Partner Sexual Violence*. Geneva: World Health Organization.
- World Health Organization. (2014). *Suicide Prevention: A Global Imperative*. Geneva, Switzerland: WHO Press.
- Wyman, P. A., Brown, C. H., LoMurray, M., Schmeelk-Cone, K., Petrova, M., Yu, Q., . . . Wang, W. (2010). An outcome evaluation of the Sources of Strength suicide prevention program delivered by adolescent peer leaders in high schools. *Am J Public Health*, 100(9), 1653-1661. doi:
- Yip, P., Caine, E., Yousuf, S., Chang, S.-S., Wu, K., & Chen, Y.-Y. (2012). Means restriction for suicide prevention. *Lancet*, 379. doi:10.1016/s0140-6736(12)60521-2

## Appendix A: Summary of Strategies and Approaches to Prevent Suicide

Strategy	Approach/Program, Practice or Policy	Best Available Evidence			Lead Sectors <sup>1</sup>
		Suicide	Suicide Attempts or Ideation	Other Risk/Protective Factors for Suicide	
Strengthen economic supports	<b>Strengthen household financial security</b>				Government (local, state, Federal)
	<i>Unemployment benefit programs</i>	✓		✓	Business/labor
	<i>Other income supports</i>	✓			
	<b>Housing stabilization policies</b>				Government (local, state, Federal)
	<i>The National Neighborhood Stabilization Program</i>			✓	
Strengthen access and delivery of suicide care	<b>Coverage of mental health conditions in health insurance policies</b>				Government (local, state, Federal)
	<i>Mental Health Parity Laws</i>	✓		✓	
	<b>Reduce provider shortages in underserved areas</b>				
	<i>National Health Service Corps (NHSC)</i>			✓	Healthcare
	<i>Telemental health (TMH)</i>			✓	Social services
	<b>Safer suicide care through systems change</b>				
	<i>Henry Ford Perfect Depression Care (Precursor to Zero Suicide)</i>	✓		✓	
Create protective environments	<b>Reduce access to lethal means among persons at-risk</b>				Government (local, state)
	<i>Intervening at suicide hot spots</i>	✓			
	<i>Safe storage practices</i>		✓	✓	Public Health
	<i>Emergency Department Counseling on Access to Lethal Means (ED CALM)</i>			✓	
	<b>Organizational policies and culture</b>				



		Best Available Evidence			
	<i>Together for Life</i>	✓			Business/Labor
					Justice
	<i>US Air Force Suicide Prevention Program</i>	✓		✓	Government (local, state, Federal)
	<i>Correctional suicide prevention</i>	✓			
	<b>Community-based policies to reduce excessive alcohol use</b>				Government (local, state)
	<i>Alcohol outlet density</i>	✓		✓	Business/labor
<b>Promote connectedness</b>	<b>Peer norm programs</b>				Public Health
	<i>Sources of Strength</i>			✓	Education
	<b>Community engagement activities</b>				Public Health
	<i>Greening vacant urban spaces</i>			✓	Government (local
<b>Teach coping and problem-solving skills</b>	<b>Social emotional learning programs</b>				Public Health
	<i>Youth Aware of Mental Health Program</i>		✓	✓	
	<i>Good Behavior Game</i>		✓	✓	Education
	<b>Parenting skill and family relationship approaches</b>				Public Health
	<i>The Incredible Years</i>			✓	Education

		Best Available Evidence			
	<i>Strengthening Families 10–14</i>			✓	
Identify and support people at-risk	<b>Gatekeeper training</b>				Public Health
	<i>Applied Suicide Intervention Skills Training</i>			✓	Healthcare
	<i>Garret Lee Smith Federal Grant Program</i>	✓	✓		
	<b>Crisis Intervention</b>				Public Health
	<i>National Suicide Prevention Lifeline</i>		✓	✓	Social Services
	<b>Treatment for people at risk of suicide</b>				
	<i>Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)</i>		✓	✓	
	<i>Collaborative Assessment and Management of Suicidality (CAMS)</i>		✓	✓	Healthcare
	<i>Dialectical Behavioral Therapy (DBT)</i>		✓	✓	Social Services
	<i>Attachment-Based Family Therapy (ABFT)</i>		✓		Justice
	<i>Translating Initiatives for Depression into Effective Solutions project (TIDES)</i>			✓	
	<b>Treatment to prevent re-attempts</b>				
	<i>ED Brief Intervention with Follow-up Visits</i>	✓			Healthcare
	<i>Active follow-up contact approaches</i>	✓	✓		Social services
	<i>CBT for Suicide Prevention</i>		✓		



		Best Available Evidence			
Lessen harms and prevent future risk	<b>Postvention</b>				Healthcare
	<i>StandBy Response Service</i>		✓	✓	
	<b>Safe reporting following a suicide</b>				Public Health
	<i>Media Guidelines</i>	✓			Media

<sup>1</sup>This column refers to the lead sectors well positioned to bring leadership and resources to implementation efforts. For each strategy, there are many other sectors such as non-governmental organizations that are instrumental to prevention planning and implementing specific activities.

DRAFT NARRATIVE FOR CDC CLEARANCE

The information in this narrative has not been cleared for dissemination.  
Please do not cite, copy or disseminate

**Preventing Suicide:  
A Technical Package of Policy, Programs, and Practices**

**Prepared by:**

**Deb Stone, ScD, MSW, MPH  
Kristin Holland, PhD, MPH  
Brad Bartholow, PhD  
Alex Crosby, MD, MPH  
Shane Davis, PhD  
Natalie Wilkins, PhD**

**Division of Violence Prevention  
National Center for Injury Prevention and Control (NCIPC)  
Centers for Disease Control and Prevention**

**2017**



***Preventing Suicide: A Technical Package of Policies, Programs, and Practices* is a publication of the  
National Center for Injury Prevention and Control of the Centers for Disease Control and  
Prevention.**

Centers for Disease Control and Prevention  
Thomas R. Frieden, MD, MPH, Director

National Center for Injury Prevention and Control  
Debra E. Houry, MD, MPH, Director

Division of Violence Prevention  
James A. Mercy, PhD, Director

***Suggested Citation:*** Stone, D.M., Holland, K.M., Bartholow, B., Crosby, A.E., Davis, S., and Wilkins, N.  
***Preventing Suicide: A Technical Package of Policies, Programs, and Practices.*** Atlanta, GA: National  
Center for Injury Prevention and Control, Centers for Disease Control and Prevention, 2017.

## Contents

Acknowledgements.....	4
External Reviewers.....	5
Overview of Technical Package.....	6
Strengthen Economic Supports.....	14
Strengthen Access and Delivery of Suicide Care.....	17
Create Protective Environments.....	21
Promote Connectedness.....	26
Teach Coping and Problem-Solving Skills.....	28
Identify and Support People At-Risk.....	31
Lessen Harms and Prevent Future Risk.....	37
Sector Involvement.....	39
Monitoring and Evaluation.....	41
Conclusion.....	42
References.....	44
Appendix A.....	50



## Acknowledgments

We would like to thank the following individuals who contributed in specific ways to the development of this technical package. We give special thanks to Linda Dahlberg for her vision, guidance, and support throughout the development of this package. We thank Division, Center, and CDC leadership for their careful review and helpful feedback on earlier iterations of this document. We thank Alida Knuth for her formatting and design expertise. Last but definitely not least, we extend our thanks and gratitude to all the external reviewers for their helpful feedback, support and encouragement for this resource.

## External Reviewers

Casey Castaldi  
Prevention Institute

Carmen Clelland  
Office for State, Tribal, Local and Territorial  
Support, Centers for Disease Control and  
Prevention

Amalia Corby-Edwards  
American Psychological Association

Rachel Davis  
Prevention Institute

Pamela End of Horn  
Indian Health Service Headquarters

Craig Fisher  
American Psychological Association

Keita Franklin  
Department of Defense

Jill M. Harkavy Friedman  
American Foundation for Suicide Prevention

Jarrold Hindman  
Colorado Department of Public Health and  
Environment

Linda Langford  
Education Development Center, Inc.

Richard McKeon  
Substance Abuse and Mental Health Services  
Administration

Doreen S. Marshall  
American Foundation for Suicide Prevention

Christine Moutier  
American Foundation for Suicide Prevention

Jason H. Padgett  
Education Development Center, Inc.

Jerry Reed  
Education Development Center, Inc.

Christine Schuler  
National Institute for Occupational Safety and  
Health, Centers for Disease Control and  
Prevention

Morton Silverman  
Education Development Center, Inc.

Ellyson Stout  
Education Development Center, Inc.

Hope M. Tiesman  
National Institute for Occupational Safety and  
Health, Centers for Disease Control and  
Prevention

Dan Reidenberg  
Suicide Awareness Voices for Education (SAVE)

The experts above are listed with their affiliations at the time this document was reviewed.



## Overview

This technical package represents a select group of strategies based on the best available evidence to help communities and states sharpen their focus on prevention activities with the greatest potential to prevent suicide. These strategies include: strengthening economic supports; strengthening access to mental health care; creating protective environments; promoting connectedness; teaching coping and problem-solving skills; identifying and supporting people at-risk; and intervening to lessen harms and prevent future risk. The strategies represented in this package include those with a focus on preventing suicide from happening in the first place as well as approaches to lessen the immediate and long-term harms of suicidal behavior for individuals, families, communities, and society. The strategies in the technical package support the goals and objectives of the National Strategy for Suicide Prevention and the National Action Alliance for Suicide Prevention's priority to strengthen community-based prevention. Commitment, cooperation, and leadership from numerous sectors, including public health, education, justice, health care, social services, business, labor, and government can bring about the successful implementation of this package.

### What is a Technical Package?

A technical package is a compilation of a core set of strategies to achieve and sustain substantial reductions in a specific risk factor or outcome (Frieden, 2014). Technical packages help communities and states prioritize prevention activities based on the best available evidence. This technical package has three components. The first component is the **strategy** or the preventive direction or actions to achieve the goal of preventing suicide. The second component is the **approach**. The approach includes the specific ways to advance the strategy. This can be accomplished through *programs, policies, and practices*. The approaches included come primarily from studies based in the United States. The **evidence** for each of the approaches in preventing suicide or its associated risk factors is included as the third component. This package is intended as a resource to guide and inform prevention decision-making in communities and states.

### Preventing Suicide is a Priority

Suicide, as defined by the Centers for Disease Control and Prevention (CDC), is part of a broader class of behavior called *self-directed violence*. Self-directed violence refers to behavior directed at oneself that deliberately results in injury or the *potential* for injury (A.E. Crosby, Ortega, & Melanson, 2011). Self-directed violence may be *suicidal* or *non-suicidal* in nature. For the purposes of this document, we refer only to behavior where suicide is intended:

- **Suicide** is a death caused by self-directed injurious behavior with any intent to die as a result of the behavior.

- **Suicide attempt** is defined as a *non-fatal* self-directed and potentially injurious behavior with any intent to die as a result of the behavior. A suicide attempt may or may not result in injury.

**Suicide is highly prevalent.** Suicide presents a major challenge to public health in the United States and worldwide. It contributes to premature death, morbidity, lost productivity, and health care costs (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014). In 2014 (the most recent year of available death data), suicide was responsible for 42,773 deaths in the U.S., which is approximately one suicide every 12 minutes (Centers for Disease Control and Prevention, 2016). In 2014, suicide ranked as the 10th leading cause of death and has been among the top 12 leading causes of death since 1975 in the U.S (Centers for Disease Control and Prevention, 2016). Overall suicide rates increased 24% from 1999 to 2014 (Curtin, Warner, & Hedegaard, 2016). Suicide is a problem throughout the life span; it is the second leading cause of death among those aged 10–34 years; it is the fourth leading cause among persons in their 40s and seventh among persons in their 50s.

Suicide rates vary by race/ethnicity, age, and other population characteristics, with the highest rates across the lifespan occurring among non-Hispanic American Indian/Alaska Native (AI/AN) and non-Hispanic White population groups. In 2014, the rates for these groups were 17.8 and 16.4 per 100,000 population, respectively (Centers for Disease Control and Prevention, 2016). Other population groups disproportionately impacted by suicide include middle-aged adults (whose rates increased 48% from 1999 to 2014, with steep increases seen among both males (43%) and females (63%) aged 45-64 years; (Curtin et al., 2016); Veterans and other military personnel, whose suicide rate nearly doubled from 2003 to 2008, surpassing the rate of suicide among civilians for the first time in decades (Bachynski et al., 2012; Lineberry & O'Connor); workers in certain occupational groups (e.g., protective service occupations; workers in farming, fishing, and forestry; McIntosh et al., 2016); and lesbian, gay, bisexual, and/or queer (LGBQ) youth, who experience increased suicidal ideation and behavior compared to their heterosexual counterparts (Kann et al., 2016; Russell & Joyner, 2001).

Suicides reflect only a portion of the problem (A.E. Crosby, Han, Ortega, Parks, & Gfroerer, 2011). Substantially more people are hospitalized as a result of nonfatal suicidal behavior (i.e. suicide attempts) than are fatally injured, and an even greater number are either treated in ambulatory settings (e.g., emergency departments) or not treated at all (A.E. Crosby, Han, et al., 2011). For example, during 2014, among adults aged 18 years and older, for every one suicide there were 9 adults treated in hospital emergency departments for self-harm injuries, 27 who reported making a suicide attempt, and over 227 who reported seriously considering suicide (i.e. ideation) (Ferdon et al., In press).

**Suicide is associated with several risk and protective factors.** Suicide, like other human behaviors, has no single determining cause. Instead, suicide occurs in response to multiple biological, psychological, interpersonal, environmental and societal influences that interact with one another, often over time.



The social-ecological model – encompassing multiple levels of focus from the individual, relationship, community, and societal – is a useful framework for viewing and understanding suicide risk factors identified in the literature (Dahlberg & Krug, 2002). Risk and protective factors for suicide exist at each level. For example, risk factors include:

- **Individual level:** History of depression and other mental illnesses, hopelessness, substance abuse, certain health conditions, previous suicide attempt, violence victimization and perpetration, and genetic and biological determinants
- **Relationship level:** High conflict or violent relationships, sense of isolation and lack of social support, family/loved one's history of suicide, financial and work stress
- **Community level:** Inadequate community connectedness, barriers to health care (e.g., lack of access to providers and medications)
- **Societal level:** Availability of lethal means of suicide, unsafe media portrayals of suicide, stigma associated with help-seeking and mental illness (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014).

It is important to recognize that the vast majority of individuals who are depressed, attempt suicide, or who have other risk factors noted, do *not* die by suicide. Furthermore, the relevance of each risk factor can vary by age, race, gender, sexual orientation, residential geography, and socio-cultural and economic status (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014).

Protective factors, or those influences that buffer against the risk for suicide, can also be found across the different levels of the social-ecological model. Protective factors identified in the literature include: effective coping and problem solving skills, moral objections to suicide, strong and supportive relationships with partners, friends, and family; connectedness to school, community, and other social institutions; availability of quality and ongoing physical and mental health care, and reduced access to lethal means (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014). These protective factors can either counter a specific risk factor or buffer against a number of risks associated with suicide.

**Suicide is connected to other forms of violence.** Exposure to violence (e.g., child abuse and neglect, bullying, peer violence, dating violence, sexual violence, and intimate partner violence) increases the risk of depression, post-traumatic stress disorder (PTSD), anxiety, suicide, and suicide attempts (Bossarte et al., 2014; D. P. Chapman et al., 2004; Dube et al., 2001; Felitti et al., 1998; Klomek, Sourander, & Gould, 2010; Leeb, Lewis, & Zolotor, 2011; World Health Organization, 2013). Women exposed to partner violence are nearly 5 times more likely to attempt suicide as women not exposed to partner violence (WHO, 2013). Exposure to adverse experiences in childhood, such as physical, sexual, emotional abuse and neglect, and living in homes with violence, mental health, substance abuse problems and other instability, increases the risk for suicide and suicide attempts several fold (Bellis et al., 2014; Dube et al.,

2001). The psychosocial effects of violence in childhood and adolescence can be observed decades later, including severe problems with finances, family, jobs, and stress – factors that increase the risk for suicide. Suicide and other forms of violence often share the same individual, relationship, community, and societal risk factors suggesting that efforts to prevent interpersonal violence may also prove beneficial in preventing suicide (Haegerich & Dahlberg, 2011; Hamby & Grych, 2013; Wilkins, Tsao, Hertz, Davis, & Klevens, 2014). Further, just as risk factors may be shared across suicide and violence, so too may protective factors overlap. For example, connectedness to one's community (Kleiman, Riskind, Schaefer, & Weingarden, 2012), school (Carter, McGee, Taylor, & Williams, 2007), family (Maimon, Browning, & Brooks-Gunn, 2010), caring adults (Capaldi, Knoble, Shortt, & Kim, 2012; Losel & Farrington, 2012), and pro-social peers (Wyman et al., 2010) enhances resilience to suicide and other forms of violence.

**The health and economic consequences of suicide are substantial.** Suicide and suicide attempts have far reaching consequences for individuals, families, and communities (Dunne, McIntosh, & Dunne-Maxim, 1987; Mishara, 1995; National Action Alliance for Suicide Prevention: Suicide Attempt Survivors Task Force, 2014; National Action Alliance for Suicide Prevention: Survivors of Suicide Loss Task Force, 2015). In an early study, Crosby and Sacks (2002) estimated that 7% of the U.S. adult population, or 13.2 million adults, knew someone in the prior 12 months who had died by suicide. They also estimated that for each suicide, 425 adults were exposed, or knew about the death. In a more recent study, in one state, Cerel et al (2016) found that 48% of the population knew at least one person who died by suicide in their lifetime. Research indicates that the impact of knowing someone who died by suicide and/or having lived experience (i.e., personally have attempted suicide, have had suicidal thoughts, or have been impacted by suicidal loss) is much more extensive than injury and death. People with lived experience may suffer long-term health and mental health consequences ranging from anger, guilt, and physical impairment, depending on the means and severity of the attempt (A. L. Chapman & Dixon-Gordon, 2007). Similarly, survivors of a loved one's suicide may experience ongoing pain and suffering including complicated grief (Mitchell, Kim, Prigerson, & Mortimer-Stephens, 2004), stigma, depression, anxiety, post-traumatic stress disorder, and increased risk of suicidal ideation and suicide (Cerel, McIntosh, Neimeyer, Maple, & Marshall, 2014; Sudak, Maxim, & Carpenter, 2008). Less discussed but no less important, are the financial and occupational effects for those left behind (Florence, Simon, Haegerich, Luo, & Zhou, 2015).

The economic toll of suicide is immense as well. According to conservative estimates, in 2013, suicide cost \$50.8 billion in estimated lifetime medical and work-loss costs alone (Florence et al., 2015). Adjusting for potential under-reporting of suicide and drawing upon health expenditures per capita, GDP per capita, and variability among states in per capita health care expenditures and income, another study estimated the total lifetime costs associated with nonfatal injuries and deaths caused by self-directed violence to be approximately \$93.5 billion in 2013 (Shepard, Gurewich, Lwin, Reed, & Silverman, 2016). The overwhelming burden of these costs were from lost productivity over the life course, with the



average cost per suicide being over \$1.3 million (Shepard et al., 2016). The true economic costs are likely higher, as neither study included monetary figures related to other societal costs such as those associated with the pain and suffering of family members or other impacts.

**Suicide can be prevented.** Like most public health problems, suicide is preventable (U.S. Public Health Service, 1999). While progress will continue to be made into the future, evidence for numerous programs, practices, and policies currently exists, and many programs are ready to be implemented now. Just as suicide is not caused by a single factor, research suggests that reductions in suicide will not be prevented by any single strategy or approach (Silverman & Maris, 1995; U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). Rather, suicide prevention is best achieved by a focus across the individual, relationship, family, community, and societal-levels and across all sectors, private and public (e.g., business, public health, physical and behavioral healthcare, justice, education, and labor; National Action Alliance for Suicide Prevention, 2014; World Health Organization, 2014).

### Assessing the Evidence

This technical package includes programs, practices, and policies with evidence of impact on suicide or risk or protective factors for suicide. To be considered for inclusion in the technical package, the program, practice, or policy selected had to meet at least one of these criteria: a) meta-analyses or systematic reviews showing impact on suicide; b) evidence from at least one rigorous (e.g., randomized controlled trial [RCT] or quasi-experimental design) evaluation study that found significant preventive effects on suicide; c) meta-analyses or systematic reviews showing impact on risk or protective factors for suicide, or d) evidence from at least one rigorous (e.g., RCT or quasi-experimental design) evaluation study that found significant impacts on risk or protective factors for suicide. Finally, consideration was also given to the likelihood of achieving beneficial effects on multiple forms of violence; no evidence of harmful effects on specific outcomes or with particular subgroups; and feasibility of implementation in a U.S. context if the program, policy, or practice has been evaluated in another country.

Within this technical package, some approaches do not yet have research evidence demonstrating impact on rates of suicide but instead are supported by evidence indicating impacts on risk or protective factors for suicide (e.g., help-seeking, stigma reduction, depression, connectedness). In terms of the strength of the evidence, programs that have demonstrated effects on suicidal behavior (e.g., reductions in deaths, attempts) provide a higher-level of evidence, but the evidence base is not that strong in all areas. For instance, there has been less evaluation of community engagement and family programs on suicidal behavior. Thus, approaches in this package that have effects on risk or protective factors reflect the developing nature of the evidence base and the use of the best available evidence at a given time.

It is also important to note that there is often significant heterogeneity among the programs, policies, or practices that fall within one approach or strategy area in terms of the nature and quality of the available



evidence. Not all programs, policies, or practices that utilize the same approach are equally effective, and even those that are effective may not work across all populations. Tailoring programs and more evaluation may be necessary to address different population groups. The evidence-based programs, practices, or policies included in the package are not intended to be a comprehensive list for each approach, but rather to serve as examples that have been shown to impact suicide or have beneficial effects on risk or protective factors for suicide.

### Context and Cross-Cutting Themes

One important feature of the package is the complementary, but potentially synergistic impact of the strategies and approaches. The strategies and approaches that have been included in this technical package represent different levels of the social ecology, with efforts intended to impact the community and societal levels, as well individual and relationship levels. The strategies and approaches are intended to work in combination and reinforce each other to prevent suicide (see box below). The strategies are arranged in order such that those strategies hypothesized to have the greatest potential for broad public health impact on suicide are included first, followed by those that might impact more select populations (e.g., persons who have already made a suicide attempt).

**Comment [A]:** A few other things that could be mentioned:

The SV package included the following paragraph:

*"The strategies and approaches delineate prevention efforts that impact various SV related outcomes. The strategies are not mutually exclusive categories, but each has an immediate focus. The strategy Create Protective Environments, for example, may ultimately impact SV social norms, but the immediate focus of this strategy is to change school, workplace and community environmental factors. Similarly, the approaches within any one strategy sometimes have components that cross other strategies. For example, Mobilizing Men and Boys as Allies, an approach in the Promote Social Norms that Protect against Violence strategy, includes fostering healthy dating relationships which is also found in some of the approaches under the Teach Skills to Prevent SV strategy."*

Preventing Suicide	
Strategy	Approach
Strengthen economic supports	<ul style="list-style-type: none"> <li>Strengthen household financial security</li> <li>Housing stabilization policies</li> </ul>
Strengthen access and delivery of suicide care	<ul style="list-style-type: none"> <li>Coverage of mental health conditions in health insurance policies</li> <li>Reduce provider shortages in underserved areas</li> <li>Safer suicide care through systems change</li> </ul>
Create protective environments	<ul style="list-style-type: none"> <li>Reduce access to lethal means among persons at-risk of suicide</li> <li>Organizational policies and culture</li> <li>Community-based policies to reduce excessive alcohol use</li> </ul>
Promote connectedness	<ul style="list-style-type: none"> <li>Peer norm approaches</li> <li>Community engagement activities</li> </ul>
Teach coping and problem-solving skills	<ul style="list-style-type: none"> <li>Social-emotional learning programs</li> <li>Parenting skill and family relationship approaches</li> </ul>
Identify and support people at risk	<ul style="list-style-type: none"> <li>Gatekeeper training</li> <li>Crisis Intervention</li> <li>Screening and treatment for people at risk</li> <li>Treatment to prevent re-attempts</li> </ul>
Lessen harms and prevent future risk	<ul style="list-style-type: none"> <li>Postvention</li> <li>Safe reporting following a suicide</li> </ul>



It is important to note that these strategies are not mutually exclusive. Thus, examples of programs, policies, or practices listed under one strategy may also be relevant to another strategy. For instance, some forms of crisis intervention, an approach under *Identify and Support People At-Risk*, may also be considered as ways to *Lessen Harms and Prevent Future Risk*. Social emotional learning programs, an approach under the *Teach Coping and Problem-Solving Skills* strategy, sometimes include components to change peer norms and the broader environment.

The goal of this package is to stress the importance of comprehensive prevention efforts and to provide examples of effective programs addressing each level of the social ecology, with the knowledge that some programs, practices, and policies may impact multiple levels. Further, those that involve multiple sectors and impact multiple levels of the social ecology are more likely to have a greater impact on the overall burden of suicide.

Suicide ideation, thoughts, attempts, and deaths vary by gender, race/ethnicity, age, occupation, and other important population characteristics. Further, certain transition periods are also associated with higher rates of suicide (e.g., transition from working into retirement, transition from active duty military status to civilian status). In fact, suicide risk can change along with dynamic risk factors. For example, individuals' coping skills may change during periods of crisis and heightened stress, limiting their normal ability to effectively solve problems and cope. Research indicates that suicide risk changes as a result of the number and intensity of key risk and protective factors experienced (Turecki, 2014). Ideally, the availability of multiple strategies and approaches tailored to the social, economic, cultural, and environmental context of individuals and communities are desirable as they may increase the likelihood of removing barriers to supportive and effective care and provide opportunities to develop individual and community resilience.

Identifying programs, practices, and policies with evidence of impact on suicide, suicide attempts, or beneficial effects on risk or protective factors for suicide is only the first step. In practice, the effectiveness of the programs, policies and practices identified in this package will be strongly dependent on how well programs are implemented, as well as the partners and communities in which they are implemented. Practitioners in the field may be in the best position to assess the needs and strengths of their communities and work with community members to make decisions about the combination of approaches included here that are best suited to their context.

Data-driven strategic planning processes can help communities with this work (e.g., see Edwards, Jumper-Thurman, Plested, Oetting, & Swanson, 2000; Hawkins, Catalano, & Kuklinski, 2014; Plested, Edwards, & Jumper-Thurman, 2006). These planning processes engage and guide community stakeholders through a prevention planning process designed to address a community's profile of risk and protective factors with evidence-based programs, practices, and policies. These processes can also be used to monitor implementation, track outcomes, and make adjustments as indicated by the data. The readiness of the program for broad dissemination and implementation (e.g., availability of program

materials, training and technical assistance) can also influence program effects. Implementation guidance to assist practitioners, organizations and communities will be developed separately.

This package includes strategies where public health agencies are well positioned to bring leadership and resources to implementation efforts. It also includes strategies where public health can serve as an important collaborator (e.g., strategies addressing community and societal level risks), but where leadership and commitment from other sectors such as business, labor or health care is critical to implement a particular policy or program (e.g., workplace policies; screening combined with care management). The role of various sectors in the implementation of a strategy or approach in preventing suicide is described further in the section on *Sector Involvement*.

In the sections that follow, the strategies and approaches with the best available evidence for preventing suicide are described.



## Strengthen Economic Supports

### Rationale

Studies from the U.S. examining historical trends indicate that suicide rates increase during economic recessions marked by high unemployment rates, job losses, and economic instability and decrease during economic expansions and periods marked by low unemployment rates, particularly for working-age individuals 25 to 64 years old (Luo et al., 2011; Fowler et al., 2015). Economic and financial strain, such as job loss, long periods of unemployment, reduced income, difficulty covering medical, food, and housing expenses, and even the anticipation of such financial stress may increase an individual's risk for suicide or may indirectly increase risk by exacerbating related physical and mental health problems; buffering these risks can therefore, potentially protect against suicide (Stack & Wasserman, 2007). For example, strengthening economic support systems can help people stay in their homes or obtain affordable housing while also paying for necessities such as food and medical care, job training, child care, among other expenses required for daily living. In providing this support, stress and anxiety and the potential for a crisis situation may be reduced, thereby preventing suicide. Although more research is needed to understand how economic factors interact with other factors to increase suicide risk, the available evidence suggests that strengthening economic supports may be one opportunity to buffer suicide risk.

### Approaches

Economic supports for individuals and families can be strengthened by targeting household financial security and ensuring stability in housing during periods of economic stress.

- **Strengthening household financial security** can potentially buffer the risk of suicide by providing individuals with the financial means to lessen the stress and hardship associated with a job loss or other unanticipated financial problems. The provision of unemployment benefits and other forms of temporary assistance, livable wages, medical benefits, and retirement and disability insurance to help cover the cost of necessities or to offset costs in the event of disability, are examples of ways to strengthen household financial security.
- **Housing stabilization policies** aim to keep people in their homes and provide housing options for those in need during times of financial insecurity. This may occur through programs that provide affordable housing such as through government subsidies or through other options available to potential homebuyers such as loan modification programs, move-out planning, or financial counseling services that help minimize the risk or impact of foreclosures and eviction.

### Potential Outcomes

- Reductions in foreclosure rates



- Reductions in eviction rates
- Reductions in emotional distress
- Reductions in suicide

## Evidence

There is evidence suggesting that strengthening household financial security and stabilizing housing can reduce suicide risk.

- **Strengthen household financial security.** The *Federal-State Unemployment Insurance Program* allows states to define the maximum amount and duration of unemployment benefits that workers are entitled to receive after a job loss (Cylus, Glymour, & Avendano, 2014). An examination of variations in *unemployment benefit programs* across states demonstrated that the impact of unemployment on rates of suicide was offset in those states that provided greater than average unemployment benefits (mean level: \$7,990 per person in U.S. constant dollars; Cylus et al., 2014). The effects of *unemployment benefit programs* were also consistent by sex and age group. Another U.S. study examining the link between unemployment and suicide rates using monthly suicide data, length of unemployment (less than 5 weeks, 5-14 weeks, 15-26 weeks, and greater than 26 weeks), and job losses found that the duration of unemployment, as opposed to just the loss of job, predicted suicide risk (Classen & Dunn, 2012). Together, these results suggest that not only should state unemployment benefit programs be generous in their financial allocations, but also in their duration.

Other measures to strengthen household financial security (e.g., transfer payments related to retirement and disability insurance, unemployment insurance compensation, medical benefits, and other forms of family assistance) have also shown an impact on rates of suicide. A study by Flavin and Radcliff (2009) examined the impact of states' per capita spending on transfer payments, medical benefits, and family assistance (Temporary Assistance to Needy Families – TANF) and total state spending on suicide rates between 1990-2000, controlling for a number of suicide risk factors (e.g., residential mobility, divorce rate, unemployment rate) at the state level. As per capita spending on total transfer payments, medical benefits, and family assistance increased there was an associated decrease in state suicide rates. Moreover, it wasn't spending in general that was associated with the reduction but spending on these types of assistance. In terms of lives saved, Flavin & Radcliff calculated the cost of reducing a state's suicide rate by a full point for the years studied. At the national level, they estimated that 3,000 fewer suicides would occur per year nationwide if every state increased its per capita spending on these types of assistance by \$45 per year (Flavin & Radcliff, 2009). Although this was a correlational study, the results demonstrate the potential benefits of policies that reach particularly vulnerable



individuals during periods of great need and increased risk for suicide. More evaluation studies are needed to further understand the outcomes impacted by programs such as these.

- **Housing stabilization policies.** The *National Neighborhood Stabilization Program* was designed to help neighborhoods suffering from high rates of foreclosure and abandonment by slowing the deterioration of the neighborhoods and providing affordable housing options for low, moderate, and middle-income homebuyers. This program also offers financial assistance to eligible individuals for the purchase of a new home. Although this program has not been rigorously evaluated for its impact on suicide outcomes, it addresses foreclosure and eviction, which are risk factors for suicide. A longitudinal analysis of annual data on suicides and foreclosures demonstrated that as the proportion of foreclosed properties increased in U.S. states, so did the state suicide rate, particularly among working-aged adults (Houle & Light, 2014). Another study of data from 16 U.S. states participating in the National Violent Death Reporting System found that suicides precipitated by home foreclosures and evictions increased more than 100% from 2005 (before the housing crisis began) to 2010 (after it had peaked; Fowler, Gladden, Vagi, Barnes, and Frazier (2015)). Most of these suicides occurred prior to the actual loss of the decedent's home. These findings suggest that integrating suicide prevention resources, messaging, and referrals into financial, foreclosure, and move-out planning and counseling services may help to prevent suicide.

## Strengthen Access and Delivery of Suicide Care

### Rationale

While most people with mental health problems do not attempt or die by suicide (Olfson, Gerhard, Huang, Crystal, & Stroup, 2015; Owens, 2002), and the level of risk conferred by different types of mental illness varies (Arsenault-Lapierre, Kim, & Turecki, 2004; E. C. Harris & Barraclough, 1997; Tyrer, Reed, & Crawford, 2015), previous research indicates that mental illness is an important risk factor for suicide (E. C. Harris & Barraclough, 1998; World Health Organization, 2014). State-level suicide rates have also been found to be correlated with general mental health measures such as depression (Lang, 2013; Mark, Shern, Bagalman, & Cao, 2007). Findings from the National Comorbidity Survey indicate that relatively few people in the U.S. with mental health disorders receive treatment for those conditions (Kessler et al., 2005). Lack of access to mental health care is one of the contributing factors related to the underuse of mental health services (Cunningham, 2009). Identifying ways to improve access to timely, affordable, and quality mental health and suicide care for people in need is a critical component to suicide prevention (World Health Organization, 2014). Additionally, research suggests that services provided are maximized when health and behavioral health care systems are set up to effectively and efficiently deliver such care (C.E. Coffey, 2007). Apart from treatment benefits, these approaches can also normalize help-seeking behavior and increase the use of such services.

### Approaches

One approach to strengthening access to mental health care is through the provision of mental health coverage in health insurance policies. Attending to training and provider shortages is another approach.

- **Coverage of mental health conditions in health insurance policies.** Federal and state laws include provisions for equal coverage of mental health services in health insurance plans that is on par with coverage for other health concerns (i.e., mental health parity). Benefits and services covered include such things as the number of visits, co-pays, deductibles, inpatient/outpatient services, prescription drugs, and hospitalizations. If a state has a stronger mental health parity law than the federal parity law, then insurance plans regulated by the state must follow the state parity law. If a state has a weaker parity law than the federal parity law (e.g., includes coverage for some mental health conditions but not others), then the federal parity law will replace the state law. Equal coverage does not necessarily imply good coverage as health insurance plans vary in the extent to which benefits and services are offered to address various health conditions. Rather it helps to ensure that mental health services are covered on par with other health concerns.
- **Reduce provider shortages in underserved areas.** Access to effective and state-of-the-art mental health care is largely dependent upon the training and the size of the mental health care workforce ~~available to provide quality care.~~ Over 85 million Americans live in areas with an



insufficient number of mental health providers; this shortage is particularly severe among low-income urban and rural communities (U.S. Department of Health and Human Services Health Resources and Services Administrations, 2016a). There are a number of ways to increase the number and distribution of practicing mental health providers including providing and expanding existing state and federal programs; increasing wages and reimbursement rates for mental health services; and expanding telemental health services. Such approaches can increase the likelihood that those in need will be able to access affordable, quality care for mental health problems, which can reduce risk for suicide.

- **Safer suicide care through systems change.** Access to health and behavioral health care services is critical for people at risk of suicide however this is just one piece of the puzzle. Care being accessed must also be delivered efficiently and effectively. More specifically, care should take place within a system that supports suicide prevention and patient safety through strong leadership, workforce training, systematic identification and assessment of suicide risk, implementation of evidence-based treatments (see *Identify and Support People At-Risk*, p.31), continuity of care, and continuous quality improvement. Care that is patient-centered and promotes equity for all patients is also of critical importance (National Action Alliance for Suicide Prevention: Clinical Workforce Preparedness Task Force, 2014).

### Potential Outcomes

- Increases in access to mental health services
- Increase in utilization of mental health services
- Reductions in symptoms of mental illnesses and suicidality
- Reductions in rates of suicide attempts
- Reductions in rates of suicide

### Evidence

There is evidence suggesting that coverage of mental health conditions in health insurance policies can reduce risk factors associated with suicide and may directly impact suicide rates.

- **Coverage of mental health conditions in health insurance policies.** The National Survey of Drug Use and Health is a nationally representative survey of the U.S. population that provides data on substance use, mental health conditions, and services utilization. Using data from this survey, K. M. Harris, Carpenter, and Bao (2006) found that 12 months after states enacted *mental health parity laws*, self-reported use of mental healthcare services significantly increased. Moreover, subsequent research by Lang (2013) examined state mental health laws and suicide rates between 1990 and 2004 and found that mental health parity laws, specifically, were associated



with an approximate 5% reduction in suicide rates. This reduction, in the 29 states with parity laws, equated to the prevention of 592 suicides per year (Lang, 2013).

- **Reduce provider shortages in underserved areas.** One example of a program to improve access to mental health care providers is the *National Health Service Corps (NHSC)*, which offers financial incentives to attract mental/behavioral health clinicians to underserved areas. Programs such as *NHSC* encourage individuals to work in the mental health profession in locations designated as Health Professional Shortage Areas (HPSAs) in exchange for student loan debt repayment. A 2012 retention survey conducted by the Health Resources and Services Administration (HRSA), found that 61% of mental and behavioral health care providers continued to practice in designated mental health shortage areas after their four year commitment to The National Health Service Corps (U.S. Department of Health and Human Services Health Resources and Services Administrations, 2016b). *NHSC* is made possible by Title VII (Section 747, Primary Care Training) funding which improves the educational infrastructure of medical schools and residency programs to encourage physicians to work with underserved populations. Using data from the 2004 American Medical Association's Physician Masterfile and from Medicare claims data, one study demonstrated that attending a medical school or residency program that received Title VII training was positively associated with both participation in the *NHSC* loan repayment program and with staffing of community health centers serving underserved populations (Rittenhouse et al., 2008). While this evaluation focused on the commitment of primary care physicians to these programs, examination of the impact of such programs on improved care in underserved settings, among specialty physicians, such as psychiatrists, is still needed. Moreover, between 2003 and 2008, Title VII funds were reduced by almost 50%-- from \$92 million per year to \$48 million, so additional study on the program's impact is needed.

Telemental health (TMH) services refer to the use of telephone, video and web-based technologies for providing psychiatric or psychological care at a distance. TMH can be used in a variety of settings (e.g. outpatient clinics, hospitals, military treatment facilities) to treat a wide range of mental health conditions. TMH can improve access to care for patients in isolated areas as well as reduce travel time and expenses, reduce delays in receiving care, and improve satisfaction interacting with the mental health care system. A systematic review of TMH services found that services rated as high or good quality were associated with effectiveness in treating mental health conditions such as depression, schizophrenia, substance abuse, and suicidal ideation and suicide mortality among other outcomes (Hailey, Roine, & Ohinmaa, 2008). Further, Mohr and colleagues (2008) conducted a meta-analysis examining the effect of psychotherapy delivered specifically via telephone and found that it significantly reduced depressive symptoms in comparison to face-to-face psychotherapy. They also found that



treatment attrition rates were significantly lower among patients receiving telephone-administered psychotherapy compared to patients receiving face-to-face therapy. Thus, TMH may not only offer improved access to mental health care, but it may also ensure continuity of care, and thereby further reduce the risk for suicide.

Comment [A]: May need to rework the introductory statements.

- **Safer suicide care through systems change.** Studies have demonstrated that collaborative care models are as effective in treating depression and suicidal ideation as standard care (Archer et al., 2012; Bruce et al., 2004; Gilbody, Bower, Fletcher, Richards, & Sutton, 2006). One example where a collaborative care model has been implemented is through the Henry Ford healthcare system, which is a large health maintenance organization (HMO) in the state of Michigan pioneered the *Perfect Depression Care* program, the pre-cursor to what is now called *Zero Suicide*. The overall goal of *Perfect Depression Care* was to eliminate suicide among HMO members. More broadly, the goal of the program was to redesign delivery of depression care to achieve “breakthrough improvement” in quality and safety by focusing on effectiveness, safety, patient centeredness, timeliness, efficiency, and equity among patients. The program screened and assessed each patient for suicide risk and implemented coordinated continuous follow-up care system wide (C. E. Coffey, 2006). An examination of the impact of the program found that there was a dramatic and statistically significant decrease in the rate of suicide between the baseline years, 1999 and 2000, prior to the intervention to the intervention years, 2002-2009. During this time period, the suicide rate fell by 82% (C. E. Coffey, 2006; C. E. Coffey, Coffey, & Ahmedani, 2013). Further, among HMO members who received mental health specialty services, the suicide rate significantly decreased over time from 1999 to 2010 (110.3 to 47.6 per 100,000;  $p < .04$ ) with a mean of 36.2 per 100,000 over the period. Additionally, for those HMO members who accessed only general medical services as opposed to specialty mental health services, the suicide rate increased from 2.7 to 5.6 per 100,000 ( $p < .01$ ). Similarly, in the state of Michigan, rates of suicide in the general population increased over the period from 9.8 to 12.5 per 100,000 ( $p < .001$ ) (M. Coffey, Coffey, & Ahmedani, 2015).



## Create Protective Environments

### Rationale

Prevention efforts that focus not only on individual behavior change (e.g., help-seeking, treatment interventions) but on changes to the environment can increase the likelihood of positive behavioral and health outcomes (Haddon, 1980). Creating environments that address risk and protective factors where individuals live, work, and play, can help prevent suicide (Dahlberg & Krug, 2002; U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). For example, rates of suicide are high among middle-aged adults (who comprise 42.6% of the workforce; Toosi, 2015) and are also elevated in among certain occupational groups (e.g., farming, fishing, forestry, and construction; Han et al., 2016; McIntosh et al., 2016), and among people in detention facilities (e.g. jail, prison), to name a few. Thus, workplaces settings where these populations work and reside may serve as an ideal setting for reaching certain high-risk groups and implementing programs, practices and policies to buffer against suicide. Changes to organizational culture through the implementation of supportive policies, for instance, can change social norms, encourage help-seeking, and demonstrate that good health and mental health are valued and that stigma and other risk factors for suicide are not (Knox et al., 2010; National Action Alliance for Suicide Prevention Workplace Task Force, 2015). Similarly, modifying the characteristics of the physical environment to prevent harmful behavior such as access to lethal means can reduce suicide rates, particularly in times of crisis or transition (Beautrais, Gibb, Fergusson, Horwood, & Larkin, 2009; A.E. Crosby, Espitia-Hardeman, Ortega, & Lozano, 2013; Kaplan et al., 2013; Miller, Warren, Hemenway, & Azrael, 2015; Runyan et al., 2016; Stokes, McCoy, Abram, Byck, & Teplin, 2015).

### Approaches

The current evidence suggests three potential approaches for creating environments that protect against suicide.

- **Reduce access to lethal means among persons at-risk of suicide.** Means of suicide such as firearms, hanging/suffocation, or jumping from heights provide little opportunity for rescue and, as such, have high case fatality rates (e.g., about 85% of people who use a firearm in a suicide attempt will die from the injury). Research also indicates that 1) the interval between deciding to act and attempting suicide can be as short as 5 or 10 minutes (Deisenhammer et al., 2009; Simon et al., 2001) and 2) that people tend *not* to substitute a different method when a highly lethal method is unavailable or difficult to access (Hawton, 2007; Yip et al., 2012). Therefore, increasing the time interval between deciding to act and the suicide attempt, for example, by making it more difficult to access lethal means, can be lifesaving. The following are examples of approaches reducing access to lethal means for persons at-risk of suicide:



- *Intervening at Suicide Hotspots.* Suicide hotspots, or places where suicides may take place relatively easily, include tall structures (e.g., bridges, cliffs, balconies, and rooftops), railway tracks, and isolated locations such as parks. Efforts to prevent suicide at these locations include erecting barriers or limiting access to prevent jumping and installing signs and telephones to encourage individuals who are considering suicide, to seek help (Cox et al., 2013).
- *Safe Storage Practices.* Safe storage of medications, firearms, and other household products can reduce the risk for suicide by separating vulnerable individuals from easy access to lethal means. Such practices may include education and counseling around storing firearms--locked in a secure place (e.g., in a gun safe or lock box), unloaded and separate from the ammunition--and keeping medicines in a locked cabinet or other secure location away from people who may be at risk or who have made prior attempts (Rowhani-Rahbar, Simonetti, & Rivara, 2016; Runyan et al., 2016).
- **Organizational policies and culture** that promote protective environments may be implemented in places of employment, detention facilities, and other secured environments (e.g. residential programs). Such policies and cultural values encourage leadership from the top down and may promote prosocial behavior (e.g., asking for help), skill building, changing positive social norms, assessment, referral and access to helping services (e.g. mental health, substance abuse treatment, financial counseling), and development of crisis response plans, postvention, and safe physical environments. ~~and encourage leadership support from the top down.~~ Such policies and cultural shifts can positively impact organizational climate and morale and help prevent suicide and its related risk factors (e.g. depression, social isolation) (Hayes, 2013; National Action Alliance for Suicide Prevention Workplace Task Force, 2015).
- **Community-based policies to reduce excessive alcohol use.** Research studies in the United States have found that greater alcohol availability is positively associated with alcohol-involved suicides (Escobedo & Ortiz, 2002; Giesbrecht et al., 2015). Policies to reduce excessive alcohol use broadly include zoning to limit alcohol outlet locations and density, taxes on alcohol, and bans on the sale of alcohol for individuals under the legal drinking age. These policies are important because acute alcohol use has been found to be associated with more than one-third of suicides and approximately 40% of suicide attempts (Cherpitel, Borges, & Wilcox, 2004).

### Potential Outcomes

- Increases in safe storage of lethal means
- Reductions in suicide attempts
- Reductions in suicide deaths



- Increases in help-seeking
- Reductions in alcohol-related suicide deaths

## Evidence

The evidence suggests that creating protective environments can reduce suicide and suicide attempts and increase protective behaviors.

- **Reduce access to lethal means among persons at-risk of suicide.** A meta-analysis examining the impact of *suicide hotspot interventions* implemented in combination or in isolation, both in the U.S. and abroad, found associated reduced rates of suicide (Cox et al., 2013; Pirkis et al., 2015). For example, after erecting a barrier on the Jacques-Cartier bridge in Canada, the suicide rate from jumping from the bridge decreased from about 10 suicide deaths per year to about 3 deaths per year (Perron, Burrows, Fournier, Perron, & Ouellet, 2013). Moreover, the reduction in suicides by jumping was sustained even when all bridges and nearby jumping sites were considered, suggesting little to no displacement of suicides to other jumping sites (Perron et al., 2013). Further evidence for the effectiveness of bridge barriers was demonstrated by a study examining the impact of the *removal* of safety barriers from the Grafton Bridge in Auckland, New Zealand. After removal of the barrier, both the number and rate of suicide increased fivefold (Beautrais, 2001; Beautrais et al., 2009).

Another form of means reduction involves implementation of *safe storage practices*. In a case-control study of firearm-related events identified from 37 counties in Washington, Oregon, and Missouri, and from 5 trauma centers, Grossman et al. (2005) found that storing firearms unloaded, separate from ammunition, in a locked place or secured with a safety device was protective of suicide attempts among adolescents. Further, a recent systematic review of clinic and community-based education and counseling interventions suggested that the provision of safety devices significantly increased safe firearm storage practices compared to counseling alone or compared to the provision of economic incentives to acquire safety devices on one's own (Rowhani-Rahbar et al., 2016).

Another program, *The Emergency Department Counseling on Access to Lethal Means (ED CALM)*, trained psychiatric emergency clinicians in a large children's hospital to provide lethal means counseling and safe storage boxes to parents of patients under age 18 receiving care for suicidal behavior. In a pre-post quality improvement project, Runyan et al. (2016) found that at post-test 76% (of the 55% of parents followed up, n=114) reported that all medications in the home were locked up as compared to fewer than 10% at the time of the initial emergency department visit. Among parents who indicated the presence of guns in the home at pre-test (i.e. 67%), all (100%) reported guns were currently locked up at post-test (Runyan et al., 2016).



- **Organizational policies and culture.** *Together for Life* is a workplace program of the Montreal Police Force implemented to address suicide among officers. Policy and program components were designed to foster an organizational culture that promoted mutual support and solidarity among all members of the Force. The program included training of supervisors, managers and all units to improve competencies in identifying suicidal risk and to improve use and awareness of existing resources. The program also included an education campaign to improve awareness and help-seeking (Mishara & Martin, 2012). Police suicides were tracked over 12 years and compared to rates in the control city of Quebec. The suicide rate in the intervention group decreased significantly by 78.9% to a rate of 6.4 suicides per 100,000 population per year compared to an 11% increase in the control city (29.0 per 100,000; Mishara & Martin, 2012).

Another example of this approach is the *United States Air Force Suicide Prevention Program*. The program included 11 policy and education initiatives and was designed to change the culture of the Air Force surrounding suicide. The program uses leaders as role models and agents of change, establishes expectations for behavior related to awareness of suicide risk, develops population skills and knowledge (i.e., education and training), and investigates every suicide (i.e., outcomes measurement). The program represents a fundamental shift from viewing suicide and mental illness solely as medical problem and instead sees them as larger service-wide problems impacting the whole community (Knox, Litts, Talcott, Feig, & Caine, 2003). Using a time-series design to examine the impact of the program on various violence-related outcomes, researchers found that the program was associated with a 33% relative risk reduction in suicide (Knox et al., 2003). The program was also associated with relative risk reductions in related outcomes including moderate and severe family violence (30% and 54%, respectively), homicide (51%), and accidental death (18%) (Knox et al., 2003). A longitudinal assessment of the program over the period 1981 to 2008 (16 years before the 1997 launch of the program and 11 years post-launch) found significantly lower rates of suicide after the program was launched than before (Knox et al., 2010). These effects were sustained over time, except in 2004, which the authors found was associated with less rigorous implementation in that year than in the other years (Knox et al., 2010).

*Mates in Construction (MIC)* is a multifaceted suicide prevention strategy developed in Australia and implemented and evaluated in construction workplaces. The program has three primary components: general awareness training, connector training, and applied suicide intervention skills training (ASIST). A one-hour general awareness training is provided for all construction workers on site with the goal of increasing awareness of suicide as a safety issue and a problem facing workplace health, increasing knowledge about warning signs of suicide, and encouraging help-seeking behaviors among construction workers. A four-hour connector training session is provided for individuals labeled “connectors”, who serve to keep coworkers safe while



connecting them to help through an ASIST-trained worker, MIC field manager, or case manager. Individuals trained in ASIST take part in an intensive two-day training to build skills for identifying and responding to suicidal ideation and behavior, with the goal of implementing a safety plan to involve at-risk individuals obtaining the care they need in a safe environment. An evaluation examining the potential economic impact of widespread implementation of MIC among New South Wales construction industry workers identified suicide rates before MIC implementation from 2008-2012 and after implementation of MIC from 2013-2017 using time series data on NSW suicide deaths and the construction workforce. Doran et al. (2016) found that MIC could potentially avert 0.4 suicides, 1.01 full incapacity cases, and almost 5 short absences, per year, in the construction industry, generating an annual savings of \$3.66 million AU. They further indicated that every Australian dollar invested in MIC would result in a \$4.60 return (Doran, Ling, Gullestrup, Swannell, & Milner, 2016).

Finally, while the evidence is still being built for suicide prevention in correctional facilities, preliminary evidence exists for comprehensive policies and practices within these settings. These policies and practices include: routine suicide prevention training for all staff, standardized intake screening and risk assessment, provision of shared information between staff members, especially in transitioning or transferring of inmates, varying levels of observation, safe physical environment, emergency response protocols in place, notification of suicidal behavior/suicide through the chain of command, and critical incident stress debriefing and death review. When these policies and practices were implemented across 11 state prisons in Louisiana, suicide rates dropped from a rate of 23.1/100,000 before the intervention to 12.4/100,000 the following year (Hayes, 1995). Other similar programs have seen declines in suicide both in the United States and internationally (Barker, Kølves, & De Leo, 2014).

- **Community-based policies to reduce excessive alcohol use.** While multiple policies to limit excessive use of alcohol exist, several studies on alcohol outlet *density*, specifically, suggest that measures to reduce alcohol outlet density can potentially reduce alcohol-involved suicides. Additionally, a longitudinal analysis of alcohol outlet density, suicide mortality, and hospitalizations for suicide attempts over 6 years in 581 California zip codes indicated that the density of bars, specifically, is related to suicide and suicide attempts, particularly in rural areas (Johnson, Gruenewald, & Remer, 2009).



## Promote Connectedness

### Rationale

Sociologist, Emile Durkheim theorized in 1897 that weak social bonds, i.e. lack of connectedness, are among the chief causes for suicidality (Durkheim, 1897/1951). *Connectedness* is the degree to which an individual or group of individuals are socially close, interrelated, or share resources with others (Centers for Disease Control and Prevention, 2009). Social connections can be formed within and between multiple levels of the social ecology (Dahlberg & Krug, 2002), for instance between individuals (e.g. peers, neighbors, co-workers), families, schools, neighborhoods, workplace, faith communities, cultural groups, and society as a whole. Related to connectedness, *social capital* refers to a sense of trust in one's community and neighborhood, social integration, and also the availability and participation in social organizations (Beyer, Layde, Hamberger, & Laud, 2015; Muennig, Cohen, Palmer, & Zhu, 2013). Many ecological cross-sectional and longitudinal studies have examined the impact of aspects of social capital on depression symptoms, depressive disorder, mental health more generally, and suicide. While the evidence is limited, existing studies suggest the pattern is towards a positive association between social capital measured by social trust, community/neighborhood engagement, and improved mental health. Connectedness and social capital together can serve to protect against suicidal behaviors by decreasing isolation, encouraging adaptive coping behaviors, increasing belongingness, personal value and worth all of which helps individuals to build resilience in the face of adversity. Connectedness can also provide individuals with better access to formal supports and resources, mobilize communities to meet the needs of its members and provide collective primary prevention activities to the community as a whole (Centers for Disease Control and Prevention, 2009).

### Approaches

Promoting connectedness among individuals and within communities through modeling peer norms and enhancing community engagement may protect against suicide.

- **Peer norm approaches** seek to normalize protective factors for suicide such as help-seeking, reaching out and talking to trusted adults, and promote peer connectedness. By leveraging the leadership qualities and social influence of peers, these approaches can be used to shift group-level beliefs and promote positive social and behavioral change. These approaches typically target youth and are delivered in school settings but can also be implemented in community settings.
- **Community engagement activities.** Community engagement is an aspect of social capital. Community engagement approaches may involve residents participating in a range of activities, including religious activities, community clean-up and greening activities, and physical exercise. These activities provide opportunities for residents to become more involved in the community and to connect with other community members, organizations, and resources, resulting in



enhanced overall physical health, reduced stress, and decreased depressive symptoms, thereby reducing risk of suicide.

### Potential Outcomes

- Reductions in maladaptive coping attitudes and behaviors
- Increases in healthy coping attitudes and behaviors
- Increases in referrals for youth in distressed
- Increases help-seeking behaviors
- Increases in positive perceptions of adult support

### Evidence

Current evidence suggests a number of positive benefits of peer norm and community engagement activities, although more evaluation research is needed to examine whether these improvements in factors that protect against suicidal behavior translate into reduced suicide attempts and deaths.

- **Peer norm approaches.** Evaluations show that programs such as *Sources of Strength* can improve school norms and beliefs about suicide that are created and disseminated by student peers. In a randomized controlled trial of *Sources of Strength* conducted with 18 high-schools (6 metropolitan, 12 rural), Wyman et al. (2010) found that the program improved adaptive norms regarding suicide among peer leaders, connectedness to adults, and school engagement. Peer leaders were also more likely than controls to refer a suicidal friend to an adult. For students, the program resulted in increased perceptions of adult support for suicidal youths, particularly among those with a history of suicidal ideation, and the acceptability of help-seeking behaviors. Finally, trained peer leaders also reported a greater decrease in maladaptive coping attitudes compared with untrained leaders (Wyman et al., 2010).
- **Community engagement activities.** A vacant lot greening initiative was undertaken in Philadelphia between 1999 and 2008. Local residents and community members worked together to green 4,436 lots (or 7.8 million square feet) in 4 areas of the city. Researchers found significant reductions in community residents' self-reported level of stress, which is a risk factor for suicide, and engagement in more physical exercise, a protective factor for suicide, than residents in control vacant lot areas. Other benefits included reductions in firearm assaults and vandalism (Branas et al., 2011).



## Teach Coping and Problem-Solving Skills

### Rationale

Building life skills prepares individuals to successfully tackle every day challenges and adapt to stress and adversity. Life skills encompasses many concepts, but most often include coping and problem-solving skills, emotional regulation, conflict resolution, and critical thinking. Life skills are important in shielding individuals from suicidal behaviors (World Health Organization, 2014). Suicide prevention programs that focus on life and social skills training are drawn from social cognitive theories (Bandura, 1986), surmising that suicidal behavior is attributed to either direct learning and modeling or environmental and individual (e.g. hopelessness) characteristics. The inability to employ adequate strategies to cope with immediate stressors or identify and find solutions for problems has been characterized among suicide attempters (Pollock & Williams, 2004). Teaching and providing youth with the skills to tackle every day challenges and stressors is, therefore, an important component to suicide prevention.

### Approaches

Social emotional learning programs and parenting skill and family relationship programs are two approaches for teaching coping and problem-solving skills.

- **Social emotional learning programs** focus on developing and strengthening communication and problem-solving skills, emotion regulation, conflict resolution, help seeking and coping skills. These approaches address a range of risk and protective factors for suicidal behavior. They provide children and youth with skills to resolve problems in relationships, school, and with peers, and help youth to address other negative influences (e.g., substance use) associated with suicide. These approaches are typically delivered to all students in a particular grade or school, although some programs also focus on groups of students considered to be at high risk for suicide. Opportunities to practice and reinforce skills are an important part of programs that work (Herman, Borden, Reinke, & Webster-Stratton, 2011).
- **Parenting skill and family relationship programs** provide caregivers with support and are designed to strengthen parenting skills, enhance positive parent-child interactions, and improve children's behavioral and emotional skills and abilities. Programs are typically designed for parents or caregivers with children in a specific age range and can be self-directed or delivered to individual or groups of families. Some programs have sessions primarily with parents while others include sessions for parents, youth, and the family. Specific program content typically varies by the age of the child but often has consistent themes of child development, parent-child communication and relationships, and youth's interpersonal and problem-solving skills.



## Potential Outcomes

- Reductions in suicide attempts and suicide ideation
- Reductions in suicide risk behaviors (i.e., depression, anxiety, conduct problems, substance abuse)
- Improvements in help-seeking behavior
- Improvements in social competence and emotional regulation skills
- Improvements in problem-solving and conflict management skills

## Evidence

Several social emotional learning and parenting and family relationship programs have been shown in rigorous evaluations to improve resilience and reduce risk factors for various behaviors, including ones closely related to suicide, such as depression, internalizing behaviors, and substance abuse (M. S. Knox, Burkhart, & Hunter, 2010).

- **Social emotional learning programs.** The *Youth Aware of Mental Health Program (YAM)* is a program developed for teenagers aged 14-16 that uses interactive dialogue and role-playing to teach adolescents about the risk and protective factors associated with suicide (including knowledge about depression and anxiety) and enhances their problem-solving skills for dealing with adverse life events, stress, school and other problems (Wasserman et al., 2014). In a cluster-randomized controlled trial conducted across 10 European Union countries and 168 schools, students in schools randomized to *YAM* were significantly less likely to attempt suicide and have severe suicidal ideation at the 12-month follow-up compared to students in control schools which received educational materials and care as usual. Overall, the relative risk of youth suicide attempts among the *YAM* group was reduced by over 50% demonstrating that out of 1000 students, five attempted suicide in the *YAM* group compared to 11 in the control group. Additionally, related to severe suicide ideation, in the *YAM* group absolute risk fell by 0.50% and relative risk fell by 49.6% (Wasserman et al., 2014).

Another example is the *Good Behavior Game (GBG)*, which is a classroom-based program for elementary school children aged 6-10. The program uses a team-based behavior management strategy that promotes good behavior by setting clear expectations for good behavior and consequences for maladaptive behavior. The goal of the *GBG* program is to create an integrated classroom social system that is supportive of all children being able to learn with little aggressive or disruptive behavior (Wilcox et al., 2008). Two cohorts of youths participated in the program in 1985-86 and 1986-87 school years when they were in the first and second grades. A number of proximal and distal outcomes were assessed among the two cohorts over time. With respect to distal suicide-related outcomes, an outcome evaluation of the *GBG* indicated that individuals in the first cohort who were assigned to participate in

**Comment [A]:** Should we add references for some of the systematic reviews on school and parenting/family programs?

**Comment [A]:** Dropped Signs of Suicide

Consider adding PATHS? Two examples may be fine here, so not sure we need to add another program.



*GBG* when they were in the first grade reported half the adjusted odds of suicidal ideation and suicide attempts when assessed approximately 15 years later, between the ages of 19 to 21, compared to peers who had been in a standard classroom setting. The beneficial effect of the program was consistent for suicidal ideation regardless of whether baseline covariates were included. The *GBG* effect on attempts was less robust in some adjusted models including caregiver mental health. In the second cohort of *GBG* students, neither suicidal ideation nor suicide attempts were significantly different between *GBG* and the control interventions (Wilcox et al., 2008). The researchers believed this may have been due to a lack of implementation fidelity. *GBG* was also found to be associated with reduced risk of later substance abuse, a risk factor for suicide (Kellam et al., 2008).

- **Parenting skill and family relationship programs.** Parenting and family skills training approaches have shown promising impacts in preventing key risk factors associated with suicide. For example, the *Incredible Years (IY)* is a comprehensive group training program for parents, teachers and children designed to reduce conduct and substance abuse problems, two important suicide risk factors in youth by improving protective factors such as responsive and positive parent-teacher-child interactions and relationships, emotion self-regulation and social competence (all protective factors for suicide) (Herman et al., 2011). The program includes 9-20 sessions offered in community-based settings (e.g., religious, recreation centers, mental health treatment centers, and hospitals). Several studies have demonstrated the effect of the *IY* program on reducing internalizing symptoms, such as anxiety and depression, and child conduct problems (C. H. Webster-Stratton, Reid, & Beauchaine, 2011; Webster-Stratton, Jamila Reid, & Stoolmiller, 2008). The program is also associated with improved problem-solving and conflict management; these skills were maintained at 1-year follow-up (Reid, Webster-Stratton, & Hammond, 2003; C. Webster-Stratton & Hammond, 1997; C. Webster-Stratton, Reid, & Hammond, 2001). The program demonstrated greater benefits as the dosage of the intervention increased (Herman et al., 2011).

Additionally, *Strengthening Families 10-14* is a program that involves sessions between parents, youth, and family with the goal of improving parents' skills for disciplining, managing emotions and conflict, and communicating with their children; promoting youths' interpersonal and problem-solving skills; and creating family activities to build cohesion and positive parent-child interactions. The premise of the program is that developing these skills for both parents and children will reduce internalizing behavior and adolescent substance abuse, two important risk factors for suicide (Spoth, Gyll, & Day, 2002). *Strengthening Families* has been shown to significantly decrease externalizing behaviors, such as aggression, alcohol use, and drug use among youth participants, as well as reduce depression, alcohol use, and drug use among participating families (Spoth et al., 2002).

## Identify and Support People At-Risk

### Rationale

In order to decrease suicide, attention to people at increased risk is necessary, as these individuals tend to experience suicidal behavior at higher than average rates. These vulnerable or disadvantaged populations include, but are not limited to, individuals with lower socio-economic status or who are living with a mental health problem; people who have attempted suicide previously; Veterans and active duty military personnel; individuals who are institutionalized, have been victims of violence, or are homeless; **individuals of sexual minority status**; and members of certain racial and ethnic minority groups (Bachynski et al., 2012; Centers for Disease Control and Prevention, 2016; Curtin et al., 2016; Kann et al., 2016; Lineberry & O'Connor; Russell & Joyner, 2001). Supporting these vulnerable groups requires proactive case finding along with access to, and retention in, mental health services. Finding effective ways of identifying at-risk or vulnerable groups, customizing services to make them accessible and engaged in care remain key challenges. For example, simply improving services does not guarantee that those services will be used by those most in need of them, nor will it necessarily increase the number of people who follow treatments that are recommended. ~~People who are disadvantaged~~**Marginalized populations** may face social and economic issues that ~~may can~~ adversely affect their ability to ~~access~~ **care and treatment**.

### Approaches

The following three approaches focus on identifying and supporting people at increased risk.

- **Gatekeeper training** is designed to train teachers, coaches, clergy, emergency responders, primary and urgent care providers, and others in the community to identify people who may be at risk of suicide and to respond effectively, including facilitating treatment seeking and support services. Gatekeeper training may be **implemented in a variety of settings to identify and support people at risk**.
- **Crisis intervention**. These approaches provide support and referral services, typically by connecting a person in crisis (or a friend or family member of someone at-risk) to trained volunteers or professional staff via telephone hotline, online chat, text messaging, or in-person. Crisis intervention approaches are intended to impact key risk factors for suicide, including feelings of depression, hopelessness, and subsequent mental health care utilization. Like means reduction, crisis interventions can put space or time between an individual who may be considering suicide and harmful behavior.
- ~~Screening and treatment~~**Treatment** for people at-risk of **suicide**. ~~Screening can be used in primary care and behavioral health care settings to assure that people who may be at high risk of suicide are identified and receive appropriate care. This can include various forms of~~

**Comment [A]:** Need to tweak rationale so that it includes the treatment pieces.

**Comment [A]:** There was a comment that people who are disadvantaged sounded awkward which I agree. What about marginalized?

**Comment [A]:** We're no longer giving examples of screening (that went with Henry Ford) so I took that out.



psychotherapy delivered by licensed providers to help individuals with mental health problems and other suicide risk factors ~~for suicide~~ with problem-solving and ~~impulsivity and~~ emotion regulation. Treatment usually takes place in a one on one or group format between patients and clinicians ~~and can vary in duration from several weeks to ongoing therapy, for years in some cases as needed. Treatment that employs collaborative (i.e., between patient and therapist or care manager) and/or integrated care (e.g. linkage between primary care and behavioral health care) can help engage and motivate patients, thereby increasing retention in therapy and decreasing suicide risk have demonstrated that collaborative care models are as effective in treating depression and suicidal ideation as standard care~~ (Archer et al., 2012; Bruce et al., 2004; Gilbody, Bower, Fletcher, Richards, & Sutton, 2006).

- **Treatment to prevent re-attempts.** These approaches typically include follow-up contact and use diverse modalities (e.g., home visits, mail, telephone, e-mail) to engage recent suicide attempt survivors in continued treatment to prevent re-attempts. Treatment may focus on improved coping skills, mindfulness, and other emotional regulation skills, and may include case management home visits to increase adherence to treatment and continuity of care; and one-on-one interpersonal therapy and/or group therapy. Approaches that engage and connect attempters to peers and providers are especially important because many attempters do not present to aftercare; 12%-25% reattempt within a year, and 3%-9% of attempt survivors die by suicide within 1 to 5 years of their initial attempt (Inagaki et al., 2015)

### Potential Outcomes

- Reductions in suicide attempts
- Reductions in suicide deaths
- Increases in identification of individuals at-risk for suicidal behavior
- Increases in at-risk individuals in treatment
- Increases in community members trained to identify at-risk individuals
- Increases in referrals for health care

### Evidence

The current evidence suggests that identifying people at risk of suicide and the continued provision of support for these individuals can positively impact suicide and its associated risk factors.

- **Gatekeeper training.** *Applied Suicide Intervention Skills Training (ASIST)* is a widely implemented training program that helps hotline counselors, emergency workers, and other gatekeepers to identify and connect with suicidal individuals, understand their reasoning for living and dying, and assist with safely connecting those in need to available resources. In a study employing a

**Comment [A]:** Wonder if it would just be better to end the sentence after the word "clinicians"?

**KH:** Yes, I think that's fine.

**Comment [A]:** Moved ASIST here per reviewers comments.

Dropped MHFA – consider incorporating that program in another category?

randomized controlled trial, Gould, Cross, Pisani, Munfakh, & Kleinman (2013) evaluated the training across the *National Suicide Prevention Lifeline* network of hotlines over the period 2008-2009. Using data from 1,410 suicidal individuals who called 17 Lifeline centers, the researchers found that compared to callers who spoke to counselors that received the usual care training, individuals who spoke with counselors without training in *ASIST* were significantly more likely to feel depressed, suicidal, more overwhelmed, and less hopeful by the end of their call to the hotline compared to those with training in *ASIST*. Counselors trained in *ASIST* were also more skilled at keeping callers on the phone longer and establishing a connection with them. However, training in *ASIST* did not result in more comprehensive suicide risk assessments than usual care training (Gould et al., 2013).

Gatekeeper training has also been a primary component of the *Garret Lee Smith (GLS) Suicide Prevention Program*, which is in place in 49 states and 48 tribes. A multi-site evaluation assessed the impact of community gatekeeper training on suicide attempts and deaths by comparing the change in suicide rates and nonfatal suicidal behavior among young people aged 10-24 in counties implementing *GLS* trainings, with the trajectory observed in similar counties that did not implement these trainings. Counties that implemented *GLS* trainings had significantly lower youth suicide rates one year following the training implementation (Walrath, Garraza, Reid, Goldston, & McKeon, 2015). This finding equates to a decrease of 1 suicide death per 100,000 among youth ages 10 to 24, or the prevention of approximately 237 deaths in the age group, between 2007 and 2010. Counties implementing *GLS* program activities also had significantly lower suicide attempt rates among youth ages 16 to 23 in the year following implementation of the *GLS* program than did similar counties that did not implement *GLS* activities (4.9 fewer attempts per 1000 youths; Godoy Garraza, Walrath, Goldston, Reid, & McKeon, 2015). More than 79,000 suicide attempts may have been prevented during the period examined, following implementation of the *GLS* program.

- **Crisis intervention.** Suicide prevention hotlines are one way to provide crisis intervention. In an evaluation of the effectiveness of the *National Suicide Prevention Lifeline* to prevent suicide, 1,085 suicidal individuals who called the hotline completed a standard risk assessment for suicide, and 380 of those completed a follow-up assessment between 1 and 52 days (mean=13.5 days) after the initial assessment. Researchers found that over half of the initial sample were seriously considering suicide when they called, and they had a plan for their suicide. Researchers also found that among follow-up participants, there was a significant decrease in psychological pain, hopelessness, and intent to die between initiation of the call (time 1) to follow-up (time 3). Between time 2 (end of the call) to time 3, the effect remained for psychological pain and hopelessness, but was not significant for intent to die (Gould, Kalafat, Harrismunfakh, &



Kleinman,

2007).

Comment [A]: May need to rework introductory statement and description to fit in the notion of screening.

- **Screening and Treatment for people at-risk of suicide.** ~~(One example of a treatment with evidence of impact on risk and protective factors for suicide is the~~ *The Improving Mood – Promoting Access to Collaborative Treatment (IMPACT) program.* ~~IMPACT~~ aims to prevent suicide among older primary care patients by reducing suicide ideation and depression ~~in primary care settings.~~ *IMPACT* facilitates the development of a therapeutic alliance, a personalized treatment plan that includes patient preferences, as well as proactive follow-up (biweekly during an acute phase and monthly during continuation phase) by a depression care manager (Hunkeler et al., 2006). The program has been shown to significantly improve quality of life, and to reduce functional impairment, depression and suicidal ideation over 24-months of follow-up (Hunkeler et al., 2006; Unutzer et al., 2006) relative to patients who received care as usual.

~~Another example is~~ *Collaborative Assessment and Management of Suicidality (CAMS), which is a therapeutic approach for suicide-specific assessment and treatment of patient's suicide risk. The program's* flexible approach can be used across treatment settings and clinician theoretical orientations and involves the clinician and patient working together in an interactive assessment process to develop patient-specific treatment plans. Sessions are collaborative and involve constant patient input about what is and is not working with the ultimate goal of enhancing the therapeutic alliance and increasing treatment motivation in the suicidal patient. CAMS been tested and supported in 6 correlational studies (Jobes, 2012), in a variety of inpatient and outpatient settings and in one RCT with several additional RCTs under way. CAMS has been associated with significant improvements in suicidal ideation, overall symptom distress, and feelings of hopelessness at 12 month follow-up among a community-based sample of suicidal outpatients. (Comtois et al., 2011).

Other examples include *Dialectical Behavioral Therapy (DBT)* and *Attachment-Based Family Therapy (ABFT)*. DBT is a multicomponent therapy for individuals at high risk for suicide and who may struggle with impulsivity and emotional regulation. The components of DBT include individual therapy, group skills training, between-session telephone coaching and a therapist consultation team. In a randomized controlled trial of women with recent suicidal or self-injurious behavior, those receiving DBT were half as likely to make a suicide attempt at two-year follow-up than women receiving community treatment (23% vs 46%), required less hospitalization for suicide ideation, and had lower medical risk across all suicide attempts and self-injurious acts combined (Linehan et al., 2006).

ABFT is a program for adolescents aged 12-18 and is designed to treat clinically diagnosed major depressive disorder, eliminate suicidal ideation, and reduce dispositional anxiety (Diamond et al., 2010). A randomized controlled trial of ABFT found that suicidal adolescents assigned to ABFT



experienced significantly greater improvement in suicidal ideation over 24 weeks of follow-up than did adolescents assigned to enhanced usual care. Additionally, a significantly higher percentage of ABFT participants reported no suicidal ideation in the week prior to assessment at 12 weeks than did adolescents receiving enhanced usual care (69.2% vs. 34.6%) and at 24 weeks (82.1% vs. 46.2%) (Diamond et al., 2010).

Another example is the *Finally, the Veterans Affairs Translating Initiatives for Depression into Effective Solutions* project (VA TIDES), which uses a depression care liaison to link primary care and mental health services. The depression care liaison assesses and educates patients and follows up with both patients and providers between primary care visits to optimize treatment. This collaborative care increases the efficiency of providing mental health services by bringing mental health care to the primary care setting, where most patients are first detected and subsequently treated for many mental health conditions. A study of the VA TIDES project, specifically, found significant decreases in depression severity scores among 70% of primary care patients. TIDES also demonstrated 85% and 95% compliance with medication and follow-up visits, respectively (Rubenstein et al., 2010).

- **Treatment to prevent re-attempts.** Several strategies that aim to prevent re-attempts have demonstrated impact on reducing suicidal behavior suicide mortality. For example, *Emergency Department Brief Intervention with Follow-up Visits* is a program that involves a one-hour discharge information session that addresses suicidal ideation and behavior, distress, risk and protective factors, alternatives to suicidal behavior self-harm, and referral options, combined with nine follow-up contacts over 18 months (at 1, 2, 4, 7, 11 weeks and 4, 6, 12, 18 months). Follow-up contacts are either conducted by phone or through home visits according to a specific time line for up to 18-months. A randomized controlled trial that enrolled suicide attempters from eight hospital emergency departments in five countries (Brazil, India, Sri Lanka, Iran, and China) found that a brief intervention combined with 9 follow-up visits over 18-months was associated with significantly fewer deaths from suicide relative to a treatment-as-usual group (0.2% versus 2.2%, respectively) (Fleischmann et al., 2008).

Another example of treatment to prevent re-attempts involves *active follow-up contact approaches* such as postcards, letters, and telephone calls intended to increase a patient's sense of connectedness with health care providers and decrease isolation. These approaches include expression of care and support and typically invite patients to reconnect with their provider. Contacts are made periodically (e.g., monthly or every few months in the first 12 months post-discharge with some programs continuing contact for two or more years). In a meta-analysis conducted by Inagaki et al. (2015), interventions to prevent repeat suicidal behavior suicide attempts in patients admitted to an emergency department for suicide attempt were found to reduce reattempts by approximately 17% for up to 12 months post-discharge; however, the



effects of these approaches beyond 12 months on reattempts has not yet been demonstrated. Also, because the number of trials and associated sample sizes included in this meta-analysis were small, it was not possible to determine the effect of active contact and follow-up approaches on death by suicide.

In a randomized controlled trial of the post-crisis suicide prevention long-term follow-up contact approach, Motto and Bostrom (2001) found that patients who refused ongoing care but who were randomized to be contacted by letter four times per year had a lower rate of suicide over two years of follow-up than did patients in the control group who received no further contact. Other studies have also shown post-crisis letters and coping cards to be protective against suicide ideation and attempts (Hassanian-Moghaddam, Sarjami, Kolahi, & Carter, 2011; Wang et al., 2016).

Finally, *Cognitive Behavior Therapy for Suicide Prevention (CBT-SP)* is an example of a therapeutic approach to prevent re-attempts. It uses a risk-reduction, relapse prevention approach that includes an analysis of proximal risk factors and stressors (e.g., relationship problems, school or work-related difficulties) leading up to and following the suicidal event; safety plan development; skill building; and psychoeducation. *CBT-SP* also has family skill modules focused on family support and communication patterns as well as improving the family's problem solving skills. A randomized controlled trial of *CBT-SP* found that 10-session outpatient cognitive therapy designed to prevent repeat suicide attempts resulted in a 50% reduction in the likelihood of a suicide reattempt among adults who had been admitted to an emergency department for a suicide attempt relative to treatment as usual (Brown et al., 2005).

## Lessen Harms and Prevent Future Risk

### Rationale

Individuals who have experienced mental health challenges, suicidal ideation, who have made suicide attempts or engaged in non-suicidal self-injury are at increased risk of suicide (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). Risk of suicide can also increase among those who have lost a friend, family member, co-worker, or other acquaintance to suicide (Pitman, Osborn, King, & Erlangsen, 2014). Exposure to sensationalized or uninformed reporting regarding on suicide may heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to suicide contagion (Etzersdorfer & Sonneck, 1998; Niederkrotenthaler & Sonneck, 2007).

### Approaches

There are a number of approaches that can be used to lessen harms and reduce future risk of suicide including various therapeutic treatments and approaches providing continuity of care, caring for the bereaved, and safe reporting following a suicide.

- **Postvention** approaches are implemented *after* a suicide has taken place and may include debriefing sessions, counseling, and/or bereavement support groups for surviving friends and family members/loved ones. These programs have not typically been evaluated for their impact on suicide or suicidal behavior but may reduce survivors' guilt, feelings of depression, and complicated grief (Szumilas & Kutcher, 2011).
- **Safe reporting following a suicide.** The manner in which information on a recent suicide is communicated to the public (e.g. school assemblies, mass media, social media) can heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to suicide contagion. Therefore, responsible and safe reporting may help prevent suicide and suicide contagion.

### Potential Outcomes

- Reductions in mental health-related sequelae
- Increases in connectedness
- Improvements in coping skills
- Improvements in messaging following suicide
- Reductions in re-attempts
- Reductions in contagion effects related to suicide

**Comment [A]:** Need to modify the rationale so that it speaks to the primary approaches included below – perhaps starting with the second sentence and expanding on that a bit.

**Comment [A]:** Introductory statement needs to be modified



## Evidence

Current evidence suggests that therapeutic treatments and other approaches for lessening harm can impact risk and protective factors for suicide.

Comment [A]: Statement needs to be modified

- **Postvention** programs are implemented with the goal of providing support to survivors of others' suicide to reduce their own risk of suicide. One example of a postvention program, *StandBy Response Service (StandBy)*, provides clients with face-to-face outreach and telephone support through a professional crisis response team. Site coordinators develop customized case management plans, referring clients to other existing community services matched to their needs (Visser, Comans, & Scuffham, 2014). In a study by Visser et al. (2014), *StandBy* clients were significantly less likely to be at high risk for suicidality than a suicide bereaved comparison group who had not had contact with the *StandBy* program (48% and 64% respectively). Additionally, research suggests that active postvention approaches in which outreach to suicide survivors occurs at the scene of a suicide is associated with intake into treatment sooner, greater attendance at support group meetings, and attendance at more meetings compared to passive postvention (versus passive approaches where survivors self-refer for services) (Cerel & Campbell, 2008).
- **Safe reporting and messaging about suicide.** One way to ensure safe reporting and messaging about suicide is to encourage news media adhere to *Recommendations for Reporting on Suicide* (<http://www.reportingonsuicide.org>). Reports that are both inclusive of suicide prevention messages, stories of hope and resilience, risk and protective factors, and links to helping resources (e.g., hotline), and that avoid sensationalizing events or reducing suicide to one cause, can help reduce the likelihood of suicide contagion. The most compelling evidence supporting these recommendations for reporting comes from Austria. After a sharp increase in suicides on the Viennese subway, media guidelines were introduced and an interrupted time series design was used to evaluate the national impact of the guidelines on subsequent suicides. Changes in the quality and quantity of media reporting resulted in a nationwide significant reduction of 81 suicides annually (Niederkrotenthaler & Sonneck, 2007). Finally, research suggests that not only does reporting on suicide in a negative way (e.g., reporting on suicide myths and repetition) have harmful effects on suicide, but reporting on positive coping skills in the face of adversity can also demonstrate protective effects against suicide (Niederkrotenthaler et al., 2010). Reports of individual suicidal ideation not accompanied by reports of suicide or suicide attempts, along with reports describing a "mastery" of a crisis situation where adversities were overcome, was associated with significant decreases in suicide rates in the time period immediately following such reports (Niederkrotenthaler et al., 2010).



## Sector Involvement

Public health can play an important and unique role in addressing suicide. Public health agencies, which typically place prevention at the forefront of efforts and work to create broad population-level impact, can bring critical leadership and resources to bear on this problem. For example, these agencies can serve as a convener, bringing together partners and stakeholders to plan, prioritize, and coordinate suicide prevention efforts. Public health agencies are also well positioned to collect and disseminate data, implement preventive measures, evaluate programs, and track progress. Although public health can play a leadership role in preventing suicide, the strategies and approaches outlined in this technical package cannot be accomplished by the public health sector alone. As noted in the National Strategy to Prevent Suicide, the integration and coordination of prevention activities across sectors and settings is critical for expanding the reach and impact of suicide prevention efforts.

Other sectors vital to implementing this package include, but are not limited to, education, government (local, state, and federal), social services, health services, business, labor, justice, housing, media, and organizations that comprise the civil society sector such as faith-based organizations, youth-serving organizations, foundations, and other non-governmental organizations. Collectively, these sectors can make a difference in preventing suicide by impacting the various contexts and underlying risks that contribute to suicide.

The strategies and approaches described in this technical package are summarized in Appendix A along with the relevant sectors that are well positioned to lead implementation efforts. For example, business and labor, health care insurers and providers, and government entities are in the best position to implement programs and policies that *Strengthen Economic Supports and Access to Mental Health Care*. These types of supports go beyond individual behavior change and require commitment and support from those sectors that can directly address some of the underlying risks and the environmental contexts that increase the risk for suicide. Public health entities can play an important role by gathering and synthesizing information to inform policy, raise awareness, and evaluate the effectiveness of various policies. Moreover, partnerships with non-governmental and community organizations can be instrumental in increasing awareness of and garnering support for policies affecting individuals and families.

The public health sector has been at the forefront of many community-based prevention efforts, working collaboratively with schools and community-based organizations, to change social norms and positively impact health behavior. Public health is well suited to take on a similar leadership role in *Promoting Connectedness* through peer norm and community engagement activities and supporting the development, evaluation, and adoption of effective programs that *Teach Coping and Problem-Solving Skills* to prevent suicide from happening in the first place. These programs are often delivered in school and community settings, making education and non-governmental organizations vital partners in prevention.



Businesses, workplaces, and local and state government entities, on the other hand, are in the best position to establish policies and support practices that *Create Protective Environments* where people live, work, and play. Public health entities can play an important role by gathering and synthesizing information, working with other agencies within the executive branch of their state or local government in support of policy and other approaches, and evaluating the effectiveness of measures taken. In a similar fashion, public health entities can partner with schools, workplaces, and community organizations to implement and evaluate prevention programs, policies and practices geared toward creating safe, healthy, and supportive environments.

Finally, this technical package includes a number of interventions delivered in hospital, primary care, behavioral health care, and community settings designed to *Identify and Support People At-Risk* and to *Lessen Harms and Prevent Future Risk*. The intensity and activities of these interventions require the expertise of professionals who are licensed and trained to deliver critical intervention support. The health care, social services, and justice sectors can work collaboratively to support individuals at high-risk for suicide and their families. These activities also require coordination of supports across various service providers and community organizations.

Regardless of strategy, action by many sectors will be necessary for the successful implementation of this package. In this regard, all sectors can play an important and influential role in preventing suicide from happening in the first place and lessening the immediate and long-term harms of suicidal behavior by helping those in times of crisis get the services and support they need.

## Monitoring and Evaluation

Monitoring and evaluation are necessary components of the public health approach to prevention. It is important to have timely and reliable data to monitor the extent of the problem and to evaluate the impact of prevention efforts. Data are also necessary for prevention planning and implementation.

Gathering ongoing and systematic data is important for prevention efforts. However, it is also important to gather data that are uniform and consistent across systems. Consistent data allow public health and other entities to better gauge the scope of the problem, identify high-risk groups, and monitor the effects of prevention programs and policies. Currently, it is common for different ~~sectors,~~ ~~agencies, and organizations to employ unique definitions of suicidal ideation, behavior, and death that can make it difficult to consistently monitor specific outcomes across sectors and over time.~~ For example, the manner in which deaths are classified can change from one jurisdiction to another, and can change based on local medical and/or medicolegal standards (A.E. Crosby, Ortega, et al., 2011). CDC's uniform definitions and recommended data elements for self-directed violence provide a useful framework to help ensure that data are collected in a consistent manner across surveillance systems and data collection sites (e.g., A.E. Crosby, Ortega, et al., 2011).

Surveillance data help researchers and practitioners track changes in the burden of suicide. Surveillance systems exist at the federal, state, and local levels. It is important to assess the availability of surveillance data and data systems across these levels to identify and address gaps in the systems. CDC's National Vital Statistics System (NVSS) and the National Violent Death Reporting System (NVDRS) are examples of surveillance systems that provide data on deaths from suicide. NVSS is a nationwide surveillance system that collects demographic, geographic, and cause-of-death data from death certificates. NVDRS is a state-based surveillance system (currently in 40 states, DC and Puerto Rico) that combines data from death certificates, law enforcement reports, and coroner or medical examiner reports to provide detailed information on the circumstances of violent deaths, including suicide, which can assist communities in guiding prevention approaches (Blair, Fowler, Jack, & Crosby, 2016). The National Electronic Injury Surveillance System-All Injury Program (NEISS-AIP) provides nationally representative data about all types and causes of nonfatal injuries treated in U.S. hospital emergency departments, and can be used to assess national rates of, and trends in, self-harm injuries by cause (e.g., falls, poisoning, etc.), age, race/ethnicity, sex, disposition (where the injured person goes when released from the Emergency Department).

In addition to information on deaths and nonfatal injuries, there are also surveillance systems that provide national, state, and some local estimates of suicidal behavior. The Youth Risk Behavior Surveillance System (YRBSS) collects information from a nationally representative sample of 9-12 grade students and is a key resource in monitoring health-risk behaviors among youth, including whether youth have seriously considered attempting suicide, attempted suicide, made a plan, or required treatment by a doctor or nurse for a suicide attempt that resulted in an injury, poisoning, or overdose (Brener et al.,



2013). The YRBSS data are obtained from a national school-based survey conducted by CDC as well as from state, territorial, tribal, and large urban school district surveys conducted by education and health agencies. The National Survey on Drug Use and Health (NSDUH) is an annual survey of the civilian, non-institutionalized population aged 12 years and older. NSDUH provides both national and state-level estimates of substance use (alcohol, tobacco, illicit drugs, and non-medical use of prescription drugs); mental health (past year mental illness, co-occurring illnesses); and service utilization, along with suicide ideation, suicide plans, and suicide attempts. NSDUH is a key resource to track trends in suicide-related risk factors in the population and to help identify groups at increased risk.

It is also important at all levels (local, state, and federal) to address gaps in responses, track progress of prevention efforts and evaluate the impact of those efforts, including the impact of this technical package. Evaluation data, produced through program implementation and monitoring, is essential to provide information on what does and does not work to reduce rates of suicide and its associated risk and protective factors. Theories of change and logic models that identify short, intermediate, and long-term outcomes are an important part of program evaluation.

The evidence-base for suicide prevention has advanced greatly over the last few decades. However, additional research is needed to understand the impact of programs, policies, and practices on suicide (and suicide attempts, at a minimum), as opposed to merely examining their effectiveness on risk factors. More research is also needed to examine the effectiveness of primary prevention strategies (before risk occurs) and community-level strategies to prevent suicide at the population level. Lastly, it will be important for researchers to test the effectiveness of combinations of the strategies and approaches included in this package. Most existing evaluations focus on approaches implemented in isolation, but there is potential to understand the synergistic effects within a comprehensive prevention approach.

## Conclusion

Suicide is a serious public health problem whose rates have been on the rise for more than a decade and whose costs stretch well into the billions of dollars each year. While suicide is a rare outcome statistically, its human impact has a ripple effect that is far-reaching. Each of us likely interacts with suicide survivors, those with lived experience, and those with thoughts of suicide on a daily basis – at home, at work, and in our communities. Suicide and suicide attempts are public health issues of societal concern. There are a number of barriers that have impeded progress, including, for example, stigma related to help-seeking, mental illness, being a survivor and fear related to asking someone about suicidal thoughts. Fortunately, like many public health problems, suicide is preventable, and more is being done to prevent suicide than ever before, as evidenced by the work of the National Action Alliance for Suicide Prevention, the release of the first world report on suicide, and more timely surveillance data, to name just a few examples.

In an effort to continue pushing the field and society further towards prevention, this technical package includes strategies and approaches that ideally would be used in a comprehensive, multi-level and multi-sectoral way. It includes strategies and approaches to prevent suicide from occurring in the first place, as well as strategies focused on lessening the immediate and long-term harms of suicidal behavior. It includes strategies that range from a focus on the whole population regardless of risk to strategies designed to support people at highest risk. Importantly, this technical package extends the bounds of the typical prevention strategies to consider approaches that go beyond individual behavior change to better address risk factors impacting communities and populations more broadly (e.g., economic policies to strengthen housing and financial security).

While the evidence base continues to emerge, the collection of programs, policies, and practices laid out here are available for implementation now. In keeping with good public health practice, the intent is that monitoring and evaluation will play a key role in that implementation. Moreover, as new evidence becomes available, this technical package can be refined to reflect the current state of the science.

In closing, and in keeping with a message of resilience as spoken by those with lived experience, ‘hope, help, and healing is possible.’



## References

- Archer, J., Bower, P., Gilbody, S., Lovell, K., Richards, D., Gask, L., . . . Coventry, P. (2012). Collaborative care for depression and anxiety problems. *The Cochrane Library*.
- Arsenault-Lapierre, G., Kim, C., & Turecki, G. (2004). Psychiatric diagnoses in 3275 suicides: a meta-analysis. *BMC Psychiatry*, 4, 37. doi:10.1186/1471-244X-4-37
- Bachynski, K. E., Canham-Chervak, M., Black, S. A., Dada, E. O., Millikan, A. M., & Jones, B. H. (2012). Mental health risk factors for suicides in the US Army, 2007–8. *Injury Prevention*, 18(6), 405-412.
- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*: Prentice-Hall, Inc.
- Barker, E., Kölves, K., & De Leo, D. (2014). Management of Suicidal and Self-Harming Behaviors in Prisons: Systematic Literature Review of Evidence-Based Activities. *Archives of Suicide Research*, 18(3), 227-240. doi:10.1080/13811118.2013.824830
- Beautrais, A. L. (2001). Effectiveness of barriers at suicide jumping sites: A case study. *Aust NZ J Psychiat*, 35. doi:10.1080/0004867010060501
- Beautrais, A. L., Gibb, S. J., Fergusson, D. M., Horwood, L. J., & Larkin, G. L. (2009). Removing bridge barriers stimulates suicides: An unfortunate natural experiment. *Aust NZ J Psychiat*, 43. doi:10.1080/00048670902873714
- Bellis, M. A., Hughes, K., Leckenby, N., Jones, L., Baban, A., Kachaeva, M., . . . Ulukol, B. (2014). Adverse childhood experiences and associations with health-harming behaviours in young adults: surveys in eight eastern European countries. *Bulletin of the World Health Organization*, 92(9), 641-655.
- Beyer, K. M., Layde, P. M., Hamberger, L. K., & Laud, P. W. (2015). Does neighborhood environment differentiate intimate partner femicides from other femicides? *Violence Against Women*, 21(1), 49-64. doi:10.1177/1077801214564075
- Blair, J. M., Fowler, K. A., Jack, S. P., & Crosby, A. E. (2016). The National Violent Death Reporting System: overview and future directions. *Inj Prev*, 22 Suppl 1, i6-i11. doi:10.1136/injuryprev-2015-041819
- Bossarte, R. M., Karras, E., Lu, N., Tu, X., Stephens, B., Draper, J., & Kemp, J. E. (2014). Associations between the Department of Veterans Affairs' suicide prevention campaign and calls to related crisis lines. *Public Health Rep*, 129(6), 516-525.
- Branas, C. C., Cheney, R. A., MacDonald, J. M., Tam, V. W., Jackson, T. D., & Ten Have, T. R. (2011). A difference-in-differences analysis of health, safety, and greening vacant urban space. *Am J Epidemiol*, 174(11), 1296-1306. doi:10.1093/aje/kwr273
- Brown, G. K., Ten Have, T., Henriques, G. R., Xie, S. X., Hollander, J. E., & Beck, A. T. (2005). Cognitive therapy for the prevention of suicide attempts: a randomized controlled trial. *JAMA*, 294(5), 563-570. doi:10.1001/jama.294.5.563
- Bruce, M. L., Ten Have, T. R., Reynolds III, C. F., Katz, I. I., Schulberg, H. C., Mulsant, B. H., . . . Alexopoulos, G. S. (2004). Reducing suicidal ideation and depressive symptoms in depressed older primary care patients: a randomized controlled trial. *JAMA*, 291(9), 1081-1091.
- Capaldi, D. M., Knoble, N. B., Shortt, J. W., & Kim, H. K. (2012). A Systematic Review of Risk Factors for Intimate Partner Violence. *Partner Abuse*, 3(2), 231-280. doi:10.1891/1946-6560.3.2.231
- Carter, M., McGee, R., Taylor, B., & Williams, S. (2007). Health outcomes in adolescence: associations with family, friends and school engagement. *J Adolesc*, 30(1), 51-62. doi:10.1016/j.adolescence.2005.04.002
- Centers for Disease Control and Prevention. (2009). Strategic direction for the prevention of suicidal behavior: Promoting individual, family, and community connectedness to prevent suicidal behavior. Retrieved from Available at: [http://www.cdc.gov/ViolencePrevention/pdf/Suicide\\_Strategic\\_Direction\\_Full\\_version-a.pdf](http://www.cdc.gov/ViolencePrevention/pdf/Suicide_Strategic_Direction_Full_version-a.pdf)
- Centers for Disease Control and Prevention. (2016). Web-Based Injury Statistics Query and Reporting System (WISQARS). Retrieved June 3, 2016 Available at: <http://www.cdc.gov/injury/wisqars/index.html>

- Cerel, J., & Campbell, F. R. (2008). Suicide survivors seeking mental health services: a preliminary examination of the role of an active postvention model. *Suicide Life Threat Behav*, 38(1), 30-34. doi:10.1521/suli.2008.38.1.30
- Cerel, J., Maple, M., De Venne, A., Moore, M., Flaherty, C., & Brown, M. (2016). Exposure to Suicide in the Community: Prevalence and Correlates in One US State. *Public Health Reports*, 131(1).
- Cerel, J., McIntosh, J. L., Neimeyer, R. A., Maple, M., & Marshall, D. (2014). The Continuum of "Survivorship": Definitional Issues in the Aftermath of Suicide. *Suicide and life-threatening behavior*, 44(6), 591-600. doi:10.1111/sltb.12093
- Chapman, A. L., & Dixon-Gordon, K. L. (2007). Emotional antecedents and consequences of deliberate self-harm and suicide attempts. *Suicide Life Threat Behav*, 37(5), 543-552. doi:10.1521/suli.2007.37.5.543
- Chapman, D. P., Whitfield, C. L., Felitti, V. J., Dube, S. R., Edwards, V. J., & Anda, R. F. (2004). Adverse childhood experiences and the risk of depressive disorders in adulthood. *J Affect Disord*, 82(2), 217-225.
- Cherpitel, C. J., Borges, G. L. G., & Wilcox, H. C. (2004). Acute alcohol use and suicidal behavior: A review of the literature. *Alcoholism: Clinical and Experimental Research*, 28(5 SUPPL.), 18S-28S.
- Classen, T. J., & Dunn, R. A. (2012). The effect of job loss and unemployment duration on suicide risk in the United States: a new look using mass-layoffs and unemployment duration. *Health Econ*, 21(3), 338-350. doi:10.1002/hecl.1719
- Coffey, C. E. (2006). Pursuing perfect depression care. *Psychiatr Serv*, 57(10), 1524-1526. doi:10.1176/ps.2006.57.10.1524
- Coffey, C. E. (2007). Building a system of perfect depression care in behavioral health. *Jt Comm J Qual Patient Saf*, 33(4), 193-199.
- Coffey, C. E., Coffey, M. J., & Ahmedani, B. K. (2013). An update on perfect depression care. *Psychiatr Serv*, 64(4), 396. doi:10.1176/appi.PS.640422
- Coffey, M., Coffey, C., & Ahmedani, B. K. (2015). Suicide in a health maintenance organization population. *JAMA Psychiatry*, 72(3), 294-296. doi:10.1001/jamapsychiatry.2014.2440
- Comtois, K. A., Jobes, D. A., S. O'Connor, S., Atkins, D. C., Janis, K., E. Chessen, C., . . . Yuodelis-Flores, C. (2011). Collaborative assessment and management of suicidality (CAMS): feasibility trial for next-day appointment services. *Depress Anxiety*, 28(11), 963-972. doi:10.1002/da.20895
- Cox, G. R., Owens, C., Robinson, J., Nicholas, A., Lockley, A., Williamson, M., . . . Pirkis, J. (2013). Interventions to reduce suicides at suicide hotspots: a systematic review. *BMC Public Health*, 13(1), 1-12. doi:10.1186/1471-2458-13-214
- Crosby, A. E., Espitia-Hardeman, V., Ortega, L., & Lozano, B. (2013). Alcohol and suicide. *Alcohol: Science, Policy and Public Health*, 190.
- Crosby, A. E., Han, B., Ortega, L., Parks, S. E., & Gfroerer, J. (2011). Suicidal Thoughts and Behaviors Among Adults Aged ≥18 Years — United States, 2008–2009. *MMWR*, 60(No. SS-13), 1-22.
- Crosby, A. E., Ortega, L., & Melanson, C. (2011). *Self-directed Violence Surveillance: Uniform Definitions and Recommended Data Elements, Version 1.0*. Retrieved from Atlanta, GA:
- Crosby, A. E., & Sacks, J. J. (2002). Exposure to Suicide: Incidence and Association with Suicidal Ideation and Behavior: United States, 1994. *Suicide and life-threatening behavior*, 32(3), 321-328. doi:10.1521/suli.32.3.321.22170
- Cunningham, P. J. (2009). Beyond parity: primary care physicians' perspectives on access to mental health care. *Health Aff (Millwood)*, 28(3), w490-501. doi:10.1377/hlthaff.28.3.w490
- Curtin, S. C., Warner, M., & Hedegaard, H. (2016). *Increase in suicide in the United States, 1999-2014*. ( ). Hyattsville, MD: National Center for Health Statistics Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/25116188>.
- Cylus, J., Glymour, M. M., & Avendano, M. (2014). Do generous unemployment benefit programs reduce suicide rates? A state fixed-effect analysis covering 1968-2008. *Am J Epidemiol*, 180(1), 45-52. doi:10.1093/aje/kwu106



- Dahlberg, L. L., & Krug, E. G. (2002). Violence-a global public health problem. In E. Krug, L. L. Dahlberg, J. A. Mercy, A. B. Zwi, & R. Lozano (Eds.), *World Report on Violence and Health* (pp. 1-56). Geneva, Switzerland: World Health Organization.
- Deisenhammer, E. A., Ing, C. M., Strauss, R., Kemmler, G., Hinterhuber, H., & Weiss, E. M. (2009). The duration of the suicidal process: how much time is left for intervention between consideration and accomplishment of a suicide attempt? *J Clin Psychiatry*, 70(1), 19-24.
- Diamond, G. S., Wintersteen, M. B., Brown, G. K., Diamond, G. M., Gallop, R., Shelef, K., & Levy, S. (2010). Attachment-based family therapy for adolescents with suicidal ideation: a randomized controlled trial. *J Am Acad Child Adolesc Psychiatry*, 49(2), 122-131.
- Doran, C. M., Ling, R., Gullestrup, J., Swannell, S., & Milner, A. (2016). The Impact of a Suicide Prevention Strategy on Reducing the Economic Cost of Suicide in the New South Wales Construction Industry. *Crisis*, 37(2), 121-129. doi:10.1027/0227-5910/a000362
- Dube, S. R., Anda, R. F., Felitti, V. J., Chapman, D. P., Williamson, D. F., & Giles, W. H. (2001). Childhood abuse, household dysfunction, and the risk of attempted suicide throughout the life span: findings from the Adverse Childhood Experiences Study. *JAMA*, 286(24), 3089-3096.
- Dunne, E. J., McIntosh, J. L., & Dunne-Maxim, K. (Eds.). (1987). *Suicide and its aftermath: Understanding and counseling the survivors*. New York: Norton.
- Durkheim, E. (1897/1951). *Suicide: A study in sociology* (JA Spaulding & G. Simpson, trans.). Glencoe, IL: Free Press. (Original work published 1897).
- Edwards, R. W., Jumper-Thurman, P., Plested, B. A., Oetting, E. R., & Swanson, L. (2000). Community readiness: Research to practice. *Journal of Community Psychology*, 28(3), 291-307.
- Escobedo, L. G., & Ortiz, M. (2002). The relationship between liquor outlet density and injury and violence in New Mexico. *Accid Anal Prev*, 34(5), 689-694.
- Etzersdorfer, E., & Sonneck, G. (1998). Preventing suicide by influencing mass-media reporting: The Viennese experience, 1980–1996. *Arch Suicide Res*, 4.
- Felitti, V. J., Anda, R. F., Nordenberg, D., Williamson, D. F., Spitz, A. M., Edwards, V., . . . Marks, J. S. (1998). Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: The Adverse Childhood Experiences (ACE) Study. *Am J Prev Med*, 14(4), 245-258.
- Ferdon, C., Crosby, A. E., Caine, E. D., Hindman J., Reed, G. A., & Iskander, J. (In press). CDC Public Health Grand Rounds: Preventing Suicide through a Comprehensive Public Health Approach. *MMWR*.
- Flavin, P., & Radcliff, B. (2009). Public policies and suicide rates in the American states. *Social Indicators Research*, 90(2), 195-209.
- Fleischmann, A., Bertolote, J. M., Wasserman, D., De Leo, D., Bolhari, J., Botega, N. J., . . . Thanh, H. T. (2008). Effectiveness of brief intervention and contact for suicide attempters: a randomized controlled trial in five countries. *Bulletin of the World Health Organization*, 86(9), 703-709. doi:S0042-96862008000900014 [pii]
- Florence, C., Simon, T., Haegerich, T., Luo, F., & Zhou, C. (2015). Estimated lifetime medical and work-loss costs of fatal injuries-United States, 2013. *MMWR: Morbidity and mortality weekly report*, 64(38), 1074-1077.
- Fowler, K. A., Gladden, R. M., Vagi, K. J., Barnes, J., & Frazier, L. (2015). Increase in suicides associated with home eviction and foreclosure during the US housing crisis: findings from 16 National Violent Death Reporting System States, 2005-2010. *Am J Public Health*, 105(2), 311-316. doi:10.2105/AJPH.2014.301945
- Frieden, T. R. (2014). Six components necessary for effective public health program implementation. *Am J Public Health*, 104(1), 17-22. doi:10.2105/AJPH.2013.301608
- Giesbrecht, N., Huguette, N., Ogden, L., Kaplan, M. S., McFarland, B. H., Caetano, R., . . . Nolte, K. B. (2015). Acute alcohol use among suicide decedents in 14 US states: impacts of off-premise and on-premise alcohol outlet density. *Addiction*, 110(2), 300-307. doi:10.1111/add.12762

- Gilbody, S., Bower, P., Fletcher, J., Richards, D., & Sutton, A. J. (2006). Collaborative care for depression: a cumulative meta-analysis and review of longer-term outcomes. *Archives of internal medicine*, 166(21), 2314-2321.
- Godoy Garraza, L., Walrath, C., Goldston, D. B., Reid, H., & McKeon, R. (2015). Effect of the Garrett Lee Smith Memorial Suicide Prevention Program on Suicide Attempts Among Youths. *JAMA Psychiatry*, 72(11), 1143-1149. doi:10.1001/jamapsychiatry.2015.1933
- Gould, M. S., Cross, W., Pisani, A. R., Munfakh, J. L., & Kleinman, M. (2013). Impact of Applied Suicide Intervention Skills Training on the National Suicide Prevention Lifeline. *Suicide Life Threat Behav*, 43(6), 676-691. doi:10.1111/sltb.12049
- Gould, M. S., Kalafat, J., Harrismunfakh, J. L., & Kleinman, M. (2007). An evaluation of crisis hotline outcomes. Part 2: Suicidal callers. *Suicide Life Threat Behav*, 37(3), 338-352. doi:10.1521/suli.2007.37.3.338
- Grossman, D. C., Mueller, B. A., Riedy, C., Dowd, M. D., Villaveces, A., Prodzinski, J., . . . Harruff, R. (2005). Gun storage practices and risk of youth suicide and unintentional firearm injuries. *JAMA*, 293(6), 707-714. doi:10.1001/jama.293.6.707
- Haddon, W. (1980). Advances in the epidemiology of injuries as a basis for public policy. *Public Health Reports*, 95(5), 411-421.
- Haegerich, T. M., & Dahlberg, L. L. (2011). Violence as a public health risk. *American Journal of Lifestyle Medicine*, 1559827611409127.
- Hailey, D., Roine, R., & Ohinmaa, A. (2008). The effectiveness of telemental health applications: a review. *The Canadian Journal of Psychiatry*, 53(11), 769-778.
- Hamby, S., & Grych, J. (2013). The web of violence: exploring connections among different forms of interpersonal violence and abuse *Briefs in Sociology*. New York, NY: Springer.
- Han, B., Crosby, A. E., Ortega, L. A., Parks, S. E., Compton, W. M., & Gfroerer, J. (2016). Suicidal ideation, suicide attempt, and occupations among employed adults aged 18–64 years in the United States. *Comprehensive psychiatry*, 66, 176-186.
- Harris, E. C., & Barraclough, B. (1997). Suicide as an outcome for mental disorders. A meta-analysis. *Br J Psychiatry*, 170, 205-228.
- Harris, E. C., & Barraclough, B. (1998). Excess mortality of mental disorder. *Br J Psychiatry*, 173, 11-53.
- Harris, K. M., Carpenter, C., & Bao, Y. (2006). The effects of state parity laws on the use of mental health care. *Med Care*, 44(6), 499-505. doi:10.1097/01.mlr.0000215813.16211.00
- Hassanian-Moghaddam, H., Sarjami, S., Kolahi, A. A., & Carter, G. L. (2011). Postcards in Persia: randomised controlled trial to reduce suicidal behaviours 12 months after hospital-treated self-poisoning. *British Journal of Psychiatry*, 198(4), 309-316.
- Hawkins, J. D., Catalano, R. F., & Kuklinski, M. R. (2014). Communities that care *Encyclopedia of Criminology and Criminal Justice* (pp. 393-408): Springer.
- Hawton, K. (2007). Restricting access to methods of suicide: Rationale and evaluation of this approach to suicide prevention. *Crisis*, 28. doi:10.1027/0227-5910.28.s1.4
- Hayes, L. M. (1995). Prison Suicide: An Overview and a Guide to Prevention. *The Prison Journal*, 75(4), 431-456. doi:10.1177/0032855595075004003
- Hayes, L. M. (2013). Suicide prevention in correctional facilities: reflections and next steps. *Int J Law Psychiatry*, 36(3-4), 188-194. doi:10.1016/j.ijlp.2013.04.010
- Herman, K. C., Borden, L. A., Reinke, W. M., & Webster-Stratton, C. (2011). The Impact of the Incredible Years Parent, Child, and Teacher Training Programs on Children's Co-Occurring Internalizing Symptoms. *Sch Psychol Q*, 26(3), 189-201. doi:10.1037/a0025228
- Houle, J. N., & Light, M. T. (2014). The home foreclosure crisis and rising suicide rates, 2005 to 2010. *Am J Public Health*, 104(6), 1073-1079. doi:10.2105/AJPH.2013.301774



- Hunkeler, E. M., Katon, W., Tang, L., Williams, J. W., Jr., Kroenke, K., Lin, E. H., . . . Unutzer, J. (2006). Long term outcomes from the IMPACT randomised trial for depressed elderly patients in primary care. *BMJ*, 332(7536), 259-263. doi:10.1136/bmj.38683.710255.BE
- Inagaki, M., Kawashima, Y., Kawanishi, C., Yonemoto, N., Sugimoto, T., Furuno, T., . . . Yamada, M. (2015). Interventions to prevent repeat suicidal behavior in patients admitted to an emergency department for a suicide attempt: a meta-analysis. *J Affect Disord*, 175, 66-78. doi:10.1016/j.jad.2014.12.048
- Jobes, D. A. (2012). The Collaborative Assessment and Management of Suicidality (CAMS): an evolving evidence-based clinical approach to suicidal risk. *Suicide Life Threat Behav*, 42(6), 640-653. doi:10.1111/j.1943-278X.2012.00119.x
- Johnson, F. W., Gruenewald, P. J., & Remer, L. G. (2009). Suicide and alcohol: do outlets play a role? *Alcohol Clin Exp Res*, 33(12), 2124-2133. doi:10.1111/j.1530-0277.2009.01052.x
- Kann, L., McManus, T., Harris, W. A., Shanklin, S. L., Flint, K. H., Hawkins, J., . . . Zaza, S. (2016). Youth Risk Behavior Surveillance - United States, 2015. *MMWR Surveill Summ*, 65(6), 1-174. doi:10.15585/mmwr.ss6506a1
- Kaplan, M. S., McFarland, B. H., Huguet, N., Conner, K., Caetano, R., Giesbrecht, N., & Nolte, K. B. (2013). Acute alcohol intoxication and suicide: a gender-stratified analysis of the National Violent Death Reporting System. *Inj Prev*, 19(1), 38-43. doi:10.1136/injuryprev-2012-040317
- Kellam, S. G., Brown, C. H., Poduska, J. M., Ialongo, N. S., Wang, W., Toyinbo, P., . . . Wilcox, H. C. (2008). Effects of a universal classroom behavior management program in first and second grades on young adult behavioral, psychiatric, and social outcomes. *Drug Alcohol Depend*, 95 Suppl 1, S5-S28. doi:10.1016/j.drugalcdep.2008.01.004
- Kessler, R. C., Demler, O., Frank, R. G., Olfson, M., Pincus, H. A., Walters, E. E., . . . Zaslavsky, A. M. (2005). Prevalence and treatment of mental disorders, 1990 to 2003. *N Engl J Med*, 352(24), 2515-2523. doi:10.1056/NEJMsa043266
- Kleiman, E. M., Riskind, J. H., Schaefer, K. E., & Weingarden, H. (2012). The moderating role of social support on the relationship between impulsivity and suicide risk. *Crisis*, 33(5), 273-279. doi:10.1027/0227-5910/a000136
- Klomek, A. B., Sourander, A., & Gould, M. (2010). The association of suicide and bullying in childhood to young adulthood: a review of cross-sectional and longitudinal research findings. *The Canadian Journal of Psychiatry*, 55(5), 282-288.
- Knox, K. L., Litts, D. A., Talcott, G. W., Feig, J. C., & Caine, E. D. (2003). Risk of suicide and related adverse outcomes after exposure to a suicide prevention programme in the US Air Force: cohort study. *BMJ*, 327(7428), 1376.
- Knox, K. L., Pflanz, S., Talcott, G. W., Campise, R. L., Lavigne, J. E., Bajorska, A., . . . Caine, E. D. (2010). The US Air Force suicide prevention program: implications for public health policy. *Am J Public Health*, 100(12), 2457-2463. doi:10.2105/ajph.2009.159871
- Lang, M. (2013). The impact of mental health insurance laws on state suicide rates. *Health Econ*, 22(1), 73-88. doi:10.1002/hecl.1816
- Leeb, R. T., Lewis, T., & Zolotor, A. J. (2011). A review of physical and mental health consequences of child abuse and neglect and implications for practice. *American Journal of Lifestyle Medicine*, 5(5), 454-468.
- Lineberry, T. W., & O'Connor, S. S. Suicide in the US Army. *Mayo Clinic Proceedings*, 87(9), 871-878. doi:10.1016/j.mayocp.2012.07.002
- Linehan, M. M., Comtois, K. A., Murray, A. M., Brown, M. Z., Gallop, R. J., Heard, H. L., . . . Lindenboim, N. (2006). Two-year randomized controlled trial and follow-up of dialectical behavior therapy vs therapy by experts for suicidal behaviors and borderline personality disorder. *Arch Gen Psychiatry*, 63(7), 757-766. doi:10.1001/archpsyc.63.7.757
- Losel, F., & Farrington, D. P. (2012). Direct protective and buffering protective factors in the development of youth violence. *Am J Prev Med*, 43(2 Suppl 1), S8-S23. doi:10.1016/j.amepre.2012.04.029

- Maimon, D., Browning, C. R., & Brooks-Gunn, J. (2010). Collective efficacy, family attachment, and urban adolescent suicide attempts. *J Health Soc Behav*, 51(3), 307-324. doi:10.1177/0022146510377878
- Mark, T. L., Shern, D. L., Bagalman, J. E., & Cao, Z. (2007). Ranking America's mental health: An analysis of depression across the states. Alexandria, VA: *Mental Health America*.
- McIntosh, W. L., Spies, E., Stone, D. M., Lokey, C. N., Trudeau, A. R., & Bartholow, B. (2016). Suicide Rates by Occupational Group - 17 States, 2012. *MMWR Morb Mortal Wkly Rep*, 65(25), 641-645. doi:10.15585/mmwr.mm6525a1
- Miller, M., Warren, M., Hemenway, D., & Azrael, D. (2015). Firearms and suicide in US cities. *Inj Prev*, 21(e1), e116-119. doi:10.1136/injuryprev-2013-040969
- Mishara, B. L. (Ed.) (1995). *The Impact of Suicide*. New York: Springer.
- Mishara, B. L., & Martin, N. (2012). Effects of a comprehensive police suicide prevention program. *Crisis: Journal of Crisis Intervention & Suicide*, 33(3), 162-168.
- Mitchell, A. M., Kim, Y., Prigerson, H. G., & Mortimer-Stephens, M. (2004). Complicated grief in survivors of suicide. *Crisis*, 25(1), 12-18. doi:10.1027/0227-5910.25.1.12
- Mohr, D. C., Vella, L., Hart, S., Heckman, T., & Simon, G. (2008). The effect of telephone-administered psychotherapy on symptoms of depression and attrition: A meta-analysis. *Clinical Psychology: Science and Practice*, 15(3), 243-253.
- Motto, J. A., & Bostrom, A. G. (2001). A randomized controlled trial of postcrisis suicide prevention. *Psychiatr Serv*, 52(6), 828-833.
- Muennig, P., Cohen, A. K., Palmer, A., & Zhu, W. (2013). The relationship between five different measures of structural social capital, medical examination outcomes, and mortality. *Soc Sci Med*, 85, 18-26. doi:10.1016/j.socscimed.2013.02.007
- National Action Alliance for Suicide Prevention. (2014). Research Prioritization Task Force.(2014). *A prioritized research agenda for suicide prevention: An action plan to save lives*.
- National Action Alliance for Suicide Prevention Workplace Task Force. (2015). *Comprehensive Blueprint for Workplace Suicide Prevention*. Washington, D.C. : Author.
- National Action Alliance for Suicide Prevention: Clinical Workforce Preparedness Task Force. (2014). *Suicide prevention and the clinical workforce: Guidelines for training*. Washington, D.C.: Author.
- National Action Alliance for Suicide Prevention: Suicide Attempt Survivors Task Force. (2014). *The Way Forward: Pathways to hope, recovery, and wellness with insights from lived experience*. Washington, D.C. : Author.
- National Action Alliance for Suicide Prevention: Survivors of Suicide Loss Task Force. (2015). *Responding to Grief, Trauma, and Distress After a Suicide: U.S. National Guidelines*. Washington, D.C. : Author.
- Niederkrotenthaler, T., & Sonneck, G. (2007). Assessing the impact of media guidelines for reporting on suicides in Austria: Interrupted time series analysis. *Aust N Z J Psychiatry*, 41. doi:10.1080/00048670701266680
- Niederkrotenthaler, T., Voracek, M., Herberth, A., Till, B., Strauss, M., Etzersdorfer, E., . . . Sonneck, G. (2010). Media and suicide. Papageno v Werther effect. *BMJ*, 341, c5841. doi:10.1136/bmj.c5841
- Olfson, M., Gerhard, T., Huang, C., Crystal, S., & Stroup, T. S. (2015). Premature Mortality Among Adults With Schizophrenia in the United States. *JAMA Psychiatry*, 72(12), 1172-1181. doi:10.1001/jamapsychiatry.2015.1737
- Owens, D. (2002). Fatal and non-fatal repetition of self-harm: Systematic review. *British Journal of Psychiatry*, 181(3), 193-199.
- Perron, S., Burrows, S., Fournier, M., Perron, P. A., & Ouellet, F. (2013). Installation of a bridge barrier as a suicide prevention strategy in Montreal, Quebec, Canada. *Am J Public Health*, 103(7), 1235-1239. doi:10.2105/ajph.2012.301089
- Pirkis, J., Too, L. S., Spittal, M. J., Krysinaka, K., Robinson, J., & Cheung, Y. T. D. (2015). Interventions to reduce suicides at suicide hotspots: a systematic review and meta-analysis. *The Lancet Psychiatry*, 2(11), 994-1001. doi:http://dx.doi.org/10.1016/S2215-0366(15)00266-7



- Pitman, A., Osborn, D., King, M., & Erlangsen, A. (2014). Effects of suicide bereavement on mental health and suicide risk. *Lancet Psychiatry*, 1, 86-94.
- Plested, B. A., Edwards, R. W., & Jumper-Thurman, P. (2006). Community readiness: A handbook for successful change. *Fort Collins, CO: Tri-Ethnic Center for Prevention Research*.
- Pollock, L. R., & Williams, J. M. (2004). Problem-solving in suicide attempters. *Psychol Med*, 34(1), 163-167.
- Reid, M. J., Webster-Stratton, C., & Hammond, M. (2003). Follow-up of children who received the Incredible Years intervention for oppositional-defiant disorder: Maintenance and prediction of 2-year outcome. *Behavior Therapy*, 34(4), 471-491.
- Rittenhouse, D. R., Fryer, G. E., Phillips, R. L., Miyoshi, T., Nielsen, C., Goodman, D. C., & Grumbach, K. (2008). Impact of Title VII training programs on community health center staffing and National Health Service Corps participation. *The Annals of Family Medicine*, 6(5), 397-405.
- Rowhani-Rahbar, A., Simonetti, J. A., & Rivara, F. P. (2016). Effectiveness of Interventions to Promote Safe Firearm Storage. *Epidemiol Rev*, 38(1), 111-124. doi:10.1093/epirev/mxv006
- Rubenstein, L. V., Chaney, E. F., Ober, S., Felker, B., Sherman, S. E., Lanto, A., & Vivell, S. (2010). Using evidence-based quality improvement methods for translating depression collaborative care research into practice. *Families, Systems, & Health*, 28(2), 91.
- Runyan, C. W., Becker, A., Brandspiegel, S., Barber, C., Trudeau, A., & Novins, D. (2016). Lethal Means Counseling for Parents of Youth Seeking Emergency Care for Suicidality. *West J Emerg Med*, 17(1), 8-14. doi:10.5811/westjem.2015.11.28590
- Russell, S. T., & Joyner, K. (2001). Adolescent sexual orientation and suicide risk: Evidence from a national study. *American Journal of Public Health*, 91(8), 1276-1281.
- Shepard, D. S., Gurewich, D., Lwin, A. K., Reed, G. A., Jr., & Silverman, M. M. (2016). Suicide and Suicidal Attempts in the United States: Costs and Policy Implications. *Suicide Life Threat Behav*, 46(3), 352-362. doi:10.1111/sltb.12225
- Silverman, M. M., & Maris, R. W. (1995). The prevention of suicidal behaviors: An overview. *Suicide and life-threatening behavior*, 25(1), 10-21.
- Simon, O. R., Swann, A. C., Powell, K. E., Potter, L. B., Kresnow, M. J., & O'Carroll, P. W. (2001). Characteristics of impulsive suicide attempts and attempters. *Suicide Life Threat Behav*, 32(1 Suppl), 49-59.
- Spoth, R. L., Gyll, M., & Day, S. X. (2002). Universal family-focused interventions in alcohol-use disorder prevention: cost-effectiveness and cost-benefit analyses of two interventions. *J Stud Alcohol*, 63(2), 219-228.
- Stack, S., & Wasserman, I. (2007). Economic strain and suicide risk: a qualitative analysis. *Suicide and life-threatening behavior*, 37(1), 103-112.
- Stokes, M. L., McCoy, K. P., Abram, K. M., Byck, G. R., & Teplin, L. A. (2015). Suicidal Ideation and Behavior in Youth in the Juvenile Justice System: A Review of the Literature. *J Correct Health Care*, 21(3), 222-242. doi:10.1177/1078345815587001
- Sudak, H., Maxim, K., & Carpenter, M. (2008). Suicide and stigma: a review of the literature and personal reflections. *Acad Psychiatry*, 32(2), 136-142. doi:10.1176/appi.ap.32.2.136
- Szumilas, M., & Kutcher, S. (2011). Post-suicide intervention programs: a systematic review. *Can J Public Health*, 102(1), 18-29.
- Toosi, M. (2015). *Labor force projections to 2024: The labor force is growing, but slowly*. Washington, D.C.: Bureau of Labor Statistics.
- Turecki, G. (2014). Epigenetics and suicidal behavior research pathways. *Am J Prev Med*, 47(3), S144-S151.
- Tyrer, P., Reed, G. M., & Crawford, M. J. (2015). Classification, assessment, prevalence, and effect of personality disorder. *Lancet*, 385(9969), 717-726. doi:10.1016/S0140-6736(14)61995-4
- U.S. Department of Health and Human Services Health Resources and Services Administrations. (2016a). *Designated Health Professional Shortage Areas Statistics, As of November 4, 2016*. Retrieved from <http://datawarehouse.hrsa.gov/topics/shortageAreas.aspx>.

- U.S. Department of Health and Human Services Health Resources and Services Administrations. (2016b). *NHSC Clinician Retention: A Story of Dedication and Commitment*. Retrieved from <https://nhsc.hrsa.gov/currentmembers/membersites/retainproviders/retentionbrief.pdf>.
- U.S. Office of the Surgeon General, & National Action Alliance for Suicide Prevention. (2012). *2012 National Strategy for Suicide Prevention: Goals and Objectives for Action*. Washington, D.C.: HHS.
- U.S. Public Health Service. (1999). *The Surgeon General's Call to Action to Prevent Suicide*. Washington, D.C.
- Unutzer, J., Tang, L., Oishi, S., Katon, W., Williams, J. W., Jr., Hunkeler, E., . . . Langston, C. (2006). Reducing suicidal ideation in depressed older primary care patients. *J Am Geriatr Soc*, 54(10), 1550-1556.
- Visser, V. S., Comans, T. A., & Scuffham, P. A. (2014). Evaluation Of The Effectiveness Of A Community-Based Crisis Intervention Program For People Bereaved By Suicide. *Journal of Community Psychology*, 42(1), 19-28. doi:10.1002/jcop.21586
- Walrath, C., Garraza, L. G., Reid, H., Goldston, D. B., & McKeon, R. (2015). Impact of the Garrett Lee Smith youth suicide prevention program on suicide mortality. *Am J Public Health*, 105(5), 986-993. doi:10.2105/AJPH.2014.302496
- Wang, Y. C., Hsieh, L. Y., Wang, M. Y., Chou, C. H., Huang, M. W., & Ko, H. C. (2016). Coping Card Usage can Further Reduce Suicide Reattempt in Suicide Attempter Case Management Within 3-Month Intervention. *Suicide Life Threat Behav*, 46(1), 106-120. doi:10.1111/sltb.12177
- Wasserman, D., Hoven, C. W., Wasserman, C., Wall, M., Eisenberg, R., Hadlaczky, G., . . . Carli, V. (2014). School-based suicide prevention programmes: The SEYLE cluster-randomised, controlled trial. *The Lancet*, 385(9977), 1536-1544. doi:10.1016/S0140-6736(14)61213-7
- Webster-Stratton, C., & Hammond, M. (1997). Treating children with early-onset conduct problems: a comparison of child and parent training interventions. *J Consult Clin Psychol*, 65(1), 93-109.
- Webster-Stratton, C., Reid, M. J., & Hammond, M. (2001). Preventing conduct problems, promoting social competence: a parent and teacher training partnership in head start. *J Clin Child Psychol*, 30(3), 283-302. doi:10.1207/S15374424JCCP3003\_2
- Webster-Stratton, C. H., Reid, M. J., & Beauchaine, T. (2011). Combining parent and child training for young children with ADHD. *Journal of Clinical Child & Adolescent Psychology*, 40(2), 191-203.
- Webster-Stratton, C., Jamila Reid, M., & Stoolmiller, M. (2008). Preventing conduct problems and improving school readiness: evaluation of the incredible years teacher and child training programs in high-risk schools. *Journal of child psychology and psychiatry*, 49(5), 471-488.
- Wilcox, H. C., Kellam, S. G., Brown, C. H., Poduska, J. M., Ialongo, N. S., Wang, W., & Anthony, J. C. (2008). The impact of two universal randomized first- and second-grade classroom interventions on young adult suicide ideation and attempts. *Drug Alcohol Depend*, 95 Suppl 1, S60-73.
- Wilkins, N., Tsao, B., Hertz, M., Davis, R., & Klevens, J. (2014). Atlanta, GA: National Center for Injury Prevention and Control, Centers for Disease Control and Prevention.
- World Health Organization. (2013). *Global and Regional Estimates of Violence Against Women: Prevalence and Health Effects of Intimate Partner Violence and Non-Partner Sexual Violence*. Geneva: World Health Organization.
- World Health Organization. (2014). *Suicide Prevention: A Global Imperative*. Geneva, Switzerland: WHO Press.
- Wyman, P. A., Brown, C. H., LoMurray, M., Schmeelk-Cone, K., Petrova, M., Yu, Q., . . . Wang, W. (2010). An outcome evaluation of the Sources of Strength suicide prevention program delivered by adolescent peer leaders in high schools. *Am J Public Health*, 100(9), 1653-1661. doi:
- Yip, P., Caine, E., Yousuf, S., Chang, S.-S., Wu, K., & Chen, Y.-Y. (2012). Means restriction for suicide prevention. *Lancet*, 379. doi:10.1016/s0140-6736(12)60521-2



## Appendix A: Summary of Strategies and Approaches to Prevent Suicide

Strategy	Approach/Program, Practice or Policy	Best Available Evidence			Lead Sectors <sup>1</sup>
		Suicide	Suicide Attempts or Ideation	Other Risk/Protective Factors for Suicide	
Strengthen economic supports	<b>Strengthen household financial security</b>				Government (local, state, Federal)
	<i>Unemployment benefit programs</i>	✓			
	<i>Other income supports</i>	✓			Business/labor
	<b>Housing stabilization policies</b>				Government (local, state, Federal)
	<i>The National Neighborhood Stabilization Program</i>			✓	
Strengthen access to mental health care	<b>Coverage of mental health conditions in health insurance policies</b>				Health care
	<i>Mental Health Parity Laws</i>	✓		✓	Government (state, Federal)
Create protective environments	<b>Reducing access to lethal means among persons at-risk</b>				Government (local, state)
	<i>Intervening at suicide hot spots</i>	✓			
	<i>Safe storage practices</i>		✓	✓	Public Health
	<b>Organizational policies and culture</b>				Business/Labor
	<i>Together for Life</i>	✓			
	<i>US Air Force Suicide Prevention Program</i>	✓		✓	Government (local, state, Federal)

		Best Available Evidence			
	<b>Community-based policies to reduce excessive alcohol use</b>				Government (local, state)
	<i>Alcohol outlet density</i>	✓		✓	Business/labor
<b>Promote connectedness</b>	<b>Peer norm approaches</b>				Public Health
	<i>Sources of Strength</i>			✓	Education
	<b>Community-engagement activities</b>				Public Health
	<i>Greening vacant urban spaces</i>			✓	Government (local)
<b>Teach coping and problem-solving skills</b>	<b>Social emotional learning</b>				Public Health
	<i>Youth Aware of Mental Health Program</i>		✓		Education
	<i>Signs of Suicide</i>		✓	✓	
	<i>Good Behavior Game</i>		✓	✓	
	<b>Parenting skill and family relationship approaches</b>				Public Health
	<i>The Incredible Years</i>			✓	Education
	<i>Strengthening Families 10-14</i>			✓	
	<b>Gatekeeper training</b>				Public Health
	<i>Applied Suicide Intervention Skills Training</i>		?	✓	Healthcare



		Best Available Evidence			
Identify and support people at-risk	Screening combined with care management				Healthcare
	Henry Ford Perfect Depression Care (Precursor to Zero Suicide)	✓		✓	Social Services
	Crisis Intervention				Public Health
	National Suicide Prevention Lifeline		✓	✓	Social Services
Intervene to lessen harms and prevent future risk	Treatment for people at risk of suicide				Healthcare
	Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)		✓	✓	Social Services
	Collaborative Assessment and Management of Suicidality (CAMS)		✓	✓	Justice
	Dialectical Behavioral Therapy		✓	✓	
	Attachment-Based Family Therapy		✓		
	Treatment to prevent re-attempts				Healthcare
	ED Brief Intervention with Follow-up Visits	✓			Social Services
	Active follow-up contact approaches	✓	✓		
	CBT for Suicide Prevention				
	Postvention				Healthcare
	StandBy Response Service		✓		

		Best Available Evidence			
	<b>Safe reporting following a suicide</b>				Public Health
	<i>Media Guidelines</i>	✓			Media

<sup>1</sup>This column refers to the lead sectors well positioned to bring leadership and resources to implementation efforts. For each strategy, there are many other sectors such as non-governmental organizations that are instrumental to prevention planning and implementing specific activities.



DRAFT NARRATIVE FOR CDC CLEARANCE

The information in this narrative has not been cleared for dissemination.  
Please do not cite, copy or disseminate

**Preventing Suicide:  
A Technical Package of Policy, Programs, and Practices**

**Prepared by:**

**Deb Stone, ScD, MSW, MPH  
Kristin Holland, PhD, MPH  
Brad Bartholow, PhD  
Alex Crosby, MD, MPH  
Shane Davis, PhD  
Natalie Wilkins, PhD**

**Division of Violence Prevention  
National Center for Injury Prevention and Control (NCIPC)  
Centers for Disease Control and Prevention**

**2017**

***Preventing Suicide: A Technical Package of Policies, Programs, and Practices* is a publication of the  
National Center for Injury Prevention and Control of the Centers for Disease Control and  
Prevention.**

Centers for Disease Control and Prevention  
Thomas R. Frieden, MD, MPH, Director

National Center for Injury Prevention and Control  
Debra E. Houry, MD, MPH, Director

Division of Violence Prevention  
James A. Mercy, PhD, Director

*Suggested Citation:* Stone, D.M., Holland, K.M., Bartholow, B., Crosby, A.E., Davis, S., and Wilkins, N.  
*Preventing Suicide: A Technical Package of Policies, Programs, and Practices*. Atlanta, GA: National  
Center for Injury Prevention and Control, Centers for Disease Control and Prevention, 2017.



## Contents

Acknowledgements.....	4
External Reviewers.....	5
Overview of Technical Package.....	6
Strengthen Economic Supports.....	14
Strengthen Access and Delivery of Suicide Care.....	17
Create Protective Environments.....	21
Promote Connectedness.....	26
Teach Coping and Problem-Solving Skills.....	28
Identify and Support People At-Risk.....	31
Lessen Harms and Prevent Future Risk.....	37
Sector Involvement.....	39
Monitoring and Evaluation.....	41
Conclusion.....	42
References.....	44
Appendix A.....	50

## Acknowledgements

We would like to thank the following individuals who contributed in specific ways to the development of this technical package. We give special thanks to Linda Dahlberg for her vision, guidance, and support throughout the development of this package. We thank Division, Center, and CDC leadership for their careful review and helpful feedback on earlier iterations of this document. We thank Alida Knuth for her formatting and design expertise. Last but definitely not least, we extend our thanks and gratitude to all the external reviewers for their helpful feedback, support and encouragement for this resource.



## External Reviewers

Casey Castaldi  
Prevention Institute

Carmen Clelland  
Office for State, Tribal, Local and Territorial  
Support, Centers for Disease Control and  
Prevention

Amalia Corby-Edwards  
American Psychological Association

Rachel Davis  
Prevention Institute

Pamela End of Horn  
Indian Health Service Headquarters

Craig Fisher  
American Psychological Association

Keita Franklin  
Department of Defense

Jill M. Harkavy Friedman  
American Foundation for Suicide Prevention

Jarrold Hindman  
Colorado Department of Public Health and  
Environment

Linda Langford  
Education Development Center, Inc.

Richard McKeon  
Substance Abuse and Mental Health Services  
Administration

Doreen S. Marshall  
American Foundation for Suicide Prevention

Christine Moutier  
American Foundation for Suicide Prevention

Jason H. Padgett  
Education Development Center, Inc.

Jerry Reed  
Education Development Center, Inc.

Christine Schuler  
National Institute for Occupational Safety and  
Health, Centers for Disease Control and  
Prevention

Morton Silverman  
Education Development Center, Inc.

Ellyson Stout  
Education Development Center, Inc.

Hope M. Tiesman  
National Institute for Occupational Safety and  
Health, Centers for Disease Control and  
Prevention

Dan Reidenberg  
Suicide Awareness Voices for Education (SAVE)

The experts above are listed with their affiliations at the time this document was reviewed.

## Overview

This technical package represents a select group of strategies based on the best available evidence to help communities and states sharpen their focus on prevention activities with the greatest potential to prevent suicide. These strategies include: strengthening economic supports; strengthening access and delivery of suicide care; creating protective environments; promoting connectedness; teaching coping and problem-solving skills; identifying and supporting people at-risk; and lessen harms and prevent future risk. The strategies represented in this package include those with a focus on preventing suicide from happening in the first place as well as approaches to lessen the immediate and long-term harms of suicidal behavior for individuals, families, communities, and society. The strategies in the technical package support the goals and objectives of the National Strategy for Suicide Prevention and the National Action Alliance for Suicide Prevention's priority to strengthen community-based prevention. Commitment, cooperation, and leadership from numerous sectors, including public health, education, justice, health care, social services, business, labor, and government can bring about the successful implementation of this package.

### What is a Technical Package?

A technical package is a compilation of a core set of strategies to achieve and sustain substantial reductions in a specific risk factor or outcome (Frieden, 2014). Technical packages help communities and states prioritize prevention activities based on the best available evidence. This technical package has three components. The first component is the **strategy** or the preventive direction or actions to achieve the goal of preventing suicide. The second component is the **approach**. The approach includes the specific ways to advance the strategy. This can be accomplished through *programs, policies, and practices*. The approaches included come primarily from studies based in the United States. The **evidence** for each of the approaches in preventing suicide or its associated risk factors is included as the third component. This package is intended as a resource to guide and inform prevention decision-making in communities and states.

### Preventing Suicide is a Priority

Suicide, as defined by the Centers for Disease Control and Prevention (CDC), is part of a broader class of behavior called *self-directed violence*. Self-directed violence refers to behavior directed at oneself that deliberately results in injury or the *potential* for injury (A.E. Crosby, Ortega, & Melanson, 2011). Self-directed violence may be *suicidal* or *non-suicidal* in nature. For the purposes of this document, we refer only to behavior where suicide is intended:

- **Suicide** is a death caused by self-directed injurious behavior with any intent to die as a result of the behavior.



- **Suicide attempt** is defined as a *non-fatal* self-directed and potentially injurious behavior with any intent to die as a result of the behavior. A suicide attempt may or may not result in injury.

**Suicide is highly prevalent.** Suicide presents a major challenge to public health in the United States and worldwide. It contributes to premature death, morbidity, lost productivity, and health care costs (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014). In 2014 (the most recent year of available death data), suicide was responsible for 42,773 deaths in the U.S., which is approximately one suicide every 12 minutes (Centers for Disease Control and Prevention, 2016). In 2014, suicide ranked as the 10th leading cause of death and has been among the top 12 leading causes of death since 1975 in the U.S (Centers for Disease Control and Prevention, 2016). Overall suicide rates increased 24% from 1999 to 2014 (Curtin, Warner, & Hedegaard, 2016). Suicide is a problem throughout the life span; it is the second leading cause of death among those aged 10–34 years; it is the fourth leading cause among persons in their 40s and seventh among persons in their 50s.

Suicide rates vary by race/ethnicity, age, and other population characteristics, with the highest rates across the lifespan occurring among non-Hispanic American Indian/Alaska Native (AI/AN) and non-Hispanic White population groups. In 2014, the rates for these groups were 17.8 and 16.4 per 100,000 population, respectively (Centers for Disease Control and Prevention, 2016). Other population groups disproportionately impacted by suicide include middle-aged adults (whose rates increased 48% from 1999 to 2014, with steep increases seen among both males (43%) and females (63%) aged 45-64 years; (Curtin et al., 2016); Veterans and other military personnel (whose suicide rate nearly doubled from 2003 to 2008, surpassing the rate of suicide among civilians for the first time in decades;(Bachynski et al., 2012; Lineberry & O'Connor); workers in certain occupational groups (e.g., protective service occupations; workers in farming, fishing, and forestry; McIntosh et al., 2016); and lesbian, gay, bisexual, and/or queer (LGBQ) youth, who experience increased suicidal ideation and behavior compared to their heterosexual counterparts (Kann et al., 2016; Russell & Joyner, 2001).

Suicides reflect only a portion of the problem (A.E. Crosby, Han, Ortega, Parks, & Gfroerer, 2011). Substantially more people are hospitalized as a result of nonfatal suicidal behavior (i.e. suicide attempts) than are fatally injured, and an even greater number are either treated in ambulatory settings (e.g., emergency departments) or not treated at all (A.E. Crosby, Han, et al., 2011). For example, during 2014, among adults aged 18 years and older, for every one suicide there were 9 adults treated in hospital emergency departments for self-harm injuries, 27 who reported making a suicide attempt, and over 227 who reported seriously considering suicide (i.e. ideation) (Ferdon et al., In press).

**Suicide is associated with several risk and protective factors.** Suicide, like other human behaviors, has no single determining cause. Instead, suicide occurs in response to multiple biological, psychological, interpersonal, environmental and societal influences that interact with one another, often over time.

The social-ecological model – encompassing multiple levels of focus from the individual, relationship, community, and societal – is a useful framework for viewing and understanding suicide risk factors identified in the literature (Dahlberg & Krug, 2002). Risk and protective factors for suicide exist at each level. For example, risk factors include:

- **Individual level:** history of depression and other mental illnesses, hopelessness, substance abuse, certain health conditions, previous suicide attempt, violence victimization and perpetration, and genetic and biological determinants
- **Relationship level:** high conflict or violent relationships, sense of isolation and lack of social support, family/loved one's history of suicide, financial and work stress
- **Community level:** inadequate community connectedness, barriers to health care (e.g., lack of access to providers and medications)
- **Societal level:** availability of lethal means of suicide, unsafe media portrayals of suicide, stigma associated with help-seeking and mental illness (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014).

It is important to recognize that the vast majority of individuals who are depressed, attempt suicide, or who have other risk factors noted, do *not* die by suicide. Furthermore, the relevance of each risk factor can vary by age, race, gender, sexual orientation, residential geography, and socio-cultural and economic status (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014).

Protective factors, or those influences that buffer against the risk for suicide, can also be found across the different levels of the social-ecological model. Protective factors identified in the literature include: effective coping and problem solving skills, moral objections to suicide, strong and supportive relationships with partners, friends, and family; connectedness to school, community, and other social institutions; availability of quality and ongoing physical and mental health care, and reduced access to lethal means (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014). These protective factors can either counter a specific risk factor or buffer against a number of risks associated with suicide.

**Suicide is connected to other forms of violence.** Exposure to violence (e.g., child abuse and neglect, bullying, peer violence, dating violence, sexual violence, and intimate partner violence) increases the risk of depression, post-traumatic stress disorder (PTSD), anxiety, suicide, and suicide attempts (Bossarte et al., 2014; D. P. Chapman et al., 2004; Dube et al., 2001; Felitti et al., 1998; Klomek, Sourander, & Gould, 2010; Leeb, Lewis, & Zolotor, 2011; World Health Organization, 2013). Women exposed to partner violence are nearly 5 times more likely to attempt suicide as women not exposed to partner violence (WHO, 2013). Exposure to adverse experiences in childhood, such as physical, sexual, emotional abuse and neglect, and living in homes with violence, mental health, substance abuse problems and other



instability, increases the risk for suicide and suicide attempts several fold (Bellis et al., 2014; Dube et al., 2001). The psychosocial effects of violence in childhood and adolescence can be observed decades later, including severe problems with finances, family, jobs, and stress – factors that increase the risk for suicide. Suicide and other forms of violence often share the same individual, relationship, community, and societal risk factors suggesting that efforts to prevent interpersonal violence may also prove beneficial in preventing suicide (Haegerich & Dahlberg, 2011; Hamby & Grych, 2013; Wilkins, Tsao, Hertz, Davis, & Klevens, 2014). Further, just as risk factors may be shared across suicide and interpersonal violence, so too may protective factors overlap. For example, connectedness to one's community (Kleiman, Riskind, Schaefer, & Weingarden, 2012), school (Carter, McGee, Taylor, & Williams, 2007), family (Maimon, Browning, & Brooks-Gunn, 2010), caring adults (Capaldi, Knoble, Shortt, & Kim, 2012; Losel & Farrington, 2012), and pro-social peers (Wyman et al., 2010) enhances resilience to suicide and other forms of violence.

**The health and economic consequences of suicide are substantial.** Suicide and suicide attempts have far reaching consequences for individuals, families, and communities (Dunne, McIntosh, & Dunne-Maxim, 1987; Mishara, 1995; National Action Alliance for Suicide Prevention: Suicide Attempt Survivors Task Force, 2014; National Action Alliance for Suicide Prevention: Survivors of Suicide Loss Task Force, 2015). In an early study, Crosby and Sacks (2002) estimated that 7% of the U.S. adult population, or 13.2 million adults, knew someone in the prior 12 months who had died by suicide. They also estimated that for each suicide, 425 adults were exposed, or knew about the death. In a more recent study, in one state, Cerel et al (2016) found that 48% of the population knew at least one person who died by suicide in their lifetime. Research indicates that the impact of knowing someone who died by suicide and/or having lived experience (i.e., personally have attempted suicide, have had suicidal thoughts, or have been impacted by suicidal loss) is much more extensive than injury and death. People with lived experience may suffer long-term health and mental health consequences ranging from anger, guilt, and physical impairment, depending on the means and severity of the attempt (A. L. Chapman & Dixon-Gordon, 2007). Similarly, survivors of a loved one's suicide may experience ongoing pain and suffering including complicated grief (Mitchell, Kim, Prigerson, & Mortimer-Stephens, 2004), stigma, depression, anxiety, post-traumatic stress disorder, and increased risk of suicidal ideation and suicide (Cerel, McIntosh, Neimeyer, Maple, & Marshall, 2014; Sudak, Maxim, & Carpenter, 2008). Less discussed but no less important, are the financial and occupational effects for those left behind (Florence, Simon, Haegerich, Luo, & Zhou, 2015).

The economic toll of suicide is immense as well. According to conservative estimates, in 2013, suicide cost \$50.8 billion in estimated lifetime medical and work-loss costs alone (Florence et al., 2015). Adjusting for potential under-reporting of suicide and drawing upon health expenditures per capita, GDP per capita, and variability among states in per capita health care expenditures and income, another study estimated the total lifetime costs associated with nonfatal injuries and deaths caused by self-directed violence to be approximately \$93.5 billion in 2013 (Shepard, Gurewich, Lwin, Reed, & Silverman, 2016). The overwhelming burden of these costs were from lost productivity over the life course, with the

average cost per suicide being over \$1.3 million (Shepard et al., 2016). The true economic costs are likely higher, as neither study included monetary figures related to other societal costs such as those associated with the pain and suffering of family members or other impacts.

**Suicide can be prevented.** Like most public health problems, suicide is preventable (U.S. Public Health Service, 1999). While progress will continue to be made into the future, evidence for numerous programs, practices, and policies currently exists, and many programs are ready to be implemented now. Just as suicide is not caused by a single factor, research suggests that reductions in suicide will not be prevented by any single strategy or approach (Silverman & Maris, 1995; U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). Rather, suicide prevention is best achieved by a focus across the individual, relationship, family, community, and societal-levels and across all sectors, private and public (e.g., business, public health, physical and behavioral healthcare, justice, education, and labor; National Action Alliance for Suicide Prevention, 2014; World Health Organization, 2014).

### Assessing the Evidence

This technical package includes programs, practices, and policies with evidence of impact on suicide or risk or protective factors for suicide. To be considered for inclusion in the technical package, the program, practice, or policy selected had to meet at least one of these criteria: a) meta-analyses or systematic reviews showing impact on suicide; b) evidence from at least one rigorous (e.g., randomized controlled trial [RCT] or quasi-experimental design) evaluation study that found significant preventive effects on suicide; c) meta-analyses or systematic reviews showing impact on risk or protective factors for suicide, or d) evidence from at least one rigorous (e.g., RCT or quasi-experimental design) evaluation study that found significant impacts on risk or protective factors for suicide. Finally, consideration was also given to the likelihood of achieving beneficial effects on multiple forms of violence; no evidence of harmful effects on specific outcomes or with particular subgroups; and feasibility of implementation in a U.S. context if the program, policy, or practice has been evaluated in another country.

Within this technical package, some approaches do not yet have research evidence demonstrating impact on rates of suicide but instead are supported by evidence indicating impacts on risk or protective factors for suicide (e.g., help-seeking, stigma reduction, depression, connectedness). In terms of the strength of the evidence, programs that have demonstrated effects on suicidal behavior (e.g., reductions in deaths, attempts) provide a higher-level of evidence, but the evidence base is not that strong in all areas. For instance, there has been less evaluation of community engagement and family programs on suicidal behavior. Thus, approaches in this package that have effects on risk or protective factors reflect the developing nature of the evidence base and the use of the best available evidence at a given time.

It is also important to note that there is often significant heterogeneity among the programs, policies, or practices that fall within one approach or strategy area in terms of the nature and quality of the available



evidence. Not all programs, policies, or practices that utilize the same approach are equally effective, and even those that are effective may not work across all populations. Tailoring programs and more evaluation may be necessary to address different population groups. The evidence-based programs, practices, or policies included in the package are not intended to be a comprehensive list for each approach, but rather to serve as examples that have been shown to impact suicide or have beneficial effects on risk or protective factors for suicide.

### Context and Cross-Cutting Themes

One important feature of the package is the complementary, but potentially synergistic impact of the strategies and approaches. The strategies and approaches included in this technical package represent different levels of the social ecology, with efforts intended to impact community and societal levels, as well individual and relationship levels. The strategies and approaches are intended to work in combination and reinforce each other to prevent suicide (see box below). The strategies are arranged in order such that those strategies hypothesized to have the greatest potential for broad public health impact on suicide are included first, followed by those that might impact more select populations (e.g., persons who have already made a suicide attempt).

Preventing Suicide	
Strategy	Approach
Strengthen economic supports	<ul style="list-style-type: none"> <li>Strengthen household financial security</li> <li>Housing stabilization policies</li> </ul>
Strengthen access and delivery of suicide care	<ul style="list-style-type: none"> <li>Coverage of mental health conditions in health insurance policies</li> <li>Reduce provider shortages in underserved areas</li> <li>Safer suicide care through systems change</li> </ul>
Create protective environments	<ul style="list-style-type: none"> <li>Reduce access to lethal means among persons at-risk of suicide</li> <li>Organizational policies and culture</li> <li>Community-based policies to reduce excessive alcohol use</li> </ul>
Promote connectedness	<ul style="list-style-type: none"> <li>Peer norm programs</li> <li>Community engagement activities</li> </ul>
Teach coping and problem-solving skills	<ul style="list-style-type: none"> <li>Social-emotional learning programs</li> <li>Parenting skill and family relationship approaches</li> </ul>
Identify and support people at risk	<ul style="list-style-type: none"> <li>Gatekeeper training</li> <li>Crisis Intervention</li> <li>Treatment for people at risk of suicide</li> <li>Treatment to prevent re-attempts</li> </ul>
Lessen harms and prevent future risk	<ul style="list-style-type: none"> <li>Postvention</li> <li>Safe reporting following a suicide</li> </ul>

It is important to note that these strategies are not mutually exclusive but each has an immediate focus. For instance, social emotional learning programs, an approach under the *Teach Coping and Problem-Solving Skills* strategy, sometimes include components to change peer norms and the broader environment. The primary focus of these programs, however, is to provide children and youth with skills to resolve problems in relationships, school, and with peers, and to help youth address other negative influences (e.g., substance use) associated with suicide.

The goal of this package is to stress the importance of comprehensive prevention efforts and to provide examples of effective programs addressing each level of the social ecology, with the knowledge that some programs, practices, and policies may impact multiple levels. Further, those that involve multiple sectors and that impact multiple levels of the social ecology are more likely to have a greater impact on the overall burden of suicide.

Suicide ideation, thoughts, attempts, and deaths vary by gender, race/ethnicity, age, occupation, and other important population characteristics. Further, certain transition periods are also associated with higher rates of suicide (e.g., transition from working into retirement, transition from active duty military status to civilian status). In fact, suicide risk can change along with dynamic risk factors. For example, individuals' coping skills may change during periods of crisis and heightened stress, limiting their normal ability to effectively solve problems and cope. Research indicates that suicide risk changes as a result of the number and intensity of key risk and protective factors experienced (Turecki, 2014). Ideally, the availability of multiple strategies and approaches tailored to the social, economic, cultural, and environmental context of individuals and communities are desirable as they may increase the likelihood of removing barriers to supportive and effective care and provide opportunities to develop individual and community resilience.

Identifying programs, practices, and policies with evidence of impact on suicide, suicide attempts, or beneficial effects on risk or protective factors for suicide is only the first step. In practice, the effectiveness of the programs, policies and practices identified in this package will be strongly dependent on how well programs are implemented, as well as the partners and communities in which they are implemented. Practitioners in the field may be in the best position to assess the needs and strengths of their communities and work with community members to make decisions about the combination of approaches included here that are best suited to their context.

Data-driven strategic planning processes can help communities with this work (e.g., see Edwards, Jumper-Thurman, Plested, Oetting, & Swanson, 2000; Hawkins, Catalano, & Kuklinski, 2014; Plested, Edwards, & Jumper-Thurman, 2006). These planning processes engage and guide community stakeholders through a prevention planning process designed to address a community's profile of risk and protective factors with evidence-based programs, practices, and policies. These processes can also be used to monitor implementation, track outcomes, and make adjustments as indicated by the data. The readiness of the program for broad dissemination and implementation (e.g., availability of program



materials, training and technical assistance) can also influence program effects. Implementation guidance to assist practitioners, organizations and communities will be developed separately.

This package includes strategies where public health agencies are well positioned to bring leadership and resources to implementation efforts. It also includes strategies where public health can serve as an important collaborator (e.g., strategies addressing community and societal level risks), but where leadership and commitment from other sectors such as business, labor or health care is critical to implement a particular policy or program (e.g., workplace policies; treatment to prevent re-attempts). The role of various sectors in the implementation of a strategy or approach in preventing suicide is described further in the section on *Sector Involvement*.

In the sections that follow, the strategies and approaches with the best available evidence for preventing suicide are described.

## Strengthen Economic Supports

### Rationale

Studies from the U.S. examining historical trends indicate that suicide rates increase during economic recessions marked by high unemployment rates, job losses, and economic instability and decrease during economic expansions and periods marked by low unemployment rates, particularly for working-age individuals 25 to 64 years old (Luo et al., 2011; Fowler et al., 2015). Economic and financial strain, such as job loss, long periods of unemployment, reduced income, difficulty covering medical, food, and housing expenses, and even the anticipation of such financial stress may increase an individual's risk for suicide or may indirectly increase risk by exacerbating related physical and mental health problems. Buffering these risks can, therefore, potentially protect against suicide (Stack & Wasserman, 2007). For example, strengthening economic support systems can help people stay in their homes or obtain affordable housing while also paying for necessities such as food and medical care, job training, child care, among other expenses required for daily living. In providing this support, stress and anxiety and the potential for a crisis situation may be reduced, thereby preventing suicide. Although more research is needed to understand how economic factors interact with other factors to increase suicide risk, the available evidence suggests that strengthening economic supports may be one opportunity to buffer suicide risk.

### Approaches

Economic supports for individuals and families can be strengthened by targeting household financial security and ensuring stability in housing during periods of economic stress.

- **Strengthening household financial security** can potentially buffer the risk of suicide by providing individuals with the financial means to lessen the stress and hardship associated with a job loss or other unanticipated financial problems. The provision of unemployment benefits and other forms of temporary assistance, livable wages, medical benefits, and retirement and disability insurance to help cover the cost of necessities or to offset costs in the event of disability, are examples of ways to strengthen household financial security.
- **Housing stabilization policies** aim to keep people in their homes and provide housing options for those in need during times of financial insecurity. This may occur through programs that provide affordable housing such as through government subsidies or through other options available to potential homebuyers such as loan modification programs, move-out planning, or financial counseling services that help minimize the risk or impact of foreclosures and eviction.



## Potential Outcomes

- Reductions in foreclosure rates
- Reductions in eviction rates
- Reductions in emotional distress
- Reductions in suicide

## Evidence

There is evidence suggesting that strengthening household financial security and stabilizing housing can reduce suicide risk.

- **Strengthen household financial security.** The *Federal-State Unemployment Insurance Program* allows states to define the maximum amount and duration of unemployment benefits that workers are entitled to receive after a job loss (Cylus, Glymour, & Avendano, 2014). An examination of variations in *unemployment benefit programs* across states demonstrated that the impact of unemployment on rates of suicide was offset in those states that provided greater than average unemployment benefits (mean level: \$7,990 per person in U.S. constant dollars; Cylus et al., 2014). The effects of *unemployment benefit programs* were also consistent by sex and age group. Another U.S. study examining the link between unemployment and suicide rates using monthly suicide data, length of unemployment (less than 5 weeks, 5-14 weeks, 15-26 weeks, and greater than 26 weeks), and job losses found that the duration of unemployment, as opposed to just the loss of job, predicted suicide risk (Classen & Dunn, 2012). Together, these results suggest that not only should state unemployment benefit programs be generous in their financial allocations, but also in their duration.

Other measures to strengthen household financial security (e.g., transfer payments related to retirement and disability insurance, unemployment insurance compensation, medical benefits, and other forms of family assistance) have also shown an impact on rates of suicide. A study by Flavin and Radcliff (2009) examined the impact of states' per capita spending on transfer payments, medical benefits, and family assistance (Temporary Assistance to Needy Families – TANF) and total state spending on suicide rates between 1990-2000, controlling for a number of suicide risk factors (e.g., residential mobility, divorce rate, unemployment rate) at the state level. As per capita spending on total transfer payments, medical benefits, and family assistance increased there was an associated decrease in state suicide rates. Moreover, it wasn't spending in general that was associated with the reduction but spending on these types of assistance. In terms of lives saved, Flavin & Radcliff calculated the cost of reducing a state's suicide rate by a full point for the years studied. At the national level, they estimated that 3,000 fewer suicides would occur per year nationwide if every state increased its per capita spending on these types of assistance by \$45 per year (Flavin & Radcliff, 2009). Although this was a correlational study,

the results demonstrate the potential benefits of policies that reach particularly vulnerable individuals during periods of great need and increased risk for suicide. More evaluation studies are needed to further understand the outcomes impacted by programs such as these.

- **Housing stabilization policies.** The *National Neighborhood Stabilization Program* was designed to help neighborhoods suffering from high rates of foreclosure and abandonment by slowing the deterioration of the neighborhoods and providing affordable housing options for low, moderate, and middle-income homebuyers. This program also offers financial assistance to eligible individuals for the purchase of a new home. Although this program has not been rigorously evaluated for its impact on suicide outcomes, it addresses foreclosure and eviction, which are risk factors for suicide. A longitudinal analysis of annual data on suicides and foreclosures demonstrated that as the proportion of foreclosed properties increased in U.S. states, so did the state suicide rate, particularly among working-aged adults (Houle & Light, 2014). Another study of data from 16 U.S. states participating in the National Violent Death Reporting System found that suicides precipitated by home foreclosures and evictions increased more than 100% from 2005 (before the housing crisis began) to 2010 (after it had peaked; Fowler, Gladden, Vagi, Barnes, and Frazier (2015)). Most of these suicides occurred prior to the actual loss of the decedent's home. These findings suggest that integrating suicide prevention resources, messaging, and referrals into financial, foreclosure, and move-out planning and counseling services may help to prevent suicide.



## Strengthen Access and Delivery of Suicide Care

### Rationale

While most people with mental health problems do not attempt or die by suicide (Olfson, Gerhard, Huang, Crystal, & Stroup, 2015; Owens, 2002), and the level of risk conferred by different types of mental illness varies (Arsenault-Lapierre, Kim, & Turecki, 2004; E. C. Harris & Barraclough, 1997; Tyrer, Reed, & Crawford, 2015), previous research indicates that mental illness is an important risk factor for suicide (E. C. Harris & Barraclough, 1998; World Health Organization, 2014). State-level suicide rates have also been found to be correlated with general mental health measures such as depression (Lang, 2013; Mark, Shern, Bagalman, & Cao, 2007). Findings from the National Comorbidity Survey indicate that relatively few people in the U.S. with mental health disorders receive treatment for those conditions (Kessler et al., 2005). Lack of access to mental health care is one of the contributing factors related to the underuse of mental health services (Cunningham, 2009). Identifying ways to improve access to timely, affordable, and quality mental health and suicide care for people in need is a critical component to prevention (World Health Organization, 2014). Additionally, research suggests that services provided are maximized when health and behavioral health care systems are set up to effectively and efficiently deliver such care (C.E. Coffey, 2007). Apart from treatment benefits, these approaches can also normalize help-seeking behavior and increase the use of such services.

### Approaches

There are a number of approaches that can be used to strengthen access and delivery of suicide care, including:

- **Coverage of mental health conditions in health insurance policies.** Federal and state laws include provisions for equal coverage of mental health services in health insurance plans that is on par with coverage for other health concerns (i.e., mental health parity). Benefits and services covered include such things as the number of visits, co-pays, deductibles, inpatient/outpatient services, prescription drugs, and hospitalizations. If a state has a stronger mental health parity law than the federal parity law, then insurance plans regulated by the state must follow the state parity law. If a state has a weaker parity law than the federal parity law (e.g., includes coverage for some mental health conditions but not others), then the federal parity law will replace the state law. Equal coverage does not necessarily imply good coverage as health insurance plans vary in the extent to which benefits and services are offered to address various health conditions. Rather it helps to ensure that mental health services are covered on par with other health concerns.
- **Reduce provider shortages in underserved areas.** Access to effective and state-of-the-art mental health care is largely dependent upon the training and the size of the mental health care workforce. Over 85 million Americans live in areas with an insufficient number of mental health



providers; this shortage is particularly severe among low-income urban and rural communities (U.S. Department of Health and Human Services Health Resources and Services Administrations, 2016a). There are a number of ways to increase the number and distribution of practicing mental health providers in underserved areas including offering financial incentives through existing state and federal programs (e.g., loan repayment programs) and expanding telemental health services. Such approaches can increase the likelihood that those in need will be able to access affordable, quality care for mental health problems, which can reduce risk for suicide.

- **Safer suicide care through systems change.** Access to health and behavioral health care services is critical for people at risk of suicide; however this is just one piece of the puzzle. Care should also be *delivered* efficiently and effectively. More specifically, care should take place within a system that supports suicide prevention and patient safety through strong leadership, workforce training, systematic identification and assessment of suicide risk, implementation of evidence-based treatments (see *Identify and Support People At-Risk*, p.31), continuity of care, and continuous quality improvement. Care that is patient-centered and promotes equity for all patients is also of critical importance (National Action Alliance for Suicide Prevention: Clinical Workforce Preparedness Task Force, 2014).

### Potential Outcomes

- Increases in access to mental health services
- Increase in utilization of mental health services
- Reductions in symptoms of mental illnesses and suicidality
- Reductions in rates of suicide attempts
- Reductions in rates of suicide

### Evidence

There is evidence suggesting that coverage of mental health conditions in health insurance policies and improving access and the delivery of care can reduce risk factors associated with suicide and may directly impact suicide rates.

- **Coverage of mental health conditions in health insurance policies.** The National Survey of Drug Use and Health is a nationally representative survey of the U.S. population that provides data on substance use, mental health conditions, and services utilization. Using data from this survey, K. M. Harris, Carpenter, and Bao (2006) found that 12 months after states enacted *mental health parity laws*, self-reported use of mental healthcare services significantly increased. Moreover, subsequent research by Lang (2013) examined state mental health laws and suicide rates between 1990 and 2004 and found that mental health parity laws, specifically, were associated



with an approximate 5% reduction in suicide rates. This reduction, in the 29 states with parity laws, equated to the prevention of 592 suicides per year (Lang, 2013).

- **Reduce provider shortages in underserved areas.** One example of a program to improve access to mental health care providers is the *National Health Service Corps (NHSC)*, which offers financial incentives to attract mental/behavioral health clinicians to underserved areas. Programs such as *NHSC* encourage individuals to work in the mental health profession in locations designated as Health Professional Shortage Areas (HPSAs) in exchange for student loan debt repayment. A 2012 retention survey conducted by the Health Resources and Services Administration (HRSA), found that 61% of mental and behavioral health care providers continued to practice in designated mental health shortage areas after their four year commitment to The National Health Service Corps (U.S. Department of Health and Human Services Health Resources and Services Administrations, 2016b). Although this program has not been evaluated for impact on suicide, it addresses access to care, which is a critical component to suicide prevention.

*Telemental health (TMH)* services refer to the use of telephone, video and web-based technologies for providing psychiatric or psychological care at a distance. *TMH* can be used in a variety of settings (e.g. outpatient clinics, hospitals, military treatment facilities) to treat a wide range of mental health conditions. It can also improve access to care for patients in isolated areas, as well as reduce travel time and expenses, reduce delays in receiving care, and improve satisfaction interacting with the mental health care system. A systematic review of *TMH* services found that services rated as high or good quality were effective in treating mental health conditions such as depression, schizophrenia, substance abuse, and suicidal ideation and suicide deaths among other outcomes (Hailey, Roine, & Ohinmaa, 2008). Further, Mohr and colleagues (2008) conducted a meta-analysis examining the effect of psychotherapy delivered specifically via telephone and found that it significantly reduced depressive symptoms in comparison to face-to-face psychotherapy. They also found that treatment attrition rates were significantly lower among patients receiving telephone-administered psychotherapy compared to patients receiving face-to-face therapy. Thus, *TMH* may not only offer improved access to mental health care, but it may also ensure continuity of care, and thereby further reduce the risk for suicide.

- **Safer suicide care through systems change.** *Henry Ford* healthcare system, which is a large health maintenance organization (HMO) in the state of Michigan pioneered the *Perfect Depression Care* program, the pre-cursor to what is now called *Zero Suicide*. The overall goal of *Perfect Depression Care* was to eliminate suicide among HMO members. More broadly, the goal of the program was to redesign delivery of depression care to achieve “breakthrough improvement” in quality and safety by focusing on effectiveness, safety, patient centeredness, timeliness, efficiency, and equity among patients. The program screened and assessed each patient for suicide risk and

implemented coordinated continuous follow-up care system wide (C. E. Coffey, 2006). An examination of the impact of the program found that there was a dramatic and statistically significant decrease in the rate of suicide between the baseline years, 1999 and 2000, prior to the intervention to the intervention years, 2002-2009. During this time period, the suicide rate fell by 82% (C. E. Coffey, 2006; C. E. Coffey, Coffey, & Ahmedani, 2013). Further, among HMO members who received mental health specialty services, the suicide rate significantly decreased over time from 1999 to 2010 (110.3 to 47.6 per 100,000;  $p < .04$ ) with a mean of 36.2 per 100,000 over the period. Additionally, for those HMO members who accessed only general medical services as opposed to specialty mental health services, the suicide rate increased from 2.7 to 5.6 per 100,000 ( $p < .01$ ). Similarly, in the state of Michigan, rates of suicide in the general population increased over the period from 9.8 to 12.5 per 100,000 ( $p < .001$ ) (M. Coffey, Coffey, & Ahmedani, 2015).



## Create Protective Environments

### Rationale

Prevention efforts that focus not only on individual behavior change (e.g., help-seeking, treatment interventions) but on changes to the environment can increase the likelihood of positive behavioral and health outcomes (Haddon, 1980). Creating environments that address risk and protective factors where individuals live, work, and play, can help prevent suicide (Dahlberg & Krug, 2002; U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). For example, rates of suicide are high among middle-aged adults (who comprise 42.6% of the workforce; Toosi, 2015); among certain occupational groups (e.g., farming, fishing, forestry, and construction; Han et al., 2016; McIntosh et al., 2016), and among people in detention facilities (e.g. jail, prison), to name a few. Thus, settings where these populations work and reside are ideal for implementing programs, practices and policies to buffer against suicide. Changes to organizational culture through the implementation of supportive policies, for instance, can change social norms, encourage help-seeking, and demonstrate that good health and mental health are valued and that stigma and other risk factors for suicide are not (Knox et al., 2010; National Action Alliance for Suicide Prevention Workplace Task Force, 2015). Similarly, modifying the characteristics of the physical environment to prevent harmful behavior such as access to lethal means can reduce suicide rates, particularly in times of crisis or transition (Beautrais, Gibb, Fergusson, Horwood, & Larkin, 2009; A.E. Crosby, Espitia-Hardeman, Ortega, & Lozano, 2013; Kaplan et al., 2013; Miller, Warren, Hemenway, & Azrael, 2015; Runyan et al., 2016; Stokes, McCoy, Abram, Byck, & Teplin, 2015).

### Approaches

The current evidence suggests three potential approaches for creating environments that protect against suicide.

- **Reduce access to lethal means among persons at-risk of suicide.** Means of suicide such as firearms, hanging/suffocation, or jumping from heights provide little opportunity for rescue and, as such, have high case fatality rates (e.g., about 85% of people who use a firearm in a suicide attempt will die from the injury). Research also indicates that: 1) the interval between deciding to act and attempting suicide can be as short as 5 or 10 minutes (Deisenhammer et al., 2009; Simon et al., 2001), and 2) that people tend *not* to substitute a different method when a highly lethal method is unavailable or difficult to access (Hawton, 2007; Yip et al., 2012). Therefore, increasing the time interval between deciding to act and the suicide attempt, for example, by making it more difficult to access lethal means, can be lifesaving. The following are examples of approaches reducing access to lethal means for persons at-risk of suicide:



- *Intervening at Suicide Hotspots.* Suicide hotspots, or places where suicides may take place relatively easily, include tall structures (e.g., bridges, cliffs, balconies, and rooftops), railway tracks, and isolated locations such as parks. Efforts to prevent suicide at these locations include erecting barriers or limiting access to prevent jumping, and installing signs and telephones to encourage individuals who are considering suicide, to seek help (Cox et al., 2013).
- *Safe Storage Practices.* Safe storage of medications, firearms, and other household products can reduce the risk for suicide by separating vulnerable individuals from easy access to lethal means. Such practices may include education and counseling around storing firearms--locked in a secure place (e.g., in a gun safe or lock box), unloaded and separate from the ammunition--and keeping medicines in a locked cabinet or other secure location away from people who may be at risk or who have made prior attempts (Rowhani-Rahbar, Simonetti, & Rivara, 2016; Runyan et al., 2016).
- **Organizational policies and culture** that promote protective environments may be implemented in places of employment, detention facilities, and other secured environments (e.g. residential settings). Such policies and cultural values encourage leadership from the top down and may promote prosocial behavior (e.g., asking for help), skill building, positive social norms, assessment, referral and access to helping services (e.g. mental health, substance abuse treatment, financial counseling), and development of crisis response plans, postvention and other measures to foster a safe physical environment. Such policies and cultural shifts can positively impact organizational climate and morale and help prevent suicide and its related risk factors (e.g. depression, social isolation) (Hayes, 2013; National Action Alliance for Suicide Prevention Workplace Task Force, 2015).
- **Community-based policies to reduce excessive alcohol use.** Research studies in the United States have found that greater alcohol availability is positively associated with alcohol-involved suicides (Escobedo & Ortiz, 2002; Giesbrecht et al., 2015). Policies to reduce excessive alcohol use broadly include zoning to limit alcohol outlet locations and density, taxes on alcohol, and bans on the sale of alcohol for individuals under the legal drinking age. These policies are important because acute alcohol use has been found to be associated with more than one-third of suicides and approximately 40% of suicide attempts (Cherpitel, Borges, & Wilcox, 2004).

### Potential Outcomes

- Increases in safe storage of lethal means
- Reductions in rates of suicide
- Reductions in suicide attempts



- Reductions in suicide deaths
- Increases in help-seeking
- Reductions in alcohol-related suicide deaths

## Evidence

The evidence suggests that creating protective environments can reduce suicide and suicide attempts and increase protective behaviors.

- **Reduce access to lethal means among persons at-risk of suicide.** A meta-analysis examining the impact of *suicide hotspot interventions* implemented in combination or in isolation, both in the U.S. and abroad, found associated reduced rates of suicide (Cox et al., 2013; Pirkis et al., 2015). For example, after erecting a barrier on the Jacques-Cartier bridge in Canada, the suicide rate from jumping from the bridge decreased from about 10 suicide deaths per year to about 3 deaths per year (Perron, Burrows, Fournier, Perron, & Ouellet, 2013). Moreover, the reduction in suicides by jumping was sustained even when all bridges and nearby jumping sites were considered, suggesting little to no displacement of suicides to other jumping sites (Perron et al., 2013). Further evidence for the effectiveness of bridge barriers was demonstrated by a study examining the impact of the *removal* of safety barriers from the Grafton Bridge in Auckland, New Zealand. After removal of the barrier, both the number and rate of suicide increased fivefold (Beautrais, 2001; Beautrais et al., 2009).

Another form of means reduction involves implementation of *safe storage practices*. In a case-control study of firearm-related events identified from 37 counties in Washington, Oregon, and Missouri, and from 5 trauma centers, Grossman et al. (2005) found that storing firearms unloaded, separate from ammunition, in a locked place or secured with a safety device was protective of suicide attempts among adolescents. Further, a recent systematic review of clinic and community-based education and counseling interventions suggested that the provision of safety devices significantly increased safe firearm storage practices compared to counseling alone or compared to the provision of economic incentives to acquire safety devices on one's own (Rowhani-Rahbar et al., 2016).

Another program, The *Emergency Department Counseling on Access to Lethal Means (ED CALM)*, trained psychiatric emergency clinicians in a large children's hospital to provide lethal means counseling and safe storage boxes to parents of patients under age 18 receiving care for suicidal behavior. In a pre-post quality improvement project, Runyan et al. (2016) found that at post-test 76% (of the 55% of parents followed up, n=114) reported that all medications in the home were locked up as compared to fewer than 10% at the time of the initial emergency department visit. Among parents who indicated the presence of guns in the home at pre-test (i.e. 67%), all (100%) reported guns were currently locked up at post-test (Runyan et al., 2016).

- **Organizational policies and culture.** *Together for Life* is a workplace program of the Montreal Police Force implemented to address suicide among officers. Policy and program components were designed to foster an organizational culture that promoted mutual support and solidarity among all members of the Force. The program included training of supervisors, managers and all units to improve competencies in identifying suicidal risk and to improve use and awareness of existing resources. The program also included an education campaign to improve awareness and help-seeking (Mishara & Martin, 2012). Police suicides were tracked over 12 years and compared to rates in the control city of Quebec. The suicide rate in the intervention group decreased significantly by 78.9% to a rate of 6.4 suicides per 100,000 population per year compared to an 11% increase in the control city (29.0 per 100,000; Mishara & Martin, 2012).

Another example of this approach is the *United States Air Force Suicide Prevention Program*. The program included 11 policy and education initiatives and was designed to change the culture of the Air Force surrounding suicide. The program uses leaders as role models and agents of change, establishes expectations for behavior related to awareness of suicide risk, develops population skills and knowledge (i.e., education and training), and investigates every suicide (i.e., outcomes measurement). The program represents a fundamental shift from viewing suicide and mental illness solely as medical problem and instead sees them as larger service-wide problems impacting the whole community (Knox, Litts, Talcott, Feig, & Caine, 2003). Using a time-series design to examine the impact of the program on various violence-related outcomes, researchers found that the program was associated with a 33% relative risk reduction in suicide (Knox et al., 2003). The program was also associated with relative risk reductions in related outcomes including moderate and severe family violence (30% and 54%, respectively), homicide (51%), and accidental death (18%) (Knox et al., 2003). A longitudinal assessment of the program over the period 1981 to 2008 (16 years before the 1997 launch of the program and 11 years post-launch) found significantly lower rates of suicide after the program was launched than before (Knox et al., 2010). These effects were sustained over time, except in 2004, which the authors found was associated with less rigorous implementation in that year than in the other years (Knox et al., 2010).

Finally, while the evidence is still being built for *suicide prevention in correctional facilities*, preliminary evidence suggests that organizational policies and practices that include routine suicide prevention training for all staff, standardized intake screening and risk assessment, provision of shared information between staff members, especially in transitioning or transferring of inmates, varying levels of observation, safe physical environment, emergency response protocols, notification of suicidal behavior/suicide through the chain of command, and critical incident stress debriefing and death review can potentially reduce suicide. When these policies and practices were implemented across 11 state prisons in Louisiana, suicide rates



dropped from a rate of 23.1 per 100,000 before the intervention to 12.4 per 100,000 the following year (Hayes, 1995). Other similar programs have seen declines in suicide both in the United States and internationally (Barker, Kőlves, & De Leo, 2014).

- **Community-based policies to reduce excessive alcohol use.** While multiple policies to limit excessive use of alcohol exist, several studies on alcohol outlet *density*, specifically, suggest that measures to reduce alcohol outlet density can potentially reduce alcohol-involved suicides. Additionally, a longitudinal analysis of alcohol outlet density, suicide mortality, and hospitalizations for suicide attempts over 6 years in 581 California zip codes indicated that the density of bars, specifically, is inversely related to suicide and suicide attempts, particularly in rural areas (Johnson, Gruenewald, & Remer, 2009).

## Promote Connectedness

### Rationale

Sociologist, Emile Durkheim theorized in 1897 that weak social bonds, i.e. lack of connectedness, are among the chief causes for suicidality (Durkheim, 1897/1951). *Connectedness* is the degree to which an individual or group of individuals are socially close, interrelated, or share resources with others (Centers for Disease Control and Prevention, 2009). Social connections can be formed within and between multiple levels of the social ecology (Dahlberg & Krug, 2002), for instance between individuals (e.g. peers, neighbors, co-workers), families, schools, neighborhoods, workplace, faith communities, cultural groups, and society as a whole. Related to connectedness, *social capital* refers to a sense of trust in one's community and neighborhood, social integration, and also the availability and participation in social organizations (Beyer, Layde, Hamberger, & Laud, 2015; Muennig, Cohen, Palmer, & Zhu, 2013). Many ecological cross-sectional and longitudinal studies have examined the impact of aspects of social capital on depression symptoms, depressive disorder, mental health more generally, and suicide. While the evidence is limited, existing studies suggest the pattern is towards a positive association between social capital measured by social trust, community/neighborhood engagement, and improved mental health. Connectedness and social capital together can serve to protect against suicidal behaviors by decreasing isolation, encouraging adaptive coping behaviors, increasing belongingness, personal value and worth all of which helps individuals to build resilience in the face of adversity. Connectedness can also provide individuals with better access to formal supports and resources, mobilize communities to meet the needs of its members and provide collective primary prevention activities to the community as a whole (Centers for Disease Control and Prevention, 2009).

### Approaches

Promoting connectedness among individuals and within communities through modeling peer norms and enhancing community engagement may protect against suicide.

- **Peer norm programs** seek to normalize protective factors for suicide such as help-seeking, reaching out and talking to trusted adults, and promote peer connectedness. By leveraging the leadership qualities and social influence of peers, these approaches can be used to shift group-level beliefs and promote positive social and behavioral change. These approaches typically target youth and are delivered in school settings but can also be implemented in community settings.
- **Community engagement activities.** Community engagement is an aspect of social capital. Community engagement approaches may involve residents participating in a range of activities, including religious activities, community clean-up and greening activities, and physical exercise. These activities provide opportunities for residents to become more involved in the community and to connect with other community members, organizations, and resources, resulting in



enhanced overall physical health, reduced stress, and decreased depressive symptoms, thereby reducing risk of suicide.

### Potential Outcomes

- Reductions in maladaptive coping attitudes and behaviors
- Increases in healthy coping attitudes and behaviors
- Increases in referrals for youth in distressed
- Increases help-seeking behaviors
- Increases in positive perceptions of adult support

### Evidence

Current evidence suggests a number of positive benefits of peer norm and community engagement activities, although more evaluation research is needed to examine whether these improvements in factors that protect against suicidal behavior translate into reduced suicide attempts and deaths.

- **Peer norm programs.** Evaluations show that programs such as *Sources of Strength* can improve school norms and beliefs about suicide that are created and disseminated by student peers. In a randomized controlled trial of *Sources of Strength* conducted with 18 high-schools (6 metropolitan, 12 rural), Wyman et al. (2010) found that the program improved adaptive norms regarding suicide among peer leaders, connectedness to adults, and school engagement. Peer leaders were also more likely than controls to refer a suicidal friend to an adult. For students, the program resulted in increased perceptions of adult support for suicidal youths, particularly among those with a history of suicidal ideation, and the acceptability of help-seeking behaviors. Finally, trained peer leaders also reported a greater decrease in maladaptive coping attitudes compared with untrained leaders (Wyman et al., 2010).
- **Community engagement activities.** A vacant lot greening initiative was undertaken in Philadelphia between 1999 and 2008. Local residents and community members worked together to green 4,436 lots (or 7.8 million square feet) in 4 areas of the city. Researchers found significant reductions in community residents' self-reported level of stress, which is a risk factor for suicide, and engagement in more physical exercise, a protective factor for suicide, than residents in control vacant lot areas. Other benefits included reductions in firearm assaults and vandalism (Branas et al., 2011).

## Teach Coping and Problem-Solving Skills

### Rationale

Building life skills prepares individuals to successfully tackle every day challenges and adapt to stress and adversity. Life skills encompasses many concepts, but most often include coping and problem-solving skills, emotional regulation, conflict resolution, and critical thinking. Life skills are important in shielding individuals from suicidal behaviors (World Health Organization, 2014). Suicide prevention programs that focus on life and social skills training are drawn from social cognitive theories (Bandura, 1986), surmising that suicidal behavior is attributed to either direct learning and modeling or environmental and individual (e.g. hopelessness) characteristics. The inability to employ adequate strategies to cope with immediate stressors or identify and find solutions for problems has been characterized among suicide attempters (Pollock & Williams, 2004). Teaching and providing youth with the skills to tackle every day challenges and stressors is, therefore, an important developmental component to suicide prevention.

### Approaches

Social emotional learning programs and parenting skill and family relationship programs are two approaches for teaching coping and problem-solving skills.

- **Social emotional learning programs** focus on developing and strengthening communication and problem-solving skills, emotion regulation, conflict resolution, help seeking and coping skills. These approaches address a range of risk and protective factors for suicidal behavior. They provide children and youth with skills to resolve problems in relationships, school, and with peers, and help youth to address other negative influences (e.g., substance use) associated with suicide. These approaches are typically delivered to all students in a particular grade or school, although some programs also focus on groups of students considered to be at high risk for suicide. Opportunities to practice and reinforce skills are an important part of programs that work (Herman, Borden, Reinke, & Webster-Stratton, 2011).
- **Parenting skill and family relationship programs** provide caregivers with support and are designed to strengthen parenting skills, enhance positive parent-child interactions, and improve children's behavioral and emotional skills and abilities. Programs are typically designed for parents or caregivers with children in a specific age range and can be self-directed or delivered to individual families or groups of families. Some programs have sessions primarily with parents or caregivers while others include sessions for parents or caregivers, youth, and the family. Specific program content typically varies by the age of the child but often has consistent themes of child development, parent-child communication and relationships, and youth's interpersonal and problem-solving skills.



## Potential Outcomes

- Reductions in suicide attempts and suicide ideation
- Reductions in suicide risk behaviors (i.e., depression, anxiety, conduct problems, substance abuse)
- Improvements in help-seeking behavior
- Improvements in social competence and emotional regulation skills
- Improvements in problem-solving and conflict management skills

## Evidence

Several social emotional learning and parenting and family relationship programs have been shown in rigorous evaluations to improve resilience and reduce problem behavior and risk factors for various behaviors, including ones closely related to suicide, such as depression, internalizing behaviors, and substance abuse (M. S. Knox, Burkhart, & Hunter, 2010).

- **Social emotional learning programs.** The *Youth Aware of Mental Health Program (YAM)* is a program developed for teenagers aged 14-16 that uses interactive dialogue and role-playing to teach adolescents about the risk and protective factors associated with suicide (including knowledge about depression and anxiety) and enhances their problem-solving skills for dealing with adverse life events, stress, school and other problems (Wasserman et al., 2014). In a cluster-randomized controlled trial conducted across 10 European Union countries and 168 schools, students in schools randomized to *YAM* were significantly less likely to attempt suicide and have severe suicidal ideation at the 12-month follow-up compared to students in control schools which received educational materials and care as usual. Overall, the relative risk of youth suicide attempts among the *YAM* group was reduced by over 50% demonstrating that out of 1000 students, five attempted suicide in the *YAM* group compared to 11 in the control group. Additionally, related to severe suicide ideation, in the *YAM* group absolute risk fell by 0.50% and relative risk fell by 49.6% (Wasserman et al., 2014).

Another example is the *Good Behavior Game (GBG)*, which is a classroom-based program for elementary school children aged 6-10. The program uses a team-based behavior management strategy that promotes good behavior by setting clear expectations for good behavior and consequences for maladaptive behavior. The goal of the *GBG* program is to create an integrated classroom social system that is supportive of all children being able to learn with little aggressive or disruptive behavior (Wilcox et al., 2008). Two cohorts of youths participated in the program in 1985-86 and 1986-87 school years when they were in the first and second grades. A number of proximal and distal outcomes were assessed among the two cohorts over time. With respect to distal suicide-related outcomes, an outcome evaluation of the *GBG* indicated that individuals in the first cohort who were assigned to participate in *GBG* when they were in the first grade reported half the adjusted odds of suicidal ideation

and suicide attempts when assessed approximately 15 years later, between the ages of 19 to 21, compared to peers who had been in a standard classroom setting. The beneficial effect of the program was consistent for suicidal ideation regardless of whether baseline covariates were included. The *GBG* effect on attempts was less robust in some adjusted models including caregiver mental health. In the second cohort of *GBG* students, neither suicidal ideation nor suicide attempts were significantly different between *GBG* and the control interventions (Wilcox et al., 2008). The researchers believed this may have been due to a lack of implementation fidelity. *GBG* was also found to be associated with reduced risk of later substance abuse, a risk factor for suicide (Kellam et al., 2008).

- **Parenting skill and family relationship programs.** Parenting and family skills training approaches have shown promising impacts in preventing key risk factors associated with suicide. For example, the *Incredible Years (IY)* is a comprehensive group training program for parents, teachers and children designed to reduce conduct and substance abuse problems, two important suicide risk factors in youth by improving protective factors such as responsive and positive parent-teacher-child interactions and relationships, emotion self-regulation and social competence (all protective factors for suicide) (Herman et al., 2011). The program includes 9-20 sessions offered in community-based settings (e.g., religious, recreation centers, mental health treatment centers, and hospitals). Several studies have demonstrated the effect of the *IY* program on reducing internalizing symptoms, such as anxiety and depression, and child conduct problems (C. H. Webster-Stratton, Reid, & Beauchaine, 2011; Webster-Stratton, Jamila Reid, & Stoolmiller, 2008). The program is also associated with improved problem-solving and conflict management; these skills were maintained at 1-year follow-up (Reid, Webster-Stratton, & Hammond, 2003; C. Webster-Stratton & Hammond, 1997; C. Webster-Stratton, Reid, & Hammond, 2001). The program demonstrated greater benefits as the dosage of the intervention increased (Herman et al., 2011).

Additionally, *Strengthening Families 10–14* is a program that involves sessions between parents, youth, and family with the goal of improving parents' skills for disciplining, managing emotions and conflict, and communicating with their children; promoting youths' interpersonal and problem-solving skills; and creating family activities to build cohesion and positive parent-child interactions. The premise of the program is that developing these skills for both parents and children will reduce internalizing behavior and adolescent substance abuse, two important risk factors for suicide (Spoth, Guyll, & Day, 2002). *Strengthening Families* has been shown to significantly decrease externalizing behaviors, such as aggression, alcohol use, and drug use among youth participants, as well as reduce depression, alcohol use, and drug use among participating families (Spoth et al., 2002).



## Identify and Support People At-Risk

### Rationale

In order to decrease suicide, care of, and attention to, vulnerable populations is necessary, as these groups tend to experience suicidal behavior at higher than average rates. Such vulnerable populations include, but are not limited to, individuals with lower socio-economic status or who are living with a mental health problem; people who have previously attempted suicide; Veterans and active duty military personnel; individuals who are institutionalized, have been victims of violence, or are homeless; individuals of sexual minority status; and members of certain racial and ethnic minority groups (Bachynski et al., 2012; Centers for Disease Control and Prevention, 2016; Curtin et al., 2016; Kann et al., 2016; Lineberry & O'Connor; Russell & Joyner, 2001). Supporting these groups requires proactive case finding and effective response, crisis intervention, and evidence-based treatment. Finding optimal ways of identifying at-risk individuals, customizing services to make them more accessible (e.g., internet-based services when appropriate) and engaging people in evidence-based care (e.g. through such measures as collaborative treatment), remain key challenges. Simply improving or expanding services does not guarantee that those services will be used by people most in need, nor will it necessarily increase the number of people who follow recommended referrals or treatment. For example, some people living in disadvantaged communities may face social and economic issues that can adversely affect their ability to access supportive services.

### Approaches

The following approaches focus on identifying and supporting people at increased risk.

- **Gatekeeper training** is designed to train teachers, coaches, clergy, emergency responders, primary and urgent care providers, and others in the community to identify people who may be at risk of suicide and to respond effectively, including facilitating treatment seeking and support services. Gatekeeper training may be implemented in a variety of settings to identify and support people at risk.
- **Crisis intervention.** These approaches provide support and referral services, typically by connecting a person in crisis (or a friend or family member of someone at-risk) to trained volunteers or professional staff via telephone hotline, online chat, text messaging, or in-person. Crisis intervention approaches are intended to impact key risk factors for suicide, including feelings of depression, hopelessness, and subsequent mental health care utilization. Similar to means reduction, crisis interventions can put space or time between an individual who may be considering suicide and harmful behavior.
- **Treatment for people at-risk of suicide** can include various forms of psychotherapy delivered by licensed providers to help individuals with mental health problems and other suicide risk factors

with problem-solving and emotion regulation. Treatment usually takes place in a one on one or group format between patients and clinicians and can vary in duration from several weeks to ongoing therapy, as needed. Treatment that employs collaborative (i.e., between patient and therapist or care manager) and/or integrated care (e.g., linkage between primary care and behavioral health care) can help engage and motivate patients, thereby increasing retention in therapy and decreasing suicide risk (Archer et al., 2012; Bruce et al., 2004; Gilbody, Bower, Fletcher, Richards, & Sutton, 2006).

- **Treatment to prevent re-attempts.** These approaches typically include follow-up contact and use diverse modalities (e.g., home visits, mail, telephone, e-mail) to engage recent suicide attempt survivors in continued treatment to prevent re-attempts. Treatment may focus on improved coping skills, mindfulness, and other emotional regulation skills, and may include case management home visits to increase adherence to treatment and continuity of care; and one-on-one interpersonal therapy and/or group therapy. Approaches that engage and connect attempters to peers and providers are especially important because many attempters do not present to aftercare; 12%-25% reattempt within a year, and 3%-9% of attempt survivors die by suicide within 1 to 5 years of their initial attempt (Inagaki et al., 2015)

### Potential Outcomes

- Reductions in suicide attempts
- Reductions in suicide deaths
- Reductions in symptoms of mental illnesses and suicidal ideation
- Reductions in mental health-related sequelae
- Reductions in re-attempts
- Increases in connectedness
- Improvements in coping skills
- Increases in identification of individuals at-risk for suicidal behavior
- Increases in treatment engagement by at-risk individuals
- Increases in community members trained to identify at-risk individuals
- Increases in referrals for health care

### Evidence

The current evidence suggests that identifying people at risk of suicide and the continued provision of treatment and support for these individuals can positively impact suicide and its associated risk factors.

- **Gatekeeper training.** *Applied Suicide Intervention Skills Training (ASIST)* is a widely implemented training program that helps hotline counselors, emergency workers, and other gatekeepers to



identify and connect with suicidal individuals, understand their reasoning for living and dying, and assist with safely connecting those in need to available resources. In a study employing a randomized controlled trial, Gould, Cross, Pisani, Munfakh, & Kleinman (2013) evaluated the training across the *National Suicide Prevention Lifeline* network of hotlines over the period 2008-2009. Using data from 1,410 suicidal individuals who called 17 Lifeline centers, the researchers found that compared to callers who spoke to counselors that received the usual care training, individuals who spoke with counselors without training in *ASIST* were significantly more likely to feel depressed, suicidal, more overwhelmed, and less hopeful by the end of their call to the hotline compared to those with training in *ASIST*. Counselors trained in *ASIST* were also more skilled at keeping callers on the phone longer and establishing a connection with them. However, training in *ASIST* did not result in more comprehensive suicide risk assessments than usual care training (Gould et al., 2013).

Gatekeeper training has also been a primary component of the *Garret Lee Smith (GLS) Suicide Prevention Program*, which is in place in 49 states and 48 tribes. A multi-site evaluation assessed the impact of community gatekeeper training on suicide attempts and deaths by comparing the change in suicide rates and nonfatal suicidal behavior among young people aged 10-24 in counties implementing *GLS* trainings, with the trajectory observed in similar counties that did not implement these trainings. Counties that implemented *GLS* trainings had significantly lower youth suicide rates one year following the training implementation (Walrath, Garraza, Reid, Goldston, & McKeon, 2015). This finding equates to a decrease of 1 suicide death per 100,000 among youth ages 10 to 24, or the prevention of approximately 237 deaths in the age group, between 2007 and 2010. Counties implementing *GLS* program activities also had significantly lower suicide attempt rates among youth ages 16 to 23 in the year following implementation of the *GLS* program than did similar counties that did not implement *GLS* activities (4.9 fewer attempts per 1000 youths; Godoy Garraza, Walrath, Goldston, Reid, & McKeon, 2015). More than 79,000 suicide attempts may have been prevented during the period examined, following implementation of the *GLS* program.

- **Crisis intervention.** Suicide prevention hotlines are one way to provide crisis intervention. In an evaluation of the effectiveness of the *National Suicide Prevention Lifeline* to prevent suicide, 1,085 suicidal individuals who called the hotline completed a standard risk assessment for suicide, and 380 of those completed a follow-up assessment between 1 and 52 days (mean=13.5 days) after the initial assessment. Researchers found that over half of the initial sample were seriously considering suicide when they called, and they had a plan for their suicide. Researchers also found that among follow-up participants, there was a significant decrease in psychological pain, hopelessness, and intent to die between initiation of the call (time 1) to follow-up (time 3). Between time 2 (end of the call) to time 3, the effect remained for psychological pain and

hopelessness, but was not significant for intent to die (Gould, Kalafat, Harrismunfakh, & Kleinman, 2007).

- **Treatment for people at-risk of suicide.** The *Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)* program aims to prevent suicide among older primary care patients by reducing suicide ideation and depression. *IMPACT* facilitates the development of a therapeutic alliance, a personalized treatment plan that includes patient preferences, as well as proactive follow-up (biweekly during an acute phase and monthly during continuation phase) by a depression care manager (Hunkeler et al., 2006). The program has been shown to significantly improve quality of life, and to reduce functional impairment, depression and suicidal ideation over 24-months of follow-up (Hunkeler et al., 2006; Unutzer et al., 2006) relative to patients who received care as usual.

*Collaborative Assessment and Management of Suicidality (CAMS)*, is a therapeutic approach for suicide-specific assessment and treatment. The program's flexible approach can be used across treatment settings and clinician theoretical orientations and involves the clinician and patient working together in an interactive assessment process to develop patient-specific treatment plans. Sessions are collaborative and involve constant patient input about what is and is not working with the ultimate goal of enhancing the therapeutic alliance and increasing treatment motivation in the suicidal patient. *CAMS* been tested and supported in 6 correlational studies (Jobes, 2012), in a variety of inpatient and outpatient settings, and in one RCT with several additional RCTs under way. A feasibility trial with a community-based sample of suicidal outpatients randomly assigned to *CAMS* or enhanced care as usual (intake with a psychiatrist or psychiatric nurse practitioner followed by 1-11 visits with a case manager and medication as needed) found better treatment retention among the *CAMS* group and significant improvements in suicidal ideation, overall symptom distress, and feelings of hopelessness at the 12 month follow-up (Comtois et al., 2011).

Other examples include *Dialectical Behavioral Therapy (DBT)* and *Attachment-Based Family Therapy (ABFT)*. *DBT* is a multicomponent therapy for individuals at high risk for suicide and who may struggle with impulsivity and emotional regulation. The components of *DBT* include individual therapy, group skills training, between-session telephone coaching and a therapist consultation team. In a randomized controlled trial of women with recent suicidal or self-injurious behavior, those receiving *DBT* were half as likely to make a suicide attempt at two-year follow-up than women receiving community treatment (23% vs 46%), required less hospitalization for suicide ideation, and had lower medical risk across all suicide attempts and self-injurious acts combined (Linehan et al., 2006).



*ABFT* is a program for adolescents aged 12-18 and is designed to treat clinically diagnosed major depressive disorder, eliminate suicidal ideation, and reduce dispositional anxiety (Diamond et al., 2010). A randomized controlled trial of *ABFT* found that suicidal adolescents assigned to *ABFT* experienced significantly greater improvement in suicidal ideation over 24 weeks of follow-up than did adolescents assigned to enhanced usual care. Additionally, a significantly higher percentage of *ABFT* participants reported no suicidal ideation in the week prior to assessment at 12 weeks than did adolescents receiving enhanced usual care (69.2% vs. 34.6%) and at 24 weeks (82.1% vs. 46.2%) (Diamond et al., 2010).

The Veterans Affairs *Translating Initiatives for Depression into Effective Solutions* project (*TIDES*) uses a depression care liaison to link primary care and mental health services. The depression care liaison assesses and educates patients and follows up with both patients and providers between primary care visits to optimize treatment. This collaborative care increases the efficiency of providing mental health services by bringing mental health care to the primary care setting, where most patients are first detected and subsequently treated for many mental health conditions. An evaluation of *TIDES* found significant decreases in depression severity scores among 70% of primary care patients (Rubenstein et al., 2010). *TIDES* also demonstrated 85% and 95% compliance with medication and follow-up visits, respectively (Rubenstein et al., 2010).

- **Treatment to prevent re-attempts.** Several strategies that aim to prevent re-attempts have demonstrated impact on reducing suicide deaths. For example, *Emergency Department Brief Intervention with Follow-up Visits* is a program that involves a one-hour discharge information session that addresses suicidal ideation and attempts, distress, risk and protective factors, alternatives to self-harm, and referral options, combined with nine follow-up contacts over 18 months (at 1, 2, 4, 7, 11 weeks and 4, 6, 12, 18 months). Follow-up contacts are either conducted by phone or through home visits according to a specific time line for up to 18-months. A randomized controlled trial that enrolled suicide attempters from eight hospital emergency departments in five countries (Brazil, India, Sri Lanka, Iran, and China) found that a brief intervention combined with 9 follow-up visits over 18-months was associated with significantly fewer deaths from suicide relative to a treatment-as-usual group (0.2% versus 2.2%, respectively) (Fleischmann et al., 2008).

Another example of treatment to prevent re-attempts involves *active follow-up contact approaches* such as postcards, letters, and telephone calls intended to increase a patient's sense of connectedness with health care providers and decrease isolation. These approaches include expression of care and support and typically invite patients to reconnect with their provider. Contacts are made periodically (e.g., monthly or every few months in the first 12 months post-discharge with some programs continuing contact for two or more years). In a meta-analysis conducted by Inagaki et al. (2015), interventions to prevent repeat suicide attempts in patients

admitted to an emergency department for suicide attempt were found to reduce reattempts by approximately 17% for up to 12 months post-discharge; however, the effects of these approaches beyond 12 months on reattempts has not yet been demonstrated. Also, because the number of trials and associated sample sizes included in this meta-analysis were small, it was not possible to determine the effect of active contact and follow-up approaches on death by suicide.

In a randomized controlled trial of the post-crisis suicide prevention long-term follow-up contact approach, Motto and Bostrom (2001) found that patients who refused ongoing care but who were randomized to be contacted by letter four times per year had a lower rate of suicide over two years of follow-up than did patients in the control group who received no further contact. Other studies have also shown post-crisis letters and coping cards to be protective against suicide ideation and attempts (Hassanian-Moghaddam, Sarjami, Kolahi, & Carter, 2011; Wang et al., 2016).

Finally, *Cognitive Behavior Therapy for Suicide Prevention (CBT-SP)* is an example of a therapeutic approach to prevent re-attempts. It uses a risk-reduction, relapse prevention approach that includes an analysis of proximal risk factors and stressors (e.g., relationship problems, school or work-related difficulties) leading up to and following the suicidal event; safety plan development; skill building; and psychoeducation. *CBT-SP* also has family skill modules focused on family support and communication patterns as well as improving the family's problem solving skills. A randomized controlled trial of *CBT-SP* found that 10-session outpatient cognitive therapy designed to prevent repeat suicide attempts resulted in a 50% reduction in the likelihood of a suicide reattempt among adults who had been admitted to an emergency department for a suicide attempt relative to treatment as usual (Brown et al., 2005).



## Lessen Harms and Prevent Future Risk

### Rationale

Millions of people are bereaved by suicide every year in the United States and throughout the world. Risk of suicide and suicide risk factors has been shown to increase among people who have lost a friend/peer, family member, co-worker, or other close contact to suicide (Pitman, Osborn, King, & Erlangsen, 2014). Care and attention to the bereaved is therefore of high importance. Despite often good intentions, media and others responding to suicide may add to this risk. For example, research suggests that exposure to sensationalized or otherwise uninformed reporting on suicide may heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to what is known as suicide contagion (Etzersdorfer & Sonneck, 1998; Niederkrotenthaler & Sonneck, 2007). While the evidence is still being built in this area, particularly with regard to the impact of policy and practices on suicide and suicide attempts in the United States, measures to care for the bereaved population through such means as postvention interventions (e.g. counseling, support groups and debriefing sessions) and safe reporting on suicide have shown impacts in other countries.

### Approaches

Some approaches that can be used to lessen harms and reduce future risk of suicide include caring for the bereaved and safe reporting following a suicide.

- **Postvention** approaches are implemented *after* a suicide has taken place and may include debriefing sessions, counseling, and/or bereavement support groups for surviving friends and family members/loved ones. These programs have not typically been evaluated for their impact on suicide or suicidal behavior but may reduce survivors' guilt, feelings of depression, and complicated grief (Szumilas & Kutcher, 2011).
- **Safe reporting following a suicide.** The manner in which information on a recent suicide is communicated to the public (e.g. school assemblies, mass media, social media) can heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to suicide contagion. Reports that are both inclusive of suicide prevention messages, stories of hope and resilience, risk and protective factors, and links to helping resources (e.g., hotline), and that avoid sensationalizing events or reducing suicide to one cause, can help reduce the likelihood of suicide contagion.

### Potential Outcomes

- Reductions in ideation/attempts

- Reductions in psychological distress
- Increases in treatment seeking
- Improvements in reporting following suicide
- Reductions in contagion effects related to suicide

## Evidence

Current evidence suggests that lessening harm through postvention and safe reporting can impact risk and protective factors for suicide.

- **Postvention** programs are implemented with the goal of providing support to survivors of others' suicide to reduce their own risk of suicide. One example of a postvention program, *StandBy Response Service (StandBy)*, provides clients with face-to-face outreach and telephone support through a professional crisis response team. Site coordinators develop customized case management plans, referring clients to other existing community services matched to their needs (Visser, Comans, & Scuffham, 2014). In a study by Visser et al. (2014), *StandBy* clients were significantly less likely to be at high risk for suicidality (suicide ideation and attempts) and had less psychological distress than a suicide bereaved comparison group who had not had contact with the *StandBy* program (48% and 64% respectively). Additionally, research suggests that active postvention approaches in which outreach to suicide survivors occurs at the scene of a suicide is associated with intake into treatment sooner, greater attendance at support group meetings, and attendance at more meetings compared to passive postvention (versus passive approaches where survivors self-refer for services) (Cerel & Campbell, 2008).
- **Safe reporting and messaging about suicide.** One way to ensure safe reporting and messaging about suicide is to encourage news media adhere to *Recommendations for Reporting on Suicide* (<http://www.reportingonsuicide.org>). The most compelling evidence supporting these recommendations for reporting comes from Austria. After a sharp increase in suicides on the Viennese subway, media guidelines were introduced and an interrupted time series design was used to evaluate the national impact of the guidelines on subsequent suicides. Changes in the quality and quantity of media reporting resulted in a nationwide significant reduction of 81 suicides annually (Niederkrotenthaler & Sonneck, 2007). Finally, research suggests that not only does reporting on suicide in a negative way (e.g., reporting on suicide myths and repetition) have harmful effects on suicide, but reporting on positive coping skills in the face of adversity can also demonstrate protective effects against suicide (Niederkrotenthaler et al., 2010). Reports of individual suicidal ideation not accompanied by reports of suicide or suicide attempts, along with reports describing a "mastery" of a crisis situation where adversities were overcome, was associated with significant decreases in suicide rates in the time period immediately following such reports (Niederkrotenthaler et al., 2010).



## Sector Involvement

Public health can play an important and unique role in addressing suicide. Public health agencies, which typically place prevention at the forefront of efforts and work to create broad population-level impact, can bring critical leadership and resources to bear on this problem. For example, these agencies can serve as a convener, bringing together partners and stakeholders to plan, prioritize, and coordinate suicide prevention efforts. Public health agencies are also well positioned to collect and disseminate data, implement preventive measures, evaluate programs, and track progress. Although public health can play a leadership role in preventing suicide, the strategies and approaches outlined in this technical package cannot be accomplished by the public health sector alone. As noted in the National Strategy to Prevent Suicide, the integration and coordination of prevention activities across sectors and settings is critical for expanding the reach and impact of suicide prevention efforts.

Other sectors vital to implementing this package include, but are not limited to, education, government (local, state, and federal), social services, health services, business, labor, justice, housing, media, and organizations that comprise the civil society sector such as faith-based organizations, youth-serving organizations, foundations, and other non-governmental organizations. Collectively, these sectors can make a difference in preventing suicide by impacting the various contexts and underlying risks that contribute to suicide.

The strategies and approaches described in this technical package are summarized in Appendix A along with the relevant sectors that are well positioned to lead implementation efforts. For example, business and labor, the health sector (including insurers, providers, and health systems), and government entities are in the best position to implement programs and policies that *Strengthen Economic Supports* and *Strengthen Access and Delivery of Suicide Care*. These types of supports go beyond individual behavior change and require commitment and support from those sectors that can directly address some of the underlying risks and the environmental contexts that increase the risk for suicide. Public health entities can play an important role by gathering and synthesizing information to inform policy, raise awareness, and evaluate the effectiveness of various policies. Moreover, partnerships with non-governmental and community organizations can be instrumental in increasing awareness of and garnering support for policies affecting individuals and families.

The public health sector has been at the forefront of many community-based prevention efforts, working collaboratively with schools and community-based organizations, to change social norms and positively impact health behavior. Public health is well suited to take on a similar leadership role in *Promoting Connectedness* through peer norm and community engagement activities and supporting the development, evaluation, and adoption of effective programs that *Teach Coping and Problem-Solving Skills* to prevent suicide from happening in the first place. These programs are often delivered in school and community settings, making education and non-governmental organizations vital partners in prevention.

Businesses, workplaces, and local and state government entities, on the other hand, are in the best position to establish policies and support practices that *Create Protective Environments* where people live, work, and play. Public health entities can play an important role by gathering and synthesizing information, working with other governmental agencies (e.g., criminal justice, defense) and agencies within the executive branch of their state or local government in support of policy and other approaches, and evaluating the effectiveness of measures taken. In a similar fashion, public health entities can partner with schools, workplaces, and community organizations to implement and evaluate prevention programs, policies and practices geared toward creating safe, healthy, and supportive environments.

Finally, this technical package includes a number of interventions delivered in hospital, primary care, behavioral health care, and community settings designed to *Identify and Support People At-Risk*. The intensity and activities for many of these interventions require the expertise of professionals who are licensed and trained to deliver critical intervention support. The health, social services, and justice sectors can work collaboratively to support individuals at high-risk for suicide and their families. These activities also require coordination of supports across various service providers and community organizations.

Regardless of strategy, action by many sectors will be necessary for the successful implementation of this package. In this regard, all sectors can play an important and influential role in preventing suicide from happening in the first place and lessening the immediate and long-term harms of suicidal behavior by helping those in times of crisis get the services and support they need.



## Monitoring and Evaluation

Monitoring and evaluation are necessary components of the public health approach to prevention. It is important to have timely and reliable data to monitor the extent of the problem and to evaluate the impact of prevention efforts. Data are also necessary for prevention planning and implementation.

Gathering ongoing and systematic data is important for prevention efforts. However, it is also important to gather data that are uniform and consistent across systems. Consistent data allow public health and other entities to better gauge the scope of the problem, identify high-risk groups, and monitor the effects of prevention programs and policies. Currently, it is common for different sectors, agencies, and organizations to employ varying definitions of suicidal ideation, behavior, and death that can make it difficult to consistently monitor specific outcomes across sectors and over time. For example, the manner in which deaths are classified can change from one jurisdiction to another, and can change based on local medical and/or medicolegal standards (A.E. Crosby, Ortega, et al., 2011). CDC's uniform definitions and recommended data elements for self-directed violence provide a useful framework to help ensure that data are collected in a consistent manner across surveillance systems (e.g., A.E. Crosby, Ortega, et al., 2011).

Surveillance systems exist at the federal, state, and local levels. It is important to assess the availability of surveillance data and data systems across these levels to identify and address gaps in the systems. CDC's *National Vital Statistics System (NVSS)* and the *National Violent Death Reporting System (NVDRS)* are examples of surveillance systems that provide data on deaths from suicide. *NVSS* is a nationwide surveillance system that collects demographic, geographic, and cause-of-death data from death certificates. *NVDRS* is a state-based surveillance system (currently in 40 states, the District of Columbia, and Puerto Rico) that combines data from death certificates, law enforcement reports, and coroner or medical examiner reports to provide detailed information on the circumstances of violent deaths, including suicide, which can assist communities in guiding prevention approaches (Blair, Fowler, Jack, & Crosby, 2016). Data from state and local Child Death Review teams and Suicide Death Review Teams (which are in a few states) offer another source to identify deaths and obtain insight into the gaps in services, systems, and modifiable risk factors for suicide.

The *National Electronic Injury Surveillance System-All Injury Program (NEISS-AIP)* provides nationally representative data about all types and causes of nonfatal injuries treated in U.S. hospital emergency departments, and can be used to assess national rates of, and trends in, self-harm injuries by cause (e.g., falls, poisoning, etc.), age, race/ethnicity, sex, disposition (where the injured person goes when released from the Emergency Department).

In addition to information on deaths and nonfatal injuries, there are also surveillance systems that provide national, state, and some local estimates of suicidal behavior. The *Youth Risk Behavior Surveillance System (YRBSS)* collects information from a nationally representative sample of 9-12 grade



students and is a key resource in monitoring health-risk behaviors among youth, including whether youth have seriously considered attempting suicide, attempted suicide, made a plan, or required treatment by a doctor or nurse for a suicide attempt that resulted in an injury, poisoning, or overdose (Brener et al., 2013). The YRBSS data are obtained from a national school-based survey conducted by CDC as well as from state, territorial, tribal, and large urban school district surveys conducted by education and health agencies. The *National Survey on Drug Use and Health (NSDUH)* is an annual survey of the civilian, non-institutionalized population aged 12 years and older. *NSDUH* provides both national and state-level estimates of substance use (alcohol, tobacco, illicit drugs, and non-medical use of prescription drugs); mental health (past year mental illness, co-occurring illnesses); and service utilization, along with suicide ideation, suicide plans, and suicide attempts. *NSDUH* is a key resource to track trends in suicide-related risk factors in the population and to help identify groups at increased risk.

It is also important at all levels (local, state, and federal) to address gaps in responses, track progress of prevention efforts and evaluate the impact of those efforts, including the impact of this technical package. Evaluation data, produced through program implementation and monitoring, is essential to provide information on what does and does not work to reduce rates of suicide and its associated risk and protective factors. Theories of change and logic models that identify short, intermediate, and long-term outcomes are an important part of program evaluation.

The evidence-base for suicide prevention has advanced greatly over the last few decades. However, additional research is needed to understand the impact of programs, policies, and practices on suicide (and suicide attempts, at a minimum), as opposed to merely examining their effectiveness on risk factors.

More research is also needed to examine the effectiveness of primary prevention strategies (before risk occurs) and community-level strategies to prevent suicide at the population level. It will be important for researchers to test the effectiveness of combinations of the strategies and approaches included in this package. Most existing evaluations focus on approaches implemented in isolation, but there is potential to understand the synergistic effects within a comprehensive prevention approach. Lastly, there are also many potential opportunities to build and strengthen partnerships across program areas (e.g., violence prevention, substance abuse prevention) to evaluate the impact of different approaches on multiple outcomes.

## Conclusion

Suicide is a serious public health problem whose rates have been on the rise for more than a decade and whose costs stretch well into the billions of dollars each year. While suicide is a rare outcome statistically, its human impact has a ripple effect that is far-reaching. Each of us likely interacts with suicide survivors, those with lived experience, and those with thoughts of suicide on a daily basis – at home, at work, and in our communities. Suicide and suicide attempts are public health issues of societal concern. There are a number of barriers that have impeded progress, including, for example, stigma related to help-seeking,



mental illness, being a survivor and fear related to asking someone about suicidal thoughts. Fortunately, like many public health problems, suicide is preventable, and more is being done to prevent suicide than ever before, as evidenced by the work of the National Action Alliance for Suicide Prevention, the release of the first world report on suicide, and more timely surveillance data, to name just a few examples.

In an effort to continue pushing the field and society further towards prevention, this technical package includes strategies and approaches that ideally would be used in a comprehensive, multi-level and multi-sectoral way. It includes strategies and approaches to prevent suicide from occurring in the first place, as well as strategies focused on lessening the immediate and long-term harms of suicidal behavior. It includes strategies that range from a focus on the whole population regardless of risk to strategies designed to support people at highest risk. Importantly, this technical package extends the bounds of the typical prevention strategies to consider approaches that go beyond individual behavior change to better address risk factors impacting communities and populations more broadly (e.g., economic policies to strengthen housing and financial security).

While the evidence base continues to emerge, the collection of programs, policies, and practices laid out here are available for implementation now. In keeping with good public health practice, the intent is that monitoring and evaluation will play a key role in that implementation. Moreover, as new evidence becomes available, this technical package can be refined to reflect the current state of the science.

In closing, and in keeping with a message of resilience as spoken by those with lived experience, ‘hope, help, and healing is possible.’

## References

- Archer, J., Bower, P., Gilbody, S., Lovell, K., Richards, D., Gask, L., . . . Coventry, P. (2012). Collaborative care for depression and anxiety problems. *The Cochrane Library*.
- Arsenault-Lapierre, G., Kim, C., & Turecki, G. (2004). Psychiatric diagnoses in 3275 suicides: a meta-analysis. *BMC Psychiatry*, 4, 37. doi:10.1186/1471-244X-4-37
- Bachynski, K. E., Canham-Chervak, M., Black, S. A., Dada, E. O., Millikan, A. M., & Jones, B. H. (2012). Mental health risk factors for suicides in the US Army, 2007–8. *Injury Prevention*, 18(6), 405-412.
- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*: Prentice-Hall, Inc.
- Barker, E., Kölves, K., & De Leo, D. (2014). Management of Suicidal and Self-Harming Behaviors in Prisons: Systematic Literature Review of Evidence-Based Activities. *Archives of Suicide Research*, 18(3), 227-240. doi:10.1080/13811118.2013.824830
- Beautrais, A. L. (2001). Effectiveness of barriers at suicide jumping sites: A case study. *Aust NZ J Psychiat*, 35. doi:10.1080/0004867010060501
- Beautrais, A. L., Gibb, S. J., Fergusson, D. M., Horwood, L. J., & Larkin, G. L. (2009). Removing bridge barriers stimulates suicides: An unfortunate natural experiment. *Aust NZ J Psychiat*, 43. doi:10.1080/00048670902873714
- Bellis, M. A., Hughes, K., Leckenby, N., Jones, L., Baban, A., Kachaeva, M., . . . Ulukol, B. (2014). Adverse childhood experiences and associations with health-harming behaviours in young adults: surveys in eight eastern European countries. *Bulletin of the World Health Organization*, 92(9), 641-655.
- Beyer, K. M., Layde, P. M., Hamberger, L. K., & Laud, P. W. (2015). Does neighborhood environment differentiate intimate partner femicides from other femicides? *Violence Against Women*, 21(1), 49-64. doi:10.1177/1077801214564075
- Blair, J. M., Fowler, K. A., Jack, S. P., & Crosby, A. E. (2016). The National Violent Death Reporting System: overview and future directions. *Inj Prev*, 22 Suppl 1, i6-i11. doi:10.1136/injuryprev-2015-041819
- Bossarte, R. M., Karras, E., Lu, N., Tu, X., Stephens, B., Draper, J., & Kemp, J. E. (2014). Associations between the Department of Veterans Affairs' suicide prevention campaign and calls to related crisis lines. *Public Health Rep*, 129(6), 516-525.
- Branas, C. C., Cheney, R. A., MacDonald, J. M., Tam, V. W., Jackson, T. D., & Ten Have, T. R. (2011). A difference-in-differences analysis of health, safety, and greening vacant urban space. *Am J Epidemiol*, 174(11), 1296-1306. doi:10.1093/aje/kwr273
- Brown, G. K., Ten Have, T., Henriques, G. R., Xie, S. X., Hollander, J. E., & Beck, A. T. (2005). Cognitive therapy for the prevention of suicide attempts: a randomized controlled trial. *JAMA*, 294(5), 563-570. doi:10.1001/jama.294.5.563
- Bruce, M. L., Ten Have, T. R., Reynolds III, C. F., Katz, I. I., Schulberg, H. C., Mulsant, B. H., . . . Alexopoulos, G. S. (2004). Reducing suicidal ideation and depressive symptoms in depressed older primary care patients: a randomized controlled trial. *JAMA*, 291(9), 1081-1091.
- Capaldi, D. M., Knoble, N. B., Shortt, J. W., & Kim, H. K. (2012). A Systematic Review of Risk Factors for Intimate Partner Violence. *Partner Abuse*, 3(2), 231-280. doi:10.1891/1946-6560.3.2.231
- Carter, M., McGee, R., Taylor, B., & Williams, S. (2007). Health outcomes in adolescence: associations with family, friends and school engagement. *J Adolesc*, 30(1), 51-62. doi:10.1016/j.adolescence.2005.04.002
- Centers for Disease Control and Prevention. (2009). Strategic direction for the prevention of suicidal behavior: Promoting individual, family, and community connectedness to prevent suicidal behavior. Retrieved from Available at: [http://www.cdc.gov/ViolencePrevention/pdf/Suicide\\_Strategic\\_Direction\\_Full\\_version-a.pdf](http://www.cdc.gov/ViolencePrevention/pdf/Suicide_Strategic_Direction_Full_version-a.pdf)
- Centers for Disease Control and Prevention. (2016). Web-Based Injury Statistics Query and Reporting System (WISQARS). Retrieved June 3, 2016 Available at: <http://www.cdc.gov/injury/wisqars/index.html>



- Cerel, J., & Campbell, F. R. (2008). Suicide survivors seeking mental health services: a preliminary examination of the role of an active postvention model. *Suicide Life Threat Behav*, 38(1), 30-34. doi:10.1521/suli.2008.38.1.30
- Cerel, J., Maple, M., De Venne, A., Moore, M., Flaherty, C., & Brown, M. (2016). Exposure to Suicide in the Community: Prevalence and Correlates in One US State. *Public Health Reports*, 131(1).
- Cerel, J., McIntosh, J. L., Neimeyer, R. A., Maple, M., & Marshall, D. (2014). The Continuum of "Survivorship": Definitional Issues in the Aftermath of Suicide. *Suicide and life-threatening behavior*, 44(6), 591-600. doi:10.1111/sltb.12093
- Chapman, A. L., & Dixon-Gordon, K. L. (2007). Emotional antecedents and consequences of deliberate self-harm and suicide attempts. *Suicide Life Threat Behav*, 37(5), 543-552. doi:10.1521/suli.2007.37.5.543
- Chapman, D. P., Whitfield, C. L., Felitti, V. J., Dube, S. R., Edwards, V. J., & Anda, R. F. (2004). Adverse childhood experiences and the risk of depressive disorders in adulthood. *J Affect Disord*, 82(2), 217-225.
- Cherpitel, C. J., Borges, G. L. G., & Wilcox, H. C. (2004). Acute alcohol use and suicidal behavior: A review of the literature. *Alcoholism: Clinical and Experimental Research*, 28(5 SUPPL.), 18S-28S.
- Classen, T. J., & Dunn, R. A. (2012). The effect of job loss and unemployment duration on suicide risk in the United States: a new look using mass-layoffs and unemployment duration. *Health Econ*, 21(3), 338-350. doi:10.1002/hecl.1719
- Coffey, C. E. (2006). Pursuing perfect depression care. *Psychiatr Serv*, 57(10), 1524-1526. doi:10.1176/ps.2006.57.10.1524
- Coffey, C. E. (2007). Building a system of perfect depression care in behavioral health. *Jt Comm J Qual Patient Saf*, 33(4), 193-199.
- Coffey, C. E., Coffey, M. J., & Ahmedani, B. K. (2013). An update on perfect depression care. *Psychiatr Serv*, 64(4), 396. doi:10.1176/appi.PS.640422
- Coffey, M., Coffey, C., & Ahmedani, B. K. (2015). Suicide in a health maintenance organization population. *JAMA Psychiatry*, 72(3), 294-296. doi:10.1001/jamapsychiatry.2014.2440
- Comtois, K. A., Jobes, D. A., S. O'Connor, S., Atkins, D. C., Janis, K., E. Chessen, C., . . . Yuodelis-Flores, C. (2011). Collaborative assessment and management of suicidality (CAMS): feasibility trial for next-day appointment services. *Depress Anxiety*, 28(11), 963-972. doi:10.1002/da.20895
- Cox, G. R., Owens, C., Robinson, J., Nicholas, A., Lockley, A., Williamson, M., . . . Pirkis, J. (2013). Interventions to reduce suicides at suicide hotspots: a systematic review. *BMC Public Health*, 13(1), 1-12. doi:10.1186/1471-2458-13-214
- Crosby, A. E., Espitia-Hardeman, V., Ortega, L., & Lozano, B. (2013). Alcohol and suicide. *Alcohol: Science, Policy and Public Health*, 190.
- Crosby, A. E., Han, B., Ortega, L., Parks, S. E., & Gfroerer, J. (2011). Suicidal Thoughts and Behaviors Among Adults Aged ≥18 Years — United States, 2008–2009. *MMWR*, 60(No. SS-13), 1-22.
- Crosby, A. E., Ortega, L., & Melanson, C. (2011). *Self-directed Violence Surveillance: Uniform Definitions and Recommended Data Elements, Version 1.0*. Retrieved from Atlanta, GA:
- Crosby, A. E., & Sacks, J. J. (2002). Exposure to Suicide: Incidence and Association with Suicidal Ideation and Behavior: United States, 1994. *Suicide and life-threatening behavior*, 32(3), 321-328. doi:10.1521/suli.32.3.321.22170
- Cunningham, P. J. (2009). Beyond parity: primary care physicians' perspectives on access to mental health care. *Health Aff (Millwood)*, 28(3), w490-501. doi:10.1377/hlthaff.28.3.w490
- Curtin, S. C., Warner, M., & Hedegaard, H. (2016). *Increase in suicide in the United States, 1999-2014*. ( ). Hyattsville, MD: National Center for Health Statistics Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/25116188>.
- Cylus, J., Glymour, M. M., & Avendano, M. (2014). Do generous unemployment benefit programs reduce suicide rates? A state fixed-effect analysis covering 1968-2008. *Am J Epidemiol*, 180(1), 45-52. doi:10.1093/aje/kwu106

- Dahlberg, L. L., & Krug, E. G. (2002). Violence-a global public health problem. In E. Krug, L. L. Dahlberg, J. A. Mercy, A. B. Zwi, & R. Lozano (Eds.), *World Report on Violence and Health* (pp. 1-56). Geneva, Switzerland: World Health Organization.
- Deisenhammer, E. A., Ing, C. M., Strauss, R., Kemmler, G., Hinterhuber, H., & Weiss, E. M. (2009). The duration of the suicidal process: how much time is left for intervention between consideration and accomplishment of a suicide attempt? *J Clin Psychiatry*, 70(1), 19-24.
- Diamond, G. S., Wintersteen, M. B., Brown, G. K., Diamond, G. M., Gallop, R., Shelef, K., & Levy, S. (2010). Attachment-based family therapy for adolescents with suicidal ideation: a randomized controlled trial. *J Am Acad Child Adolesc Psychiatry*, 49(2), 122-131.
- Dube, S. R., Anda, R. F., Felitti, V. J., Chapman, D. P., Williamson, D. F., & Giles, W. H. (2001). Childhood abuse, household dysfunction, and the risk of attempted suicide throughout the life span: findings from the Adverse Childhood Experiences Study. *JAMA*, 286(24), 3089-3096.
- Dunne, E. J., McIntosh, J. L., & Dunne-Maxim, K. (Eds.). (1987). *Suicide and its aftermath: Understanding and counseling the survivors*. New York: Norton.
- Durkheim, E. (1897/1951). *Suicide: A study in sociology* (JA Spaulding & G. Simpson, trans.). Glencoe, IL: Free Press. (Original work published 1897).
- Edwards, R. W., Jumper-Thurman, P., Plested, B. A., Oetting, E. R., & Swanson, L. (2000). Community readiness: Research to practice. *Journal of Community Psychology*, 28(3), 291-307.
- Escobedo, L. G., & Ortiz, M. (2002). The relationship between liquor outlet density and injury and violence in New Mexico. *Accid Anal Prev*, 34(5), 689-694.
- Etzersdorfer, E., & Sonneck, G. (1998). Preventing suicide by influencing mass-media reporting: The Viennese experience, 1980-1996. *Arch Suicide Res*, 4.
- Felitti, V. J., Anda, R. F., Nordenberg, D., Williamson, D. F., Spitz, A. M., Edwards, V., . . . Marks, J. S. (1998). Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: The Adverse Childhood Experiences (ACE) Study. *Am J Prev Med*, 14(4), 245-258.
- Ferdon, C., Crosby, A. E., Caine, E. D., Hindman J., Reed, G. A., & Iskander, J. (In press). CDC Public Health Grand Rounds: Preventing Suicide through a Comprehensive Public Health Approach. *MMWR*.
- Flavin, P., & Radcliff, B. (2009). Public policies and suicide rates in the American states. *Social Indicators Research*, 90(2), 195-209.
- Fleischmann, A., Bertolote, J. M., Wasserman, D., De Leo, D., Bolhari, J., Botega, N. J., . . . Thanh, H. T. (2008). Effectiveness of brief intervention and contact for suicide attempters: a randomized controlled trial in five countries. *Bulletin of the World Health Organization*, 86(9), 703-709. doi:S0042-96862008000900014 [pii]
- Florence, C., Simon, T., Haegerich, T., Luo, F., & Zhou, C. (2015). Estimated lifetime medical and work-loss costs of fatal injuries-United States, 2013. *MMWR: Morbidity and mortality weekly report*, 64(38), 1074-1077.
- Fowler, K. A., Gladden, R. M., Vagi, K. J., Barnes, J., & Frazier, L. (2015). Increase in suicides associated with home eviction and foreclosure during the US housing crisis: findings from 16 National Violent Death Reporting System States, 2005-2010. *Am J Public Health*, 105(2), 311-316. doi:10.2105/AJPH.2014.301945
- Frieden, T. R. (2014). Six components necessary for effective public health program implementation. *Am J Public Health*, 104(1), 17-22. doi:10.2105/AJPH.2013.301608
- Giesbrecht, N., Huguette, N., Ogden, L., Kaplan, M. S., McFarland, B. H., Caetano, R., . . . Nolte, K. B. (2015). Acute alcohol use among suicide decedents in 14 US states: impacts of off-premise and on-premise alcohol outlet density. *Addiction*, 110(2), 300-307. doi:10.1111/add.12762
- Gilbody, S., Bower, P., Fletcher, J., Richards, D., & Sutton, A. J. (2006). Collaborative care for depression: a cumulative meta-analysis and review of longer-term outcomes. *Archives of internal medicine*, 166(21), 2314-2321.



- Godoy Garraza, L., Walrath, C., Goldston, D. B., Reid, H., & McKeon, R. (2015). Effect of the Garrett Lee Smith Memorial Suicide Prevention Program on Suicide Attempts Among Youths. *JAMA Psychiatry*, 72(11), 1143-1149. doi:10.1001/jamapsychiatry.2015.1933
- Gould, M. S., Cross, W., Pisani, A. R., Munfakh, J. L., & Kleinman, M. (2013). Impact of Applied Suicide Intervention Skills Training on the National Suicide Prevention Lifeline. *Suicide Life Threat Behav*, 43(6), 676-691. doi:10.1111/sltb.12049
- Gould, M. S., Kalafat, J., Harrismunfakh, J. L., & Kleinman, M. (2007). An evaluation of crisis hotline outcomes. Part 2: Suicidal callers. *Suicide Life Threat Behav*, 37(3), 338-352. doi:10.1521/suli.2007.37.3.338
- Grossman, D. C., Mueller, B. A., Riedy, C., Dowd, M. D., Villaveces, A., Prodzinski, J., . . . Harruff, R. (2005). Gun storage practices and risk of youth suicide and unintentional firearm injuries. *JAMA*, 293(6), 707-714. doi:10.1001/jama.293.6.707
- Haddon, W. (1980). Advances in the epidemiology of injuries as a basis for public policy. *Public Health Reports*, 95(5), 411-421.
- Haegerich, T. M., & Dahlberg, L. L. (2011). Violence as a public health risk. *American Journal of Lifestyle Medicine*, 1559827611409127.
- Hailey, D., Roine, R., & Ohinmaa, A. (2008). The effectiveness of telemental health applications: a review. *The Canadian Journal of Psychiatry*, 53(11), 769-778.
- Hamby, S., & Grych, J. (2013). The web of violence: exploring connections among different forms of interpersonal violence and abuse *Briefs in Sociology*. New York, NY: Springer.
- Han, B., Crosby, A. E., Ortega, L. A., Parks, S. E., Compton, W. M., & Gfroerer, J. (2016). Suicidal ideation, suicide attempt, and occupations among employed adults aged 18–64 years in the United States. *Comprehensive psychiatry*, 66, 176-186.
- Harris, E. C., & Barraclough, B. (1997). Suicide as an outcome for mental disorders. A meta-analysis. *Br J Psychiatry*, 170, 205-228.
- Harris, E. C., & Barraclough, B. (1998). Excess mortality of mental disorder. *Br J Psychiatry*, 173, 11-53.
- Harris, K. M., Carpenter, C., & Bao, Y. (2006). The effects of state parity laws on the use of mental health care. *Med Care*, 44(6), 499-505. doi:10.1097/01.mlr.0000215813.16211.00
- Hassanian-Moghaddam, H., Sarjami, S., Kolahi, A. A., & Carter, G. L. (2011). Postcards in Persia: randomised controlled trial to reduce suicidal behaviours 12 months after hospital-treated self-poisoning. *British Journal of Psychiatry*, 198(4), 309-316.
- Hawkins, J. D., Catalano, R. F., & Kuklinski, M. R. (2014). Communities that care *Encyclopedia of Criminology and Criminal Justice* (pp. 393-408): Springer.
- Hawton, K. (2007). Restricting access to methods of suicide: Rationale and evaluation of this approach to suicide prevention. *Crisis*, 28. doi:10.1027/0227-5910.28.s1.4
- Hayes, L. M. (1995). Prison Suicide: An Overview and a Guide to Prevention. *The Prison Journal*, 75(4), 431-456. doi:10.1177/0032855595075004003
- Hayes, L. M. (2013). Suicide prevention in correctional facilities: reflections and next steps. *Int J Law Psychiatry*, 36(3-4), 188-194. doi:10.1016/j.ijlp.2013.04.010
- Herman, K. C., Borden, L. A., Reinke, W. M., & Webster-Stratton, C. (2011). The Impact of the Incredible Years Parent, Child, and Teacher Training Programs on Children's Co-Occurring Internalizing Symptoms. *Sch Psychol Q*, 26(3), 189-201. doi:10.1037/a0025228
- Houle, J. N., & Light, M. T. (2014). The home foreclosure crisis and rising suicide rates, 2005 to 2010. *Am J Public Health*, 104(6), 1073-1079. doi:10.2105/AJPH.2013.301774
- Hunkeler, E. M., Katon, W., Tang, L., Williams, J. W., Jr., Kroenke, K., Lin, E. H., . . . Unutzer, J. (2006). Long term outcomes from the IMPACT randomised trial for depressed elderly patients in primary care. *BMJ*, 332(7536), 259-263. doi:10.1136/bmj.38683.710255.BE

- Inagaki, M., Kawashima, Y., Kawanishi, C., Yonemoto, N., Sugimoto, T., Furuno, T., . . . Yamada, M. (2015). Interventions to prevent repeat suicidal behavior in patients admitted to an emergency department for a suicide attempt: a meta-analysis. *J Affect Disord*, 175, 66-78. doi:10.1016/j.jad.2014.12.048
- Jobes, D. A. (2012). The Collaborative Assessment and Management of Suicidality (CAMS): an evolving evidence-based clinical approach to suicidal risk. *Suicide Life Threat Behav*, 42(6), 640-653. doi:10.1111/j.1943-278X.2012.00119.x
- Johnson, F. W., Gruenewald, P. J., & Remer, L. G. (2009). Suicide and alcohol: do outlets play a role? *Alcohol Clin Exp Res*, 33(12), 2124-2133. doi:10.1111/j.1530-0277.2009.01052.x
- Kann, L., McManus, T., Harris, W. A., Shanklin, S. L., Flint, K. H., Hawkins, J., . . . Zaza, S. (2016). Youth Risk Behavior Surveillance - United States, 2015. *MMWR Surveill Summ*, 65(6), 1-174. doi:10.15585/mmwr.ss6506a1
- Kaplan, M. S., McFarland, B. H., Huguet, N., Conner, K., Caetano, R., Giesbrecht, N., & Nolte, K. B. (2013). Acute alcohol intoxication and suicide: a gender-stratified analysis of the National Violent Death Reporting System. *Inj Prev*, 19(1), 38-43. doi:10.1136/injuryprev-2012-040317
- Kellam, S. G., Brown, C. H., Poduska, J. M., Ialongo, N. S., Wang, W., Toyinbo, P., . . . Wilcox, H. C. (2008). Effects of a universal classroom behavior management program in first and second grades on young adult behavioral, psychiatric, and social outcomes. *Drug Alcohol Depend*, 95 Suppl 1, S5-S28. doi:10.1016/j.drugalcdep.2008.01.004
- Kessler, R. C., Demler, O., Frank, R. G., Olfson, M., Pincus, H. A., Walters, E. E., . . . Zaslavsky, A. M. (2005). Prevalence and treatment of mental disorders, 1990 to 2003. *N Engl J Med*, 352(24), 2515-2523. doi:10.1056/NEJMsa043266
- Kleiman, E. M., Riskind, J. H., Schaefer, K. E., & Weingarden, H. (2012). The moderating role of social support on the relationship between impulsivity and suicide risk. *Crisis*, 33(5), 273-279. doi:10.1027/0227-5910/a000136
- Klomek, A. B., Sourander, A., & Gould, M. (2010). The association of suicide and bullying in childhood to young adulthood: a review of cross-sectional and longitudinal research findings. *The Canadian Journal of Psychiatry*, 55(5), 282-288.
- Knox, K. L., Litts, D. A., Talcott, G. W., Feig, J. C., & Caine, E. D. (2003). Risk of suicide and related adverse outcomes after exposure to a suicide prevention programme in the US Air Force: cohort study. *BMJ*, 327(7428), 1376.
- Knox, K. L., Pflanz, S., Talcott, G. W., Campise, R. L., Lavigne, J. E., Bajorska, A., . . . Caine, E. D. (2010). The US Air Force suicide prevention program: implications for public health policy. *Am J Public Health*, 100(12), 2457-2463. doi:10.2105/ajph.2009.159871
- Lang, M. (2013). The impact of mental health insurance laws on state suicide rates. *Health Econ*, 22(1), 73-88. doi:10.1002/hec.1816
- Leeb, R. T., Lewis, T., & Zolotor, A. J. (2011). A review of physical and mental health consequences of child abuse and neglect and implications for practice. *American Journal of Lifestyle Medicine*, 5(5), 454-468.
- Lineberry, T. W., & O'Connor, S. S. Suicide in the US Army. *Mayo Clinic Proceedings*, 87(9), 871-878. doi:10.1016/j.mayocp.2012.07.002
- Linehan, M. M., Comtois, K. A., Murray, A. M., Brown, M. Z., Gallop, R. J., Heard, H. L., . . . Lindenboim, N. (2006). Two-year randomized controlled trial and follow-up of dialectical behavior therapy vs therapy by experts for suicidal behaviors and borderline personality disorder. *Arch Gen Psychiatry*, 63(7), 757-766. doi:10.1001/archpsyc.63.7.757
- Losel, F., & Farrington, D. P. (2012). Direct protective and buffering protective factors in the development of youth violence. *Am J Prev Med*, 43(2 Suppl 1), S8-S23. doi:10.1016/j.amepre.2012.04.029
- Maimon, D., Browning, C. R., & Brooks-Gunn, J. (2010). Collective efficacy, family attachment, and urban adolescent suicide attempts. *J Health Soc Behav*, 51(3), 307-324. doi:10.1177/0022146510377878



- Mark, T. L., Shern, D. L., Bagalman, J. E., & Cao, Z. (2007). Ranking America's mental health: An analysis of depression across the states. *Alexandria, VA: Mental Health America.*
- McIntosh, W. L., Spies, E., Stone, D. M., Lokey, C. N., Trudeau, A. R., & Bartholow, B. (2016). Suicide Rates by Occupational Group - 17 States, 2012. *MMWR Morb Mortal Wkly Rep*, 65(25), 641-645. doi:10.15585/mmwr.mm6525a1
- Miller, M., Warren, M., Hemenway, D., & Azrael, D. (2015). Firearms and suicide in US cities. *Inj Prev*, 21(e1), e116-119. doi:10.1136/injuryprev-2013-040969
- Mishara, B. L. (Ed.) (1995). *The Impact of Suicide*. New York: Springer.
- Mishara, B. L., & Martin, N. (2012). Effects of a comprehensive police suicide prevention program. *Crisis: Journal of Crisis Intervention & Suicide*, 33(3), 162-168.
- Mitchell, A. M., Kim, Y., Prigerson, H. G., & Mortimer-Stephens, M. (2004). Complicated grief in survivors of suicide. *Crisis*, 25(1), 12-18. doi:10.1027/0227-5910.25.1.12
- Mohr, D. C., Vella, L., Hart, S., Heckman, T., & Simon, G. (2008). The effect of telephone-administered psychotherapy on symptoms of depression and attrition: A meta-analysis. *Clinical Psychology: Science and Practice*, 15(3), 243-253.
- Motto, J. A., & Bostrom, A. G. (2001). A randomized controlled trial of postcrisis suicide prevention. *Psychiatr Serv*, 52(6), 828-833.
- Muennig, P., Cohen, A. K., Palmer, A., & Zhu, W. (2013). The relationship between five different measures of structural social capital, medical examination outcomes, and mortality. *Soc Sci Med*, 85, 18-26. doi:10.1016/j.socscimed.2013.02.007
- National Action Alliance for Suicide Prevention. (2014). Research Prioritization Task Force.(2014). *A prioritized research agenda for suicide prevention: An action plan to save lives.*
- National Action Alliance for Suicide Prevention Workplace Task Force. (2015). *Comprehensive Blueprint for Workplace Suicide Prevention*. Washington, D.C. : Author.
- National Action Alliance for Suicide Prevention: Clinical Workforce Preparedness Task Force. (2014). *Suicide prevention and the clinical workforce: Guidelines for training*. Washington, D.C.: Author.
- National Action Alliance for Suicide Prevention: Suicide Attempt Survivors Task Force. (2014). *The Way Forward: Pathways to hope, recovery, and wellness with insights from lived experience*. Washington, D.C. : Author.
- National Action Alliance for Suicide Prevention: Survivors of Suicide Loss Task Force. (2015). *Responding to Grief, Trauma, and Distress After a Suicide: U.S. National Guidelines*. Washington, D.C. : Author.
- Niederkrotenthaler, T., & Sonneck, G. (2007). Assessing the impact of media guidelines for reporting on suicides in Austria: Interrupted time series analysis. *Aust N Z J Psychiatry*, 41. doi:10.1080/00048670701266680
- Niederkrotenthaler, T., Voracek, M., Herberth, A., Till, B., Strauss, M., Etzersdorfer, E., . . . Sonneck, G. (2010). Media and suicide. Papageno v Werther effect. *BMJ*, 341, c5841. doi:10.1136/bmj.c5841
- Olfson, M., Gerhard, T., Huang, C., Crystal, S., & Stroup, T. S. (2015). Premature Mortality Among Adults With Schizophrenia in the United States. *JAMA Psychiatry*, 72(12), 1172-1181. doi:10.1001/jamapsychiatry.2015.1737
- Owens, D. (2002). Fatal and non-fatal repetition of self-harm: Systematic review. *British Journal of Psychiatry*, 181(3), 193-199.
- Perron, S., Burrows, S., Fournier, M., Perron, P. A., & Ouellet, F. (2013). Installation of a bridge barrier as a suicide prevention strategy in Montreal, Quebec, Canada. *Am J Public Health*, 103(7), 1235-1239. doi:10.2105/ajph.2012.301089
- Pirkis, J., Too, L. S., Spittal, M. J., Krysinska, K., Robinson, J., & Cheung, Y. T. D. (2015). Interventions to reduce suicides at suicide hotspots: a systematic review and meta-analysis. *The Lancet Psychiatry*, 2(11), 994-1001. doi:http://dx.doi.org/10.1016/S2215-0366(15)00266-7
- Pitman, A., Osborn, D., King, M., & Erlangsen, A. (2014). Effects of suicide bereavement on mental health and suicide risk. *Lancet Psychiatry*, 1, 86-94.

- Plested, B. A., Edwards, R. W., & Jumper-Thurman, P. (2006). Community readiness: A handbook for successful change. *Fort Collins, CO: Tri-Ethnic Center for Prevention Research.*
- Pollock, L. R., & Williams, J. M. (2004). Problem-solving in suicide attempters. *Psychol Med*, 34(1), 163-167.
- Reid, M. J., Webster-Stratton, C., & Hammond, M. (2003). Follow-up of children who received the Incredible Years intervention for oppositional-defiant disorder: Maintenance and prediction of 2-year outcome. *Behavior Therapy*, 34(4), 471-491.
- Rowhani-Rahbar, A., Simonetti, J. A., & Rivara, F. P. (2016). Effectiveness of Interventions to Promote Safe Firearm Storage. *Epidemiol Rev*, 38(1), 111-124. doi:10.1093/epirev/mxv006
- Rubenstein, L. V., Chaney, E. F., Ober, S., Felker, B., Sherman, S. E., Lanto, A., & Vivell, S. (2010). Using evidence-based quality improvement methods for translating depression collaborative care research into practice. *Families, Systems, & Health*, 28(2), 91.
- Runyan, C. W., Becker, A., Brandspigel, S., Barber, C., Trudeau, A., & Novins, D. (2016). Lethal Means Counseling for Parents of Youth Seeking Emergency Care for Suicidality. *West J Emerg Med*, 17(1), 8-14. doi:10.5811/westjem.2015.11.28590
- Russell, S. T., & Joyner, K. (2001). Adolescent sexual orientation and suicide risk: Evidence from a national study. *American Journal of Public Health*, 91(8), 1276-1281.
- Shepard, D. S., Gurewich, D., Lwin, A. K., Reed, G. A., Jr., & Silverman, M. M. (2016). Suicide and Suicidal Attempts in the United States: Costs and Policy Implications. *Suicide Life Threat Behav*, 46(3), 352-362. doi:10.1111/sltb.12225
- Silverman, M. M., & Maris, R. W. (1995). The prevention of suicidal behaviors: An overview. *Suicide and life-threatening behavior*, 25(1), 10-21.
- Simon, O. R., Swann, A. C., Powell, K. E., Potter, L. B., Kresnow, M. J., & O'Carroll, P. W. (2001). Characteristics of impulsive suicide attempts and attempters. *Suicide Life Threat Behav*, 32(1 Suppl), 49-59.
- Spoth, R. L., Gyll, M., & Day, S. X. (2002). Universal family-focused interventions in alcohol-use disorder prevention: cost-effectiveness and cost-benefit analyses of two interventions. *J Stud Alcohol*, 63(2), 219-228.
- Stack, S., & Wasserman, I. (2007). Economic strain and suicide risk: a qualitative analysis. *Suicide and life-threatening behavior*, 37(1), 103-112.
- Stokes, M. L., McCoy, K. P., Abram, K. M., Byck, G. R., & Teplin, L. A. (2015). Suicidal Ideation and Behavior in Youth in the Juvenile Justice System: A Review of the Literature. *J Correct Health Care*, 21(3), 222-242. doi:10.1177/1078345815587001
- Sudak, H., Maxim, K., & Carpenter, M. (2008). Suicide and stigma: a review of the literature and personal reflections. *Acad Psychiatry*, 32(2), 136-142. doi:10.1176/appi.ap.32.2.136
- Szumilas, M., & Kutcher, S. (2011). Post-suicide intervention programs: a systematic review. *Can J Public Health*, 102(1), 18-29.
- Toosi, M. (2015). *Labor force projections to 2024: The labor force is growing, but slowly*. Washington, D.C.: Bureau of Labor Statistics.
- Turecki, G. (2014). Epigenetics and suicidal behavior research pathways. *Am J Prev Med*, 47(3), S144-S151.
- Tyrer, P., Reed, G. M., & Crawford, M. J. (2015). Classification, assessment, prevalence, and effect of personality disorder. *Lancet*, 385(9969), 717-726. doi:10.1016/S0140-6736(14)61995-4
- U.S. Department of Health and Human Services Health Resources and Services Administrations. (2016a). *Designated Health Professional Shortage Areas Statistics, As of November 4, 2016*. Retrieved from <http://datawarehouse.hrsa.gov/topics/shortageAreas.aspx>.
- U.S. Department of Health and Human Services Health Resources and Services Administrations. (2016b). *NHSC Clinician Retention: A Story of Dedication and Commitment*. Retrieved from <https://nhsc.hrsa.gov/currentmembers/membersites/retainproviders/retentionbrief.pdf>.
- U.S. Office of the Surgeon General, & National Action Alliance for Suicide Prevention. (2012). *2012 National Strategy for Suicide Prevention: Goals and Objectives for Action*. Washington, D.C.: HHS.



- U.S. Public Health Service. (1999). *The Surgeon General's Call to Action to Prevent Suicide*. Washington, D.C.
- Unutzer, J., Tang, L., Oishi, S., Katon, W., Williams, J. W., Jr., Hunkeler, E., . . . Langston, C. (2006). Reducing suicidal ideation in depressed older primary care patients. *J Am Geriatr Soc*, 54(10), 1550-1556.
- Visser, V. S., Comans, T. A., & Scuffham, P. A. (2014). Evaluation Of The Effectiveness Of A Community-Based Crisis Intervention Program For People Bereaved By Suicide. *Journal of Community Psychology*, 42(1), 19-28. doi:10.1002/jcop.21586
- Walrath, C., Garraza, L. G., Reid, H., Goldston, D. B., & McKeon, R. (2015). Impact of the Garrett Lee Smith youth suicide prevention program on suicide mortality. *Am J Public Health*, 105(5), 986-993. doi:10.2105/AJPH.2014.302496
- Wang, Y. C., Hsieh, L. Y., Wang, M. Y., Chou, C. H., Huang, M. W., & Ko, H. C. (2016). Coping Card Usage can Further Reduce Suicide Reattempt in Suicide Attempter Case Management Within 3-Month Intervention. *Suicide Life Threat Behav*, 46(1), 106-120. doi:10.1111/sltb.12177
- Wasserman, D., Hoven, C. W., Wasserman, C., Wall, M., Eisenberg, R., Hadlaczky, G., . . . Carli, V. (2014). School-based suicide prevention programmes: The SEYLE cluster-randomised, controlled trial. *The Lancet*, 385(9977), 1536-1544. doi:10.1016/S0140-6736(14)61213-7
- Webster-Stratton, C., & Hammond, M. (1997). Treating children with early-onset conduct problems: a comparison of child and parent training interventions. *J Consult Clin Psychol*, 65(1), 93-109.
- Webster-Stratton, C., Reid, M. J., & Hammond, M. (2001). Preventing conduct problems, promoting social competence: a parent and teacher training partnership in head start. *J Clin Child Psychol*, 30(3), 283-302. doi:10.1207/S15374424JCCP3003\_2
- Webster-Stratton, C. H., Reid, M. J., & Beauchaine, T. (2011). Combining parent and child training for young children with ADHD. *Journal of Clinical Child & Adolescent Psychology*, 40(2), 191-203.
- Webster-Stratton, C., Jamila Reid, M., & Stoolmiller, M. (2008). Preventing conduct problems and improving school readiness: evaluation of the incredible years teacher and child training programs in high-risk schools. *Journal of child psychology and psychiatry*, 49(5), 471-488.
- Wilcox, H. C., Kellam, S. G., Brown, C. H., Poduska, J. M., Ialongo, N. S., Wang, W., & Anthony, J. C. (2008). The impact of two universal randomized first- and second-grade classroom interventions on young adult suicide ideation and attempts. *Drug Alcohol Depend*, 95 Suppl 1, S60-73.
- Wilkins, N., Tsao, B., Hertz, M., Davis, R., & Klevens, J. (2014). Atlanta, GA: National Center for Injury Prevention and Control, Centers for Disease Control and Prevention.
- World Health Organization. (2013). *Global and Regional Estimates of Violence Against Women: Prevalence and Health Effects of Intimate Partner Violence and Non-Partner Sexual Violence*. Geneva: World Health Organization.
- World Health Organization. (2014). *Suicide Prevention: A Global Imperative*. Geneva, Switzerland: WHO Press.
- Wyman, P. A., Brown, C. H., LoMurray, M., Schmeelk-Cone, K., Petrova, M., Yu, Q., . . . Wang, W. (2010). An outcome evaluation of the Sources of Strength suicide prevention program delivered by adolescent peer leaders in high schools. *Am J Public Health*, 100(9), 1653-1661. doi:
- Yip, P., Caine, E., Yousuf, S., Chang, S.-S., Wu, K., & Chen, Y.-Y. (2012). Means restriction for suicide prevention. *Lancet*, 379. doi:10.1016/s0140-6736(12)60521-2

## Appendix A: Summary of Strategies and Approaches to Prevent Suicide

Strategy	Approach/Program, Practice or Policy	Best Available Evidence			Lead Sectors <sup>1</sup>
		Suicide	Suicide Attempts or Ideation	Other Risk/Protective Factors for Suicide	
Strengthen economic supports	<b>Strengthen household financial security</b>				Government (local, state, Federal)
	<i>Unemployment benefit programs</i>	✓		✓	Business/labor
	<i>Other income supports</i>	✓			
	<b>Housing stabilization policies</b>				Government (local, state, Federal)
	<i>The National Neighborhood Stabilization Program</i>			✓	
Strengthen access and delivery of suicide care	<b>Coverage of mental health conditions in health insurance policies</b>				Government (local, state, Federal)
	<i>Mental Health Parity Laws</i>	✓		✓	
	<b>Reduce provider shortages in underserved areas</b>				
	<i>National Health Service Corps (NHSC)</i>			✓	Healthcare
	<i>Telemental health (TMH)</i>			✓	Social services
	<b>Safer suicide care through systems change</b>				
	<i>Henry Ford Perfect Depression Care (Precursor to Zero Suicide)</i>	✓		✓	
Create protective environments	<b>Reduce access to lethal means among persons at-risk</b>				Government (local, state)
	<i>Intervening at suicide hot spots</i>	✓			
	<i>Safe storage practices</i>		✓	✓	Public Health
	<i>Emergency Department Counseling on Access to Lethal Means (ED CALM)</i>			✓	
	<b>Organizational policies and culture</b>				



		Best Available Evidence			
	<i>Together for Life</i>	✓			Business/Labor
					Justice
	<i>US Air Force Suicide Prevention Program</i>	✓		✓	Government (local, state, Federal)
	<i>Correctional suicide prevention</i>	✓			
	<b>Community-based policies to reduce excessive alcohol use</b>				Government (local, state)
	<i>Alcohol outlet density</i>	✓		✓	Business/labor
<b>Promote connectedness</b>	<b>Peer norm programs</b>				Public Health
	<i>Sources of Strength</i>			✓	Education
	<b>Community engagement activities</b>				Public Health
	<i>Greening vacant urban spaces</i>			✓	Government (local
<b>Teach coping and problem-solving skills</b>	<b>Social emotional learning programs</b>				Public Health
	<i>Youth Aware of Mental Health Program</i>		✓	✓	Education
	<i>Good Behavior Game</i>		✓	✓	
	<b>Parenting skill and family relationship approaches</b>				Public Health
	<i>The Incredible Years</i>			✓	Education

		Best Available Evidence			
	<i>Strengthening Families 10–14</i>			✓	
Identify and support people at-risk	<b>Gatekeeper training</b>				Public Health
	<i>Applied Suicide Intervention Skills Training</i>			✓	Healthcare
	<i>Garret Lee Smith Federal Grant Program</i>	✓	✓		
	<b>Crisis Intervention</b>				Public Health
	<i>National Suicide Prevention Lifeline</i>		✓	✓	Social Services
	<b>Treatment for people at risk of suicide</b>				
	<i>Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)</i>		✓	✓	
	<i>Collaborative Assessment and Management of Suicidality (CAMS)</i>		✓	✓	Healthcare
	<i>Dialectical Behavioral Therapy (DBT)</i>		✓	✓	Social Services
	<i>Attachment-Based Family Therapy (ABFT)</i>		✓		Justice
	<i>Translating Initiatives for Depression into Effective Solutions project (TIDES)</i>			✓	
	<b>Treatment to prevent re-attempts</b>				
	<i>ED Brief Intervention with Follow-up Visits</i>	✓			Healthcare
	<i>Active follow-up contact approaches</i>	✓	✓		Social services
	<i>CBT for Suicide Prevention</i>		✓		



		Best Available Evidence			
Lessen harms and prevent future risk	Postvention				Healthcare
	StandBy Response Service		✓	✓	
	Safe reporting following a suicide				Public Health
	Media Guidelines	✓			Media

<sup>1</sup>This column refers to the lead sectors well positioned to bring leadership and resources to implementation efforts. For each strategy, there are many other sectors such as non-governmental organizations that are instrumental to prevention planning and implementing specific activities.

DRAFT NARRATIVE FOR CDC CLEARANCE

The information in this narrative has not been cleared for dissemination.  
Please do not cite, copy or disseminate

**Preventing Suicide:  
A Technical Package of Policy, Programs, and Practices**

**Prepared by:**

Deb Stone, ScD, MSW, MPH  
Kristin Holland, PhD, MPH  
Brad Bartholow, PhD  
Alex Crosby, MD, MPH  
Shane Davis, PhD  
Natalie Wilkins, PhD

**Division of Violence Prevention  
National Center for Injury Prevention and Control (NCIPC)  
Centers for Disease Control and Prevention**

**2017**



***Preventing Suicide: A Technical Package of Policies, Programs, and Practices* is a publication of the  
National Center for Injury Prevention and Control of the Centers for Disease Control and  
Prevention.**

Centers for Disease Control and Prevention  
Thomas R. Frieden, MD, MPH, Director

National Center for Injury Prevention and Control  
Debra E. Houry, MD, MPH, Director

Division of Violence Prevention  
James A. Mercy, PhD, Director

***Suggested Citation:*** Stone, D.M., Holland, K.M., Bartholow, B., Crosby, A.E., Davis, S., and Wilkins, N.  
***Preventing Suicide: A Technical Package of Policies, Programs, and Practices.*** Atlanta, GA: National  
Center for Injury Prevention and Control, Centers for Disease Control and Prevention, 2017.

## Contents

Acknowledgements.....	4
External Reviewers.....	5
Overview of Technical Package.....	6
Strengthen Economic Supports.....	14
Strengthen Access and Delivery of Suicide Care.....	17
Create Protective Environments.....	21
Promote Connectedness.....	26
Teach Coping and Problem-Solving Skills.....	28
Identify and Support People At-Risk.....	31
Lessen Harms and Prevent Future Risk.....	37
Sector Involvement.....	39
Monitoring and Evaluation.....	41
Conclusion.....	42
References.....	44
Appendix A.....	50



## Acknowledgements

We would like to thank the following individuals who contributed in specific ways to the development of this technical package. We give special thanks to Linda Dahlberg for her vision, guidance, and support throughout the development of this package. We thank Division, Center, and CDC leadership for their careful review and helpful feedback on earlier iterations of this document. We thank Alida Knuth for her formatting and design expertise. Last but definitely not least, we extend our thanks and gratitude to all the external reviewers for their helpful feedback, support and encouragement for this resource.

## External Reviewers

Casey Castaldi  
Prevention Institute

Carmen Clelland  
Office for State, Tribal, Local and Territorial  
Support, Centers for Disease Control and  
Prevention

Amalia Corby-Edwards  
American Psychological Association

Rachel Davis  
Prevention Institute

Pamela End of Horn  
Indian Health Service Headquarters

Craig Fisher  
American Psychological Association

Keita Franklin  
Department of Defense

Jill M. Harkavy Friedman  
American Foundation for Suicide Prevention

Jarrold Hindman  
Colorado Department of Public Health and  
Environment

Linda Langford  
Education Development Center, Inc.

Richard McKeon  
Substance Abuse and Mental Health Services  
Administration

Doreen S. Marshall  
American Foundation for Suicide Prevention

Christine Moutier  
American Foundation for Suicide Prevention

Jason H. Padgett  
Education Development Center, Inc.

Jerry Reed  
Education Development Center, Inc.

Christine Schuler  
National Institute for Occupational Safety and  
Health, Centers for Disease Control and  
Prevention

Morton Silverman  
Education Development Center, Inc.

Ellyson Stout  
Education Development Center, Inc.

Hope M. Tiesman  
National Institute for Occupational Safety and  
Health, Centers for Disease Control and  
Prevention

Dan Reidenberg  
Suicide Awareness Voices for Education (SAVE)

The experts above are listed with their affiliations at the time this document was reviewed.



## Overview

This technical package represents a select group of strategies based on the best available evidence to help communities and states sharpen their focus on prevention activities with the greatest potential to prevent suicide. These strategies include: strengthening economic supports; strengthening access and delivery of suicide care; creating protective environments; promoting connectedness; teaching coping and problem-solving skills; identifying and supporting people at-risk; and lessen harms and prevent future risk. The strategies represented in this package include those with a focus on preventing suicide from happening in the first place as well as approaches to lessen the immediate and long-term harms of suicidal behavior for individuals, families, communities, and society. The strategies in the technical package support the goals and objectives of the National Strategy for Suicide Prevention and the National Action Alliance for Suicide Prevention's priority to strengthen community-based prevention. Commitment, cooperation, and leadership from numerous sectors, including public health, education, justice, health care, social services, business, labor, and government could support the implementation of this package.

### What is a Technical Package?

A technical package is a compilation of a core set of strategies to achieve and sustain substantial reductions in a specific risk factor or outcome (Frieden, 2014). Technical packages help communities and states prioritize prevention activities based on the best available evidence. This technical package has three components. The first component is the **strategy** or the preventive direction or actions to achieve the goal of preventing suicide. The second component is the **approach**. The approach includes the specific ways to advance the strategy. This can be accomplished through *programs, policies, and practices*. The approaches included come primarily from studies based in the United States. The **evidence** for each of the approaches in preventing suicide or its associated risk factors is included as the third component. This package is intended as a resource to guide and inform prevention decision-making in communities and states.

### Preventing Suicide is a Priority

Suicide, as defined by the Centers for Disease Control and Prevention (CDC), is part of a broader class of behavior called *self-directed violence*. Self-directed violence refers to behavior directed at oneself that deliberately results in injury or the *potential* for injury (Crosby, Ortega, & Melanson, 2011). Self-directed violence may be *suicidal* or *non-suicidal* in nature. For the purposes of this document, we refer only to behavior where suicide is intended:

- **Suicide** is a death caused by self-directed injurious behavior with any intent to die as a result of the behavior.



- **Suicide attempt** is defined as a *non-fatal* self-directed and potentially injurious behavior with any intent to die as a result of the behavior. A suicide attempt may or may not result in injury.

**Suicide is highly prevalent.** Suicide presents a major challenge to public health in the United States and worldwide. It contributes to premature death, morbidity, lost productivity, and health care costs (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014). In 2015 (the most recent year of available death data), suicide was responsible for 44,193 deaths in the U.S., which is approximately one suicide every 12 minutes (Centers for Disease Control and Prevention, 2016). In 2015, suicide ranked as the 10th leading cause of death and has been among the top 12 leading causes of death since 1975 in the U.S (Centers for Disease Control and Prevention, 2016). Overall suicide rates increased 24% from 1999 to 2014 (Curtin, Warner, & Hedegaard, 2016), with the inclusion of 2015 data, that percentage has risen to more than 25%. Suicide is a problem throughout the life span; it is the second leading cause of death among those aged 10–34 years; the fourth leading cause among persons in their 40s, and seventh leading cause among persons in their 50s.

Suicide rates vary by race/ethnicity, age, and other population characteristics, with the highest rates across the lifespan occurring among non-Hispanic American Indian/Alaska Native (AI/AN) and non-Hispanic White population groups. In 2014, the rates for these groups were 17.8 and 16.4 per 100,000 population, respectively (Centers for Disease Control and Prevention, 2016). Other population groups disproportionately impacted by suicide include middle-aged adults (whose rates increased 48% from 1999 to 2014, with steep increases seen among both males (43%) and females (63%) aged 45-64 years; (Curtin et al., 2016); Veterans and other military personnel (whose suicide rate nearly doubled from 2003 to 2008, surpassing the rate of suicide among civilians for the first time in decades; (Bachynski et al., 2012; Lineberry & O'Connor, 2012); workers in certain occupational groups (e.g., protective service occupations; workers in farming, fishing, and forestry; McIntosh et al., 2016); and lesbian, gay, bisexual, and/or queer (LGBQ) youth, who experience increased suicidal ideation and behavior compared to their heterosexual counterparts (Kann et al., 2016; Russell & Joyner, 2001).

Suicides reflect only a portion of the problem (Crosby, Han, Ortega, Parks, & Gfroerer, 2011). Substantially more people are hospitalized as a result of nonfatal suicidal behavior (i.e. suicide attempts) than are fatally injured, and an even greater number are either treated in ambulatory settings (e.g., emergency departments) or not treated at all (Crosby, Han, Ortega, Parks, & Gfroerer, 2011). For example, during 2014, among adults aged 18 years and older, for every one suicide there were 9 adults treated in hospital emergency departments for self-harm injuries, 27 who reported making a suicide attempt, and over 227 who reported seriously considering suicide (i.e. ideation) (David-Ferdon, et al., 2016).



**Suicide is associated with several risk and protective factors.** Suicide, like other human behaviors, has no single determining cause. Instead, suicide occurs in response to multiple biological, psychological, interpersonal, environmental and societal influences that interact with one another, often over time. The social-ecological model – encompassing multiple levels of focus from the individual, relationship, community, and societal – is a useful framework for viewing and understanding suicide risk factors identified in the literature (Dahlberg & Krug, 2002). Risk and protective factors for suicide exist at each level. For example, risk factors include:

- **Individual level:** history of depression and other mental illnesses, hopelessness, substance abuse, certain health conditions, previous suicide attempt, violence victimization and perpetration, and genetic and biological determinants
- **Relationship level:** high conflict or violent relationships, sense of isolation and lack of social support, family/loved one's history of suicide, financial and work stress
- **Community level:** inadequate community connectedness, barriers to health care (e.g., lack of access to providers and medications)
- **Societal level:** availability of lethal means of suicide, unsafe media portrayals of suicide, stigma associated with help-seeking and mental illness (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014).

It is important to recognize that the vast majority of individuals who are depressed, attempt suicide, or have other noted risk factors, do *not* die by suicide. Furthermore, the relevance of each risk factor can vary by age, race, gender, sexual orientation, residential geography, and socio-cultural and economic status (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014).

Protective factors, or those influences that buffer against the risk for suicide, can also be found across the different levels of the social-ecological model. Protective factors identified in the literature include: effective coping and problem solving skills, moral objections to suicide, strong and supportive relationships with partners, friends, and family; connectedness to school, community, and other social institutions; availability of quality and ongoing physical and mental health care, and reduced access to lethal means (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014). These protective factors can either counter a specific risk factor or buffer against a number of risks associated with suicide.

**Suicide is connected to other forms of violence.** Exposure to violence (e.g., child abuse and neglect, bullying, peer violence, dating violence, sexual violence, and intimate partner violence) is associated with increased risk of depression, post-traumatic stress disorder (PTSD), anxiety, suicide, and suicide attempts (Bossarte et al., 2014; Chapman et al., 2004; Dube et al., 2001; Felitti et al., 1998; Klomek, Sourander, & Gould, 2010; Leeb, Lewis, & Zolotor, 2011; World Health Organization, 2013). Women exposed to

partner violence are nearly 5 times more likely to attempt suicide as women not exposed to partner violence (WHO, 2013). Exposure to adverse experiences in childhood, such as physical, sexual, emotional abuse and neglect, and living in homes with violence, mental health, substance abuse problems and other instability, is associated with increased risk for suicide and suicide attempts several fold (Bellis et al., 2014; Dube et al., 2001). The psychosocial effects of violence in childhood and adolescence can be observed decades later, including severe problems with finances, family, jobs, and stress – factors that can increase the risk for suicide. Suicide and other forms of violence often share the same individual, relationship, community, and societal risk factors suggesting that efforts to prevent interpersonal violence may also prove beneficial in preventing suicide (Haegerich & Dahlberg, 2011; Hamby & Grych, 2013; Wilkins, Tsao, Hertz, Davis, & Klevens, 2014). Further, just as risk factors may be shared across suicide and interpersonal violence, so too may protective factors overlap. For example, connectedness to one's community (Kleiman, Riskind, Schaefer, & Weingarden, 2012), school (Carter, McGee, Taylor, & Williams, 2007), family (Maimon, Browning, & Brooks-Gunn, 2010), caring adults (Capaldi, Knoble, Shortt, & Kim, 2012; Losel & Farrington, 2012), and pro-social peers (Wyman et al., 2010) can enhance resilience and help reduce risk for suicide and other forms of violence.

**The health and economic consequences of suicide are substantial.** Suicide and suicide attempts have far reaching consequences for individuals, families, and communities (Dunne, McIntosh, & Dunne-Maxim, 1987; Mishara, 1995; National Action Alliance for Suicide Prevention: Suicide Attempt Survivors Task Force, 2014; National Action Alliance for Suicide Prevention: Survivors of Suicide Loss Task Force, 2015). In an early study, Crosby and Sacks (2002) estimated that 7% of the U.S. adult population, or 13.2 million adults, knew someone in the prior 12 months who had died by suicide. They also estimated that for each suicide, 425 adults were exposed, or knew about the death. In a more recent study, in one state, Cerel et al. (2016) found that 48% of the population knew at least one person who died by suicide in their lifetime. Research indicates that the impact of knowing someone who died by suicide and/or having lived experience (i.e., personally have attempted suicide, have had suicidal thoughts, or have been impacted by suicidal loss) is much more extensive than injury and death. People with lived experience may suffer long-term health and mental health consequences ranging from anger, guilt, and physical impairment, depending on the means and severity of the attempt (Chapman & Dixon-Gordon, 2007). Similarly, survivors of a loved one's suicide may experience ongoing pain and suffering including complicated grief (Mitchell, Kim, Prigerson, & Mortimer-Stephens, 2004), stigma, depression, anxiety, post-traumatic stress disorder, and increased risk of suicidal ideation and suicide (Cerel, McIntosh, Neimeyer, Maple, & Marshall, 2014; Sudak, Maxim, & Carpenter, 2008). Less discussed but no less important, are the financial and occupational effects for those left behind (Florence, Simon, Haegerich, Luo, & Zhou, 2015).

The economic toll of suicide is immense as well. According to conservative estimates, in 2013, suicide cost \$50.8 billion in estimated lifetime medical and work-loss costs alone (Florence et al., 2015). Adjusting for potential under-reporting of suicide and drawing upon health expenditures per capita, GDP



per capita, and variability among states in per capita health care expenditures and income, another study estimated the total lifetime costs associated with nonfatal injuries and deaths caused by self-directed violence to be approximately \$93.5 billion in 2013 (Shepard, Gurewich, Lwin, Reed, & Silverman, 2016). The overwhelming burden of these costs were from lost productivity over the life course, with the average cost per suicide being over \$1.3 million (Shepard et al., 2016). The true economic costs are likely higher, as neither study included monetary figures related to other societal costs such as those associated with the pain and suffering of family members or other impacts.

**Suicide can be prevented.** Like most public health problems, suicide is preventable (U.S. Public Health Service, 1999). While progress will continue to be made into the future, evidence for numerous programs, practices, and policies currently exists, and many programs are ready to be implemented now. Just as suicide is not caused by a single factor, research suggests that reductions in suicide will not be prevented by any single strategy or approach (Silverman & Maris, 1995; U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). Rather, suicide prevention is best achieved by a focus across the individual, relationship, family, community, and societal-levels and across all sectors, private and public (e.g., business, public health, physical and behavioral healthcare, justice, education, and labor; National Action Alliance for Suicide Prevention, 2014; World Health Organization, 2014).

### Assessing the Evidence

This technical package includes programs, practices, and policies with evidence of impact on suicide or risk or protective factors for suicide. To be considered for inclusion in the technical package, the program, practice, or policy selected had to meet at least one of these criteria: a) meta-analyses or systematic reviews showing impact on suicide; b) evidence from at least one rigorous (e.g., randomized controlled trial [RCT] or quasi-experimental design) evaluation study that found significant preventive effects on suicide; c) meta-analyses or systematic reviews showing impact on risk or protective factors for suicide, or d) evidence from at least one rigorous (e.g., RCT or quasi-experimental design) evaluation study that found significant impacts on risk or protective factors for suicide. Finally, consideration was also given to the likelihood of achieving beneficial effects on multiple forms of violence; no evidence of harmful effects on specific outcomes or with particular subgroups; and feasibility of implementation in a U.S. context if the program, policy, or practice has been evaluated in another country.

Within this technical package, some approaches do not yet have research evidence demonstrating impact on rates of suicide but instead are supported by evidence indicating impacts on risk or protective factors for suicide (e.g., help-seeking, stigma reduction, depression, connectedness). In terms of the strength of the evidence, programs that have demonstrated effects on suicidal behavior (e.g., reductions in deaths, attempts) provide a higher-level of evidence, but the evidence base is not that strong in all areas. For instance, there has been less evaluation of community engagement and family programs on



suicidal behavior. Thus, approaches in this package that have effects on risk or protective factors reflect the developing nature of the evidence base and the use of the best available evidence at a given time.

It is also important to note that there is often significant heterogeneity among the programs, policies, or practices that fall within one approach or strategy area in terms of the nature and quality of the available evidence. Not all programs, policies, or practices that utilize the same approach are equally effective, and even those that are effective may not work across all populations. Tailoring programs and more evaluation may be necessary to address different population groups. The evidence-based programs, practices, or policies included in the package are not intended to be a comprehensive list for each approach, but rather to serve as examples that have been shown to impact suicide or have beneficial effects on risk or protective factors for suicide.

### Context and Cross-Cutting Themes

One important feature of the package is the complementary, but potentially synergistic impact of the strategies and approaches. The strategies and approaches included in this technical package represent different levels of the social ecology, with efforts intended to impact community and societal levels, as well individual and relationship levels. The strategies and approaches are intended to work in combination and reinforce each other to prevent suicide (see box below). The strategies are arranged in order such that those strategies hypothesized to have the greatest potential for broad public health impact on suicide are included first, followed by those that might impact more select populations (e.g., persons who have already made a suicide attempt).

Preventing Suicide	
Strategy	Approach
Strengthen economic supports	<ul style="list-style-type: none"> <li>Strengthen household financial security</li> <li>Housing stabilization policies</li> </ul>
Strengthen access and delivery of suicide care	<ul style="list-style-type: none"> <li>Coverage of mental health conditions in health insurance policies</li> <li>Reduce provider shortages in underserved areas</li> <li>Safer suicide care through systems change</li> </ul>
Create protective environments	<ul style="list-style-type: none"> <li>Reduce access to lethal means among persons at-risk of suicide</li> <li>Organizational policies and culture</li> <li>Community-based policies to reduce excessive alcohol use</li> </ul>
Promote connectedness	<ul style="list-style-type: none"> <li>Peer norm programs</li> <li>Community engagement activities</li> </ul>
Teach coping and problem-solving skills	<ul style="list-style-type: none"> <li>Social-emotional learning programs</li> <li>Parenting skill and family relationship approaches</li> </ul>
Identify and support people at risk	<ul style="list-style-type: none"> <li>Gatekeeper training</li> <li>Crisis Intervention</li> <li>Treatment for people at risk of suicide</li> </ul>



	<ul style="list-style-type: none"> <li>• Treatment to prevent re-attempts</li> </ul>
Lessen harms and prevent future risk	<ul style="list-style-type: none"> <li>• Postvention</li> <li>• Safe reporting following a suicide</li> </ul>

It is important to note that these strategies are not mutually exclusive but each has an immediate focus. For instance, social emotional learning programs, an approach under the *Teach Coping and Problem-Solving Skills* strategy, sometimes include components to change peer norms and the broader environment. The primary focus of these programs, however, is to provide children and youth with skills to resolve problems in relationships, school, and with peers, and to help youth address other negative influences (e.g., substance use) associated with suicide.

The goal of this package is to stress the importance of comprehensive prevention efforts and to provide examples of effective programs addressing each level of the social ecology, with the knowledge that some programs, practices, and policies may impact multiple levels. Further, those that involve multiple sectors and that impact multiple levels of the social ecology are more likely to have a greater impact on the overall burden of suicide.

Suicide ideation, thoughts, attempts, and deaths vary by gender, race/ethnicity, age, occupation, and other important population characteristics. Further, certain transition periods are also associated with higher rates of suicide (e.g., transition from working into retirement, transition from active duty military status to civilian status). In fact, suicide risk can change along with dynamic risk factors. For example, individuals' coping skills may change during periods of crisis and heightened stress, limiting their normal ability to effectively solve problems and cope. Research indicates that suicide risk changes as a result of the number and intensity of key risk and protective factors experienced (Turecki, 2014). Ideally, the availability of multiple strategies and approaches tailored to the social, economic, cultural, and environmental context of individuals and communities are desirable as they may increase the likelihood of removing barriers to supportive and effective care and provide opportunities to develop individual and community resilience.

Identifying programs, practices, and policies with evidence of impact on suicide, suicide attempts, or beneficial effects on risk or protective factors for suicide is only the first step. In practice, the effectiveness of the programs, policies and practices identified in this package will be strongly dependent on how well programs are implemented, as well as the partners and communities in which they are implemented. Practitioners in the field may be in the best position to assess the needs and strengths of their communities and work with community members to make decisions about the combination of approaches included here that are best suited to their context.

Data-driven strategic planning processes can help communities with this work (e.g., see Edwards, Jumper-Thurman, Plested, Oetting, & Swanson, 2000; Hawkins, Catalano, & Kuklinski, 2014; Plested, Edwards, & Jumper-Thurman, 2006). These planning processes engage and guide community

stakeholders through a prevention planning process designed to address a community's profile of risk and protective factors with evidence-based programs, practices, and policies. These processes can also be used to monitor implementation, track outcomes, and make adjustments as indicated by the data. The readiness of the program for broad dissemination and implementation (e.g., availability of program materials, training and technical assistance) can also influence program effects. Implementation guidance to assist practitioners, organizations and communities will be developed separately.

This package includes strategies where public health agencies are well positioned to bring leadership and resources to implementation efforts. It also includes strategies where public health can serve as an important collaborator (e.g., strategies addressing community and societal level risks), but where leadership and commitment from other sectors such as business, labor or health care is critical to implement a particular policy or program (e.g., workplace policies; treatment to prevent re-attempts). The role of various sectors in the implementation of a strategy or approach in preventing suicide is described further in the section on *Sector Involvement*.

In the sections that follow, the strategies and approaches with the best available evidence for preventing suicide are described.



## Strengthen Economic Supports

### Rationale

Studies from the U.S. examining historical trends indicate that suicide rates increase during economic recessions marked by high unemployment rates, job losses, and economic instability and decrease during economic expansions and periods marked by low unemployment rates, particularly for working-age individuals 25 to 64 years old (Luo et al., 2011; Fowler et al., 2015). Economic and financial strain, such as job loss, long periods of unemployment, reduced income, difficulty covering medical, food, and housing expenses, and even the anticipation of such financial stress may increase an individual's risk for suicide or may indirectly increase risk by exacerbating related physical and mental health problems. Buffering these risks can, therefore, potentially protect against suicide (Stack & Wasserman, 2007). For example, strengthening economic support systems can help people stay in their homes or obtain affordable housing while also paying for necessities such as food and medical care, job training, child care, among other expenses required for daily living. In providing this support, stress and anxiety and the potential for a crisis situation may be reduced, thereby preventing suicide. Although more research is needed to understand how economic factors interact with other factors to increase suicide risk, the available evidence suggests that strengthening economic supports may be one opportunity to buffer suicide risk.

### Approaches

Economic supports for individuals and families can be strengthened by targeting household financial security and ensuring stability in housing during periods of economic stress.

- **Strengthening household financial security** can potentially buffer the risk of suicide by providing individuals with the financial means to lessen the stress and hardship associated with a job loss or other unanticipated financial problems. The provision of unemployment benefits and other forms of temporary assistance, livable wages, medical benefits, and retirement and disability insurance to help cover the cost of necessities or to offset costs in the event of disability, are examples of ways to strengthen household financial security.
- **Housing stabilization policies** aim to keep people in their homes and provide housing options for those in need during times of financial insecurity. This may occur through programs that provide affordable housing such as through government subsidies or through other options available to potential homebuyers such as loan modification programs, move-out planning, or financial counseling services that help minimize the risk or impact of foreclosures and eviction.



## Potential Outcomes

- Reductions in foreclosure rates
- Reductions in eviction rates
- Reductions in emotional distress
- Reductions in suicide

## Evidence

There is evidence suggesting that strengthening household financial security and stabilizing housing can reduce suicide risk.

- **Strengthen household financial security.** The *Federal-State Unemployment Insurance Program* allows states to define the maximum amount and duration of unemployment benefits that workers are entitled to receive after a job loss (Cylus, Glymour, & Avendano, 2014). An examination of variations in *unemployment benefit programs* across states demonstrated that the impact of unemployment on rates of suicide was offset in those states that provided greater than average unemployment benefits (mean level: \$7,990 per person in U.S. constant dollars; Cylus et al., 2014). The effects of *unemployment benefit programs* were also consistent by sex and age group. Another U.S. study examining the link between unemployment and suicide rates using monthly suicide data, length of unemployment (less than 5 weeks, 5-14 weeks, 15-26 weeks, and greater than 26 weeks), and job losses found that the duration of unemployment, as opposed to just the loss of job, predicted suicide risk (Classen & Dunn, 2012). Together, these results suggest that not only should state unemployment benefit programs be generous in their financial allocations, but also in their duration.

Other measures to strengthen household financial security (e.g., transfer payments related to retirement and disability insurance, unemployment insurance compensation, medical benefits, and other forms of family assistance) have also shown an impact on rates of suicide. A study by Flavin and Radcliff (2009) examined the impact of states' per capita spending on transfer payments, medical benefits, and family assistance (Temporary Assistance to Needy Families – TANF) and total state spending on suicide rates between 1990-2000, controlling for a number of suicide risk factors (e.g., residential mobility, divorce rate, unemployment rate) at the state level. As per capita spending on total transfer payments, medical benefits, and family assistance increased there was an associated decrease in state suicide rates. In terms of lives saved, Flavin & Radcliff calculated the cost of reducing a state's suicide rate by a full point for the years studied. At the national level, they estimated 3,000 fewer suicides would occur per year nationwide if every state increased its per capita spending on these types of assistance by \$45 per year (Flavin & Radcliff, 2009). Although this was a correlational study, the results demonstrate the potential benefits of policies that reach particularly vulnerable individuals during periods of great need and



increased risk for suicide. More evaluation studies are needed to further understand the outcomes impacted by programs such as these.

- **Housing stabilization policies.** The *National Neighborhood Stabilization Program* was designed to help neighborhoods suffering from high rates of foreclosure and abandonment by slowing the deterioration of the neighborhoods and providing affordable housing options for low, moderate, and middle-income homebuyers. This program also offers financial assistance to eligible individuals for the purchase of a new home. Although this program has not been rigorously evaluated for its impact on suicide outcomes, it addresses foreclosure and eviction, which are risk factors for suicide. A longitudinal analysis of annual data on suicides and foreclosures demonstrated that as the proportion of foreclosed properties increased in U.S. states, so did the state suicide rate, particularly among working-aged adults (Houle & Light, 2014). Another study of data from 16 U.S. states participating in the National Violent Death Reporting System found that suicides precipitated by home foreclosures and evictions increased more than 100% from 2005 (before the housing crisis began) to 2010 (after it had peaked; Fowler, Gladden, Vagi, Barnes, and Frazier (2015)). Most of these suicides occurred prior to the actual loss of the decedent's home. These findings suggest that integrating suicide prevention resources, messaging, and referrals into financial, foreclosure, and move-out planning and counseling services may help to prevent suicide.

## Strengthen Access and Delivery of Suicide Care

### Rationale

While most people with mental health problems do not attempt or die by suicide (Olfson, Gerhard, Huang, Crystal, & Stroup, 2015; Owens, 2002), and the level of risk conferred by different types of mental illness varies (Arsenault-Lapierre, Kim, & Turecki, 2004; Harris & Barraclough, 1997; Tyrer, Reed, & Crawford, 2015), previous research indicates that mental illness is an important risk factor for suicide (Harris & Barraclough, 1998; World Health Organization, 2014). State-level suicide rates have also been found to be correlated with general mental health measures such as depression (Lang, 2013; Mark, Shern, Bagalman, & Cao, 2007). Findings from the National Comorbidity Survey indicate that relatively few people in the U.S. with mental health disorders receive treatment for those conditions (Kessler et al., 2005). Lack of access to mental health care is one of the contributing factors related to the underuse of mental health services (Cunningham, 2009). Identifying ways to improve access to timely, affordable, and quality mental health and suicide care for people in need is a critical component to prevention (World Health Organization, 2014). Additionally, research suggests that services provided are maximized when health and behavioral health care systems are set up to effectively and efficiently deliver such care (Coffey, 2007). Apart from treatment benefits, these approaches can also normalize help-seeking behavior and increase the use of such services.

### Approaches

There are a number of approaches that can be used to strengthen access and delivery of suicide care, including:

- **Coverage of mental health conditions in health insurance policies.** Federal and state laws include provisions for equal coverage of mental health services in health insurance plans that is on par with coverage for other health concerns (i.e., mental health parity). Benefits and services covered include such things as the number of visits, co-pays, deductibles, inpatient/outpatient services, prescription drugs, and hospitalizations. If a state has a stronger mental health parity law than the federal parity law, then insurance plans regulated by the state must follow the state parity law. If a state has a weaker parity law than the federal parity law (e.g., includes coverage for some mental health conditions but not others), then the federal parity law will replace the state law. Equal coverage does not necessarily imply good coverage as health insurance plans vary in the extent to which benefits and services are offered to address various health conditions. Rather it helps to ensure that mental health services are covered on par with other health concerns.
- **Reduce provider shortages in underserved areas.** Access to effective and state-of-the-art mental health care is largely dependent upon the training and the size of the mental health care workforce. Over 85 million Americans live in areas with an insufficient number of mental health

Comment [A]: Double check and make sure that this will not need an ACA review



providers; this shortage is particularly severe among low-income urban and rural communities (U.S. Department of Health and Human Services Health Resources and Services Administrations, 2016a). There are a range of ways to increase the number and distribution of practicing mental health providers in underserved areas including offering financial incentives through existing state and federal programs (e.g., loan repayment programs) and expanding telemental health services (the use of telephone, video and web-based technology to provide psychiatric or psychological care at a distance). Such approaches can increase the likelihood that those in need will be able to access affordable, quality care for mental health problems, which can reduce risk for suicide.

- **Safer suicide care through systems change.** Access to health and behavioral health care services is critical for people at risk of suicide; however this is just one piece of the puzzle. Care should also be *delivered* efficiently and effectively. More specifically, care should take place within a system that supports suicide prevention and patient safety through strong leadership, workforce training, systematic identification and assessment of suicide risk, implementation of evidence-based treatments (see *Identify and Support People At-Risk*, p.31), continuity of care, and continuous quality improvement. Care that is patient-centered and promotes equity for all patients is also of critical importance (National Action Alliance for Suicide Prevention: Clinical Workforce Preparedness Task Force, 2014).

### Potential Outcomes

- Increases in access to mental health services
- Increase in utilization of mental health services
- Reductions in symptoms of mental illnesses and suicidality
- Reductions in rates of suicide attempts
- Reductions in rates of suicide

### Evidence

There is evidence suggesting that coverage of mental health conditions in health insurance policies and improving access and the delivery of care can reduce risk factors associated with suicide and may directly impact suicide rates.

- **Coverage of mental health conditions in health insurance policies.** The National Survey of Drug Use and Health is a nationally representative survey of the U.S. population that provides data on substance use, mental health conditions, and service utilization. Using data from this survey, Harris, Carpenter, and Bao (2006) found that 12 months after states enacted *mental health parity laws*, self-reported use of mental healthcare services significantly increased. Moreover, subsequent research by Lang (2013) examined state mental health laws and suicide rates

between 1990 and 2004 and found that mental health parity laws, specifically, were associated with an approximate 5% reduction in suicide rates. This reduction, in the 29 states with parity laws, equated to the prevention of 592 suicides per year (Lang, 2013).

- **Reduce provider shortages in underserved areas.** One example of a program to improve access to mental health care providers is the *National Health Service Corps (NHSC)*, which offers financial incentives to attract mental/behavioral health clinicians to underserved areas. Programs such as *NHSC* encourage individuals to work in the mental health profession in locations designated as Health Professional Shortage Areas (HPSAs) in exchange for student loan debt repayment. A 2012 retention survey conducted by the Health Resources and Services Administration (HRSA), found that 61% of mental and behavioral health care providers continued to practice in designated mental health shortage areas after their four year commitment to The National Health Service Corps (U.S. Department of Health and Human Services Health Resources and Services Administrations, 2016b). Although this program has not been evaluated for impact on suicide, it addresses access to care, which is a critical component to suicide prevention.

*Telemental health (TMH)* services refer to the use of telephone, video and web-based technologies for providing psychiatric or psychological care at a distance. *TMH* can be used in a variety of settings (e.g. outpatient clinics, hospitals, military treatment facilities) to treat a wide range of mental health conditions. It can also improve access to care for patients in isolated areas, as well as reduce travel time and expenses, reduce delays in receiving care, and improve satisfaction interacting with the mental health care system. A systematic review of *TMH* services found that services rated as high or good quality were effective in treating mental health conditions such as depression, schizophrenia, substance abuse, and suicidal ideation and suicide deaths among other outcomes (Hailey, Roine, & Ohinmaa, 2008). Further, Mohr and colleagues (2008) conducted a meta-analysis examining the effect of psychotherapy delivered specifically via telephone and found that it significantly reduced depressive symptoms in comparison to face-to-face psychotherapy. They also found that treatment attrition rates were significantly lower among patients receiving telephone-administered psychotherapy compared to patients receiving face-to-face therapy. Thus, *TMH* may not only offer improved access to mental health care, but it may also ensure continuity of care, and thereby further reduce the risk for suicide.

- **Safer suicide care through systems change.** *Henry Ford Healthcare System*, which is a large health maintenance organization (HMO) in the state of Michigan, pioneered the *Perfect Depression Care* program, the pre-cursor to what is now called *Zero Suicide*. The overall goal of *Perfect Depression Care* was to eliminate suicide among HMO members. More broadly, the goal of the program was to redesign delivery of depression care to achieve “breakthrough improvement” in quality and safety by focusing on effectiveness, safety, patient centeredness,



timeliness, efficiency, and equity among patients. The program screened and assessed each patient for suicide risk and implemented coordinated continuous follow-up care system wide (Coffey, 2006). An examination of the impact of the program found that there was a dramatic and statistically significant decrease in the rate of suicide between the baseline years, 1999 and 2000, prior to the intervention to the intervention years, 2002-2009. During this time period, the suicide rate fell by 82% (Coffey, 2006; Coffey, Coffey, & Ahmedani, 2013). Further, among HMO members who received mental health specialty services, the suicide rate significantly decreased over time from 1999 to 2010 (110.3 to 47.6 per 100,000 population;  $p < .04$ ) with a mean of 36.2 per 100,000 over the period. Additionally, for those HMO members who accessed only general medical services as opposed to specialty mental health services, the suicide rate increased from 2.7 to 5.6 per 100,000 ( $p < .01$ ). Similarly, in the state of Michigan, rates of suicide in the general population increased over the period from 9.8 to 12.5 per 100,000 ( $p < .001$ ) (Coffey, Coffey, & Ahmedani, 2015).

## Create Protective Environments

### Rationale

Prevention efforts that focus not only on individual behavior change (e.g., help-seeking, treatment interventions) but on changes to the environment can increase the likelihood of positive behavioral and health outcomes (Haddon, 1980). Creating environments that address risk and protective factors where individuals live, work, and play can help prevent suicide (Dahlberg & Krug, 2002; U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). For example, rates of suicide are high among middle-aged adults (who comprise 42.6% of the workforce; Toosi, 2015); among certain occupational groups (e.g., farming, fishing, forestry, and construction; Han et al., 2016; McIntosh et al., 2016), and among people in detention facilities (e.g. jail, prison), to name a few. Thus, settings where these populations work and reside are ideal for implementing programs, practices and policies to buffer against suicide. Changes to organizational culture through the implementation of supportive policies, for instance, can change social norms, encourage help-seeking, and demonstrate that good health and mental health are valued and that stigma and other risk factors for suicide are not (Knox et al., 2010; National Action Alliance for Suicide Prevention Workplace Task Force, 2015). Similarly, modifying the characteristics of the physical environment to prevent harmful behavior such as access to lethal means can reduce suicide rates, particularly in times of crisis or transition (Beautrais, Gibb, Fergusson, Horwood, & Larkin, 2009; Crosby, Espitia-Hardeman, Ortega, & Lozano, 2013; Kaplan et al., 2013; Miller, Warren, Hemenway, & Azrael, 2015; Runyan et al., 2016; Stokes, McCoy, Abram, Byck, & Teplin, 2015).

### Approaches

The current evidence suggests three potential approaches for creating environments that protect against suicide.

- **Reduce access to lethal means among persons at-risk of suicide.** Means of suicide such as firearms, hanging/suffocation, or jumping from heights provide little opportunity for rescue and, as such, have high case fatality rates (e.g., about 85% of people who use a firearm in a suicide attempt will die from the injury). Research also indicates that: 1) the interval between deciding to act and attempting suicide can be as short as 5 or 10 minutes (Deisenhammer et al., 2009; Simon et al., 2001), and 2) people tend *not* to substitute a different method when a highly lethal method is unavailable or difficult to access (Hawton, 2007; Yip et al., 2012). Therefore, increasing the time interval between deciding to act and the suicide attempt, for example, by making it more difficult to access lethal means, can be lifesaving. The following are examples of approaches reducing access to lethal means for persons at-risk of suicide:



- *Intervening at Suicide Hotspots.* Suicide hotspots, or places where suicides may take place relatively easily, include tall structures (e.g., bridges, cliffs, balconies, and rooftops), railway tracks, and isolated locations such as parks. Efforts to prevent suicide at these locations include erecting barriers or limiting access to prevent jumping, and installing signs and telephones to encourage individuals who are considering suicide, to seek help (Cox et al., 2013).
- *Safe Storage Practices.* Safe storage of medications, firearms, and other household products can reduce the risk for suicide by separating vulnerable individuals from easy access to lethal means. Such practices may include education and counseling around storing firearms--locked in a secure place (e.g., in a gun safe or lock box), unloaded and separate from the ammunition--and keeping medicines in a locked cabinet or other secure location away from people who may be at risk or who have made prior attempts (Rowhani-Rahbar, Simonetti, & Rivara, 2016; Runyan et al., 2016).
- **Organizational policies and culture** that promote protective environments may be implemented in places of employment, detention facilities, and other secured environments (e.g. residential settings). Such policies and cultural values encourage leadership from the top down and may promote prosocial behavior (e.g., asking for help), skill building, positive social norms, assessment, referral and access to helping services (e.g. mental health, substance abuse treatment, financial counseling), and development of crisis response plans, postvention and other measures to foster a safe physical environment. Such policies and cultural shifts can positively impact organizational climate and morale and help prevent suicide and its related risk factors (e.g. depression, social isolation) (Hayes, 2013; National Action Alliance for Suicide Prevention Workplace Task Force, 2015).
- **Community-based policies to reduce excessive alcohol use.** Research studies in the United States have found that greater alcohol availability is positively associated with alcohol-involved suicides (Escobedo & Ortiz, 2002; Giesbrecht et al., 2015). Policies to reduce excessive alcohol use broadly include zoning to limit alcohol outlet locations and density, taxes on alcohol, and bans on the sale of alcohol for individuals under the legal drinking age. These policies are important because acute alcohol use has been found to be associated with more than one-third of suicides and approximately 40% of suicide attempts (Cherpitel, Borges, & Wilcox, 2004).

### Potential Outcomes

- Increases in safe storage of lethal means
- Reductions in rates of suicide
- Reductions in suicide attempts



- Reductions in suicide deaths
- Increases in help-seeking
- Reductions in alcohol-related suicide deaths

## Evidence

The evidence suggests that creating protective environments can reduce suicide and suicide attempts and increase protective behaviors.

- **Reduce access to lethal means among persons at-risk of suicide.** A meta-analysis examining the impact of *suicide hotspot interventions* implemented in combination or in isolation, both in the U.S. and abroad, found associated reduced rates of suicide (Cox et al., 2013; Pirkis et al., 2015). For example, after erecting a barrier on the Jacques-Cartier bridge in Canada, the suicide rate from jumping from the bridge decreased from about 10 suicide deaths per year to about 3 deaths per year (Perron, Burrows, Fournier, Perron, & Ouellet, 2013). Moreover, the reduction in suicides by jumping was sustained even when all bridges and nearby jumping sites were considered, suggesting little to no displacement of suicides to other jumping sites (Perron et al., 2013). Further evidence for the effectiveness of bridge barriers was demonstrated by a study examining the impact of the *removal* of safety barriers from the Grafton Bridge in Auckland, New Zealand. After removal of the barrier, both the number and rate of suicide increased five-fold (Beautrais, 2001; Beautrais et al., 2009).

Another form of means reduction involves implementation of *safe storage practices*. In a case-control study of firearm-related events identified from 37 counties in Washington, Oregon, and Missouri, and from 5 trauma centers, Grossman et al. (2005) found that storing firearms unloaded, separate from ammunition, in a locked place or secured with a safety device was protective of suicide attempts among adolescents. Further, a recent systematic review of clinic and community-based education and counseling interventions suggested that the provision of safety devices significantly increased safe firearm storage practices compared to counseling alone or compared to the provision of economic incentives to acquire safety devices on one's own (Rowhani-Rahbar et al., 2016).

Another program, The *Emergency Department Counseling on Access to Lethal Means (ED CALM)*, trained psychiatric emergency clinicians in a large children's hospital to provide lethal means counseling and safe storage boxes to parents of patients under age 18 receiving care for suicidal behavior. In a pre-post quality improvement project, Runyan et al. (2016) found that at post-test 76% (of the 55% of parents followed up, n=114) reported that all medications in the home were locked up as compared to fewer than 10% at the time of the initial emergency department visit. Among parents who indicated the presence of guns in the home at pre-test (i.e. 67%), all (100%) reported guns were currently locked up at post-test (Runyan et al., 2016).



- **Organizational policies and culture.** *Together for Life* is a workplace program of the Montreal Police Force implemented to address suicide among officers. Policy and program components were designed to foster an organizational culture that promoted mutual support and solidarity among all members of the Force. The program included training of supervisors, managers and all units to improve competencies in identifying suicidal risk and to improve use and awareness of existing resources. The program also included an education campaign to improve awareness and help-seeking (Mishara & Martin, 2012). Police suicides were tracked over 12 years and compared to rates in the control city of Quebec. The suicide rate in the intervention group decreased significantly by 78.9% to a rate of 6.4 suicides per 100,000 population per year compared to an 11% increase in the control city (29.0 per 100,000; Mishara & Martin, 2012).

Another example of this approach is the *United States Air Force Suicide Prevention Program*. The program included 11 policy and education initiatives and was designed to change the culture of the Air Force surrounding suicide. The program uses leaders as role models and agents of change, establishes expectations for behavior related to awareness of suicide risk, develops population skills and knowledge (i.e., education and training), and investigates every suicide (i.e., outcomes measurement). The program represents a fundamental shift from viewing suicide and mental illness solely as medical problem and instead sees them as larger service-wide problems impacting the whole community (Knox, Litts, Talcott, Feig, & Caine, 2003). Using a time-series design to examine the impact of the program on various violence-related outcomes, researchers found that the program was associated with a 33% relative risk reduction in suicide (Knox et al., 2003). The program was also associated with relative risk reductions in related outcomes including moderate and severe family violence (30% and 54%, respectively), homicide (51%), and accidental death (18%) (Knox et al., 2003). A longitudinal assessment of the program over the period 1981 to 2008 (16 years before the 1997 launch of the program and 11 years post-launch) found significantly lower rates of suicide after the program was launched than before launch (Knox et al., 2010). These effects were sustained over time, except in 2004, which the authors found was associated with less rigorous implementation of all program components across all Air Force installations in that year than in the other years (Knox et al., 2010).

Finally, while the evidence is still being built for *suicide prevention in correctional facilities*, preliminary evidence suggests organizational policies and practices that include routine suicide prevention training for all staff, standardized intake screening and risk assessment, provision of shared information between staff members, especially in transitioning or transferring of inmates, varying levels of observation, safe physical environment, emergency response protocols, notification of suicidal behavior/suicide through the chain of command, and critical incident stress debriefing and death review can potentially reduce suicide. When these policies and

practices were implemented across 11 state prisons in Louisiana, suicide rates dropped 46%, from a rate of 23.1 per 100,000 before the intervention to 12.4 per 100,000 the following year (Hayes, 1995). Other similar programs have seen declines in suicide both in the United States and internationally (Barker, Kölves, & De Leo, 2014).

- **Community-based policies to reduce excessive alcohol use.** While multiple policies to limit excessive use of alcohol exist, several studies on alcohol outlet density and suicide risk factors, such as violence, (Gruenewald & Remer, 2006; Lipton & Gruenewald, 2002; Rush, Gliksman, & Brook, 1986) suggest that measures to reduce alcohol outlet density can potentially reduce alcohol-involved suicides. Additionally, a longitudinal analysis of alcohol outlet density, suicide mortality, and hospitalizations for suicide attempts over 6 years in 581 California zip codes indicated that greater density of bars, specifically, is related to greater suicide and suicide attempts, particularly in rural areas (Johnson, Gruenewald, & Remer, 2009).



## Promote Connectedness

### Rationale

Sociologist, Emile Durkheim theorized in 1897 that weak social bonds, i.e. lack of connectedness, are among the chief causes for suicidality (Durkheim, 1897/1951). *Connectedness* is the degree to which an individual or group of individuals are socially close, interrelated, or share resources with others (Centers for Disease Control and Prevention, 2009). Social connections can be formed within and between multiple levels of the social ecology (Dahlberg & Krug, 2002), for instance between individuals (e.g. peers, neighbors, co-workers), families, schools, neighborhoods, workplaces, faith communities, cultural groups, and society as a whole. Related to connectedness, *social capital* refers to a sense of trust in one's community and neighborhood, social integration, and also the availability and participation in social organizations (Beyer, Layde, Hamberger, & Laud, 2015; Muennig, Cohen, Palmer, & Zhu, 2013). Many ecological cross-sectional and longitudinal studies have examined the impact of aspects of social capital on depression symptoms, depressive disorder, mental health more generally, and suicide. While the evidence is limited, existing studies suggest a positive association between social capital measured by social trust, community/neighborhood engagement, and improved mental health. Connectedness and social capital together may protect against suicidal behaviors by decreasing isolation, encouraging adaptive coping behaviors, and by increasing belongingness, personal value, and worth, to help build resilience in the face of adversity. Connectedness can also provide individuals with better access to formal supports and resources, mobilize communities to meet the needs of its members and provide collective primary prevention activities to the community as a whole (Centers for Disease Control and Prevention, 2009).

### Approaches

Promoting connectedness among individuals and within communities through modeling peer norms and enhancing community engagement may protect against suicide.

- **Peer norm programs** seek to normalize protective factors for suicide such as help-seeking, reaching out and talking to trusted adults, and promote peer connectedness. By leveraging the leadership qualities and social influence of peers, these approaches can be used to shift group-level beliefs and promote positive social and behavioral change. These approaches typically target youth and are delivered in school settings but can also be implemented in community settings.
- **Community engagement activities.** Community engagement is an aspect of social capital. Community engagement approaches may involve residents participating in a range of activities, including religious activities, community clean-up and greening activities, and physical exercise. These activities provide opportunities for residents to become more involved in the community and to connect with other community members, organizations, and resources, resulting in

enhanced overall physical health, reduced stress, and decreased depressive symptoms, thereby reducing risk of suicide.

### Potential Outcomes

- Reductions in maladaptive coping attitudes and behaviors
- Increases in healthy coping attitudes and behaviors
- Increases in referrals for youth in distressed
- Increases help-seeking behaviors
- Increases in positive perceptions of adult support

### Evidence

Current evidence suggests a number of positive benefits of peer norm and community engagement activities, although more evaluation research is needed to examine whether these improvements in factors that protect against suicidal behavior translate into reduced suicide attempts and deaths.

- **Peer norm programs.** Evaluations show that programs such as *Sources of Strength* can improve school norms and beliefs about suicide that are created and disseminated by student peers. In a randomized controlled trial of *Sources of Strength* conducted with 18 high-schools (6 metropolitan, 12 rural), Wyman et al. (2010) found that the program improved adaptive norms regarding suicide among peer leaders, connectedness to adults, and school engagement. Peer leaders were also more likely than controls to refer a suicidal friend to an adult. For students, the program resulted in increased perceptions of adult support for suicidal youths, particularly among those with a history of suicidal ideation, and the acceptability of help-seeking behaviors. Finally, trained peer leaders also reported a greater decrease in maladaptive coping attitudes compared with untrained leaders (Wyman et al., 2010).
- **Community engagement activities.** A vacant lot greening initiative was undertaken in Philadelphia between 1999 and 2008. Local residents and community members worked together to green 4,436 lots (or 7.8 million square feet) in 4 areas of the city. Researchers found significant reductions in community residents' self-reported level of stress, which is a risk factor for suicide, and engagement in more physical exercise, a protective factor for suicide, than residents in control vacant lot areas. There is some evidence for other benefits, including reductions in firearm assaults and vandalism (Branas et al., 2011).



## Teach Coping and Problem-Solving Skills

### Rationale

Building life skills prepares individuals to successfully tackle every day challenges and adapt to stress and adversity. Life skills encompasses many concepts, but most often include coping and problem-solving skills, emotional regulation, conflict resolution, and critical thinking. Life skills are important in shielding individuals from suicidal behaviors (World Health Organization, 2014). Suicide prevention programs that focus on life and social skills training are drawn from social cognitive theories (Bandura, 1986), surmising that suicidal behavior is attributed to either direct learning and modeling or environmental and individual (e.g. hopelessness) characteristics. The inability to employ adequate strategies to cope with immediate stressors or identify and find solutions for problems has been characterized among suicide attempters (Pollock & Williams, 2004). Teaching and providing youth with the skills to tackle every day challenges and stressors is, therefore, an important developmental component to suicide prevention.

### Approaches

Social emotional learning programs and parenting skill and family relationship programs are two approaches for teaching coping and problem-solving skills.

- **Social emotional learning programs** focus on developing and strengthening communication and problem-solving skills, emotion regulation, conflict resolution, help seeking and coping skills. These approaches address a range of risk and protective factors for suicidal behavior. They provide children and youth with skills to resolve problems in relationships, school, and with peers, and help youth to address other negative influences (e.g., substance use) associated with suicide. These approaches are typically delivered to all students in a particular grade or school, although some programs also focus on groups of students considered to be at high risk for suicide. Opportunities to practice and reinforce skills are an important part of programs that work (Herman, Borden, Reinke, & Webster-Stratton, 2011).
- **Parenting skill and family relationship programs** provide caregivers with support and are designed to strengthen parenting skills, enhance positive parent-child interactions, and improve children's behavioral and emotional skills and abilities. Programs are typically designed for parents or caregivers with children in a specific age range and can be self-directed or delivered to individual families or groups of families. Some programs have sessions primarily with parents or caregivers while others include sessions for parents or caregivers, youth, and the family. Specific program content typically varies by the age of the child but often has consistent themes of child development, parent-child communication and relationships, and youth's interpersonal and problem-solving skills.



## Potential Outcomes

- Reductions in suicide attempts and suicide ideation
- Reductions in suicide risk behaviors (i.e., depression, anxiety, conduct problems, substance abuse)
- Improvements in help-seeking behavior
- Improvements in social competence and emotional regulation skills
- Improvements in problem-solving and conflict management skills

## Evidence

Several social emotional learning and parenting and family relationship programs have been shown in rigorous evaluations to improve resilience and reduce problem behavior and risk factors for various behaviors, including ones closely related to suicide, such as depression, internalizing behaviors, and substance abuse (M. S. Knox, Burkhart, & Hunter, 2010).

- **Social emotional learning programs.** The *Youth Aware of Mental Health Program (YAM)* is a program developed for teenagers aged 14-16 that uses interactive dialogue and role-playing to teach adolescents about the risk and protective factors associated with suicide (including knowledge about depression and anxiety) and enhances their problem-solving skills for dealing with adverse life events, stress, school and other problems (Wasserman et al., 2014). In a cluster-randomized controlled trial conducted across 10 European Union countries and 168 schools, students in schools randomized to *YAM* were significantly less likely to attempt suicide and have severe suicidal ideation at the 12-month follow-up compared to students in control schools which received educational materials and care as usual. Overall, the relative risk of youth suicide attempts among the *YAM* group was reduced by over 50% demonstrating that out of 1000 students, five attempted suicide in the *YAM* group compared to 11 in the control group. Additionally, related to severe suicide ideation, in the *YAM* group relative risk fell by 49.6% (Wasserman et al., 2014).

Another example is the *Good Behavior Game (GBG)*, which is a classroom-based program for elementary school children aged 6-10. The program uses a team-based behavior management strategy that promotes good behavior by setting clear expectations for good behavior and consequences for maladaptive behavior. The goal of the *GBG* program is to create an integrated classroom social system that is supportive of all children being able to learn with little aggressive or disruptive behavior (Wilcox et al., 2008). Two cohorts of youths participated in the program in 1985-86 and 1986-87 school years when they were in the first and second grades. A number of proximal and distal outcomes were assessed among the two cohorts over time. With respect to distal suicide-related outcomes, an outcome evaluation of the *GBG* indicated that individuals in the first cohort who were assigned to participate in *GBG* when they were in the first grade reported half the adjusted odds of suicidal ideation



and suicide attempts when assessed approximately 15 years later, between the ages of 19 to 21, compared to peers who had been in a standard classroom setting. The beneficial effect of the program was consistent for suicidal ideation regardless of whether baseline covariates were included. The GBG effect on attempts was less robust in some adjusted models including caregiver mental health. In the second cohort of GBG students, neither suicidal ideation nor suicide attempts were significantly different between GBG and the control interventions (Wilcox et al., 2008). The researchers believed this may have been due to a lack of implementation fidelity, including less mentoring and monitoring of teachers. This suggests that GBG is most effective when delivered with consistency and teacher support. GBG was also found to be associated with reduced risk of later substance abuse and other suicide risk factors among the first cohort of students. Results for the second cohort were generally smaller but in the desired direction, a risk factor for suicide (Kellam et al., 2008).

- **Parenting skill and family relationship programs.** Parenting and family skills training approaches have shown promising impacts in preventing key risk factors associated with suicide. For example, the *Incredible Years (IY)* is a comprehensive group training program for parents, teachers and children designed to reduce conduct and substance abuse problems, two important suicide risk factors in youth by improving protective factors such as responsive and positive parent-teacher-child interactions and relationships, emotion self-regulation and social competence (all protective factors for suicide) (Herman et al., 2011). The program includes 9-20 sessions offered in community-based settings (e.g., religious, recreation centers, mental health treatment centers, and hospitals). Several studies have demonstrated the effect of the IY program on reducing internalizing symptoms, such as anxiety and depression, and child conduct problems (Webster-Stratton, Reid, & Beauchaine, 2011; Webster-Stratton, Jamila Reid, & Stoolmiller, 2008). The program is also associated with improved problem-solving and conflict management; these skills were maintained at 1-year follow-up (Reid, Webster-Stratton, & Hammond, 2003; Webster-Stratton & Hammond, 1997; Webster-Stratton, Reid, & Hammond, 2001). Additionally, the program demonstrated greater benefits in mother-rated child internalizing symptoms, compared to the waitlisted control group, when parent, child, and teacher components were included as the dosage of the intervention increased (Herman et al., 2011).

Additionally, *Strengthening Families 10–14* is a program that involves sessions between parents, youth, and family with the goal of improving parents' skills for disciplining, managing emotions and conflict, and communicating with their children; promoting youths' interpersonal and problem-solving skills; and creating family activities to build cohesion and positive parent-child interactions. The premise of the program is that developing these skills for both parents and children will reduce internalizing behavior and adolescent substance

**Comment [A]:** How so?

**Comment [A]:** In the last version you had added "and pointed to the need for GBG to be delivered with precision, consistency, and teacher support." It could help to put something like this back in at the end of this sentence.

**Comment [A]:** One or both cohort? Please confirm.

**Comment [A]:** Specific outcomes or all outcomes?

**Comment [A]:** Number of sessions? Do Herman et al. indicate the ideal number of sessions (range from 9 to 20)?

abuse, two important risk factors for suicide (Spoth, Gyll, & Day, 2002). *Strengthening Families* has been shown to significantly decrease externalizing behaviors, such as aggression, alcohol use, and drug use among youth participants, as well as reduce depression, alcohol use, and drug use among participating families (Spoth et al., 2002).

DRAFT



## Identify and Support **People At-Risk**

Comment [A]: Suggest: At-Risk People

Comment [A]: Prefer to keep as is.

### Rationale

In order to decrease suicide, care of, and attention to, vulnerable populations is necessary, as these groups tend to experience suicidal behavior at higher than average rates. Such vulnerable populations include, but are not limited to, individuals with lower socio-economic status or who are living with a mental health problem; people who have previously attempted suicide; Veterans and active duty military personnel; individuals who are institutionalized, have been victims of violence, or are homeless; individuals of sexual minority status; and members of certain racial and ethnic minority groups (Bachynski et al., 2012; Centers for Disease Control and Prevention, 2016; Curtin et al., 2016; Kann et al., 2016; Lineberry & O'Connor, 2012; Russell & Joyner, 2001). Supporting these at-risk groups requires proactive case finding and effective response, crisis intervention, and evidence-based treatment. Finding optimal ways of identifying at-risk individuals, customizing services to make them more accessible (e.g., Internet-based services when appropriate) and engaging people in evidence-based care (e.g. through such measures as collaborative treatment), remain key challenges. Simply improving or expanding services does not guarantee that those services will be used by people most in need, nor will it necessarily increase the number of people who follow recommended referrals or treatment. For example, some people living in disadvantaged communities may face social and economic issues that can adversely affect their ability to access supportive services.

### Approaches

The following approaches focus on identifying and supporting people at increased risk.

- **Gatekeeper training** is designed to train teachers, coaches, clergy, emergency responders, primary and urgent care providers, and others in the community to identify people who may be at risk of suicide and to respond effectively, including facilitating treatment seeking and support services. Gatekeeper training may be implemented in a variety of settings to identify and support people at risk.
- **Crisis intervention.** These approaches provide support and referral services, typically by connecting a person in crisis (or a friend or family member of someone at-risk) to trained volunteers or professional staff via telephone hotline, online chat, text messaging, or in-person. Crisis intervention approaches are intended to impact key risk factors for suicide, including feelings of depression, hopelessness, and subsequent mental health care utilization. Similar to means reduction, crisis interventions can put space or time between an individual who may be considering suicide and harmful behavior.
- **Treatment for people at-risk of suicide** can include various forms of psychotherapy delivered by licensed providers to help individuals with mental health problems and other suicide risk factors

with problem-solving and emotion regulation. Treatment usually takes place in a one-on-one or group format between patients and clinicians and can vary in duration from several weeks to ongoing therapy, as needed. Treatment that employs collaborative (i.e., between patient and therapist or care manager) and/or integrated care (e.g., linkage between primary care and behavioral health care) can help engage and motivate patients, thereby increasing retention in therapy and decreasing suicide risk (Archer et al., 2012; Bruce et al., 2004; Gilbody, Bower, Fletcher, Richards, & Sutton, 2006).

- **Treatment to prevent re-attempts.** These approaches typically include follow-up contact and use diverse modalities (e.g., home visits, mail, telephone, e-mail) to engage recent suicide attempt survivors in continued treatment to prevent re-attempts. Treatment may focus on improved coping skills, mindfulness, and other emotional regulation skills, and may include case management home visits to increase adherence to treatment and continuity of care; and one-on-one interpersonal therapy and/or group therapy. Approaches that engage and connect attempters to peers and providers are especially important because many attempters do not present to aftercare; 12%-25% reattempt within a year, and 3%-9% of attempt survivors die by suicide within 1 to 5 years of their initial attempt (Inagaki et al., 2015)

### Potential Outcomes

- Reductions in suicide attempts
- Reductions in suicide deaths
- Reductions in symptoms of mental illnesses and suicidal ideation
- Reductions in mental health-related sequelae
- Reductions in re-attempts
- Increases in connectedness
- Improvements in coping skills
- Increases in identification of individuals at-risk for suicidal behavior
- Increases in treatment engagement by at-risk individuals
- Increases in community members trained to identify at-risk individuals
- Increases in referrals for health care

### Evidence

The current evidence suggests that identifying people at risk of suicide and the continued provision of treatment and support for these individuals can positively impact suicide and its associated risk factors.

- **Gatekeeper training.** *Applied Suicide Intervention Skills Training (ASIST)* is a widely implemented training program that helps hotline counselors, emergency workers, and other gatekeepers to



identify and connect with suicidal individuals, understand their reasoning for living and dying, and assist with safely connecting those in need to available resources. In a study employing a randomized controlled trial, Gould, Cross, Pisani, Munfakh, & Kleinman (2013) evaluated the training across the *National Suicide Prevention Lifeline* network of hotlines over the period 2008-2009. Using data from 1,410 suicidal individuals who called 17 Lifeline centers, the researchers found that callers who spoke with ASIST-trained counselors were significantly more likely to feel less depressed, less suicidal, less overwhelmed, and more hopeful by the end of their call, compared to callers who spoke to non-ASIST trained counselors. Counselors trained in ASIST were also more skilled at keeping callers on the phone longer and establishing a connection with them. However, training in ASIST did not result in more comprehensive suicide risk assessments than usual care training (Gould et al., 2013).

Gatekeeper training has also been a primary component of the *Garret Lee Smith (GLS) Suicide Prevention Program*, which is in place in 49 states and 48 tribes. A multi-site evaluation assessed the impact of community gatekeeper training on suicide attempts and deaths by comparing the change in suicide rates and nonfatal suicidal behavior among young people aged 10-24 in counties implementing GLS trainings, with the trajectory observed in similar counties that did not implement these trainings. Counties that implemented GLS trainings had significantly lower youth suicide rates one year following the training implementation (Walrath, Garraza, Reid, Goldston, & McKeon, 2015). This finding equates to a decrease of 1 suicide death per 100,000 among youth ages 10 to 24, or the prevention of approximately 237 deaths in the age group, between 2007 and 2010. Counties implementing GLS program activities also had significantly lower suicide attempt rates among youth ages 16 to 23 in the year following implementation of the GLS program than did similar counties that did not implement GLS activities (4.9 fewer attempts per 1000 youths; Godoy Garraza, Walrath, Goldston, Reid, & McKeon, 2015). More than 79,000 suicide attempts may have been prevented during the period following implementation of the GLS program.

- **Crisis intervention.** Suicide prevention hotlines are one way to provide crisis intervention. In an evaluation of the effectiveness of the *National Suicide Prevention Lifeline* to prevent suicide, 1,085 suicidal individuals who called the hotline completed a standard risk assessment for suicide, and 380 of those completed a follow-up assessment between 1 and 52 days (mean=13.5 days) after the initial assessment. Researchers found that over half of the initial sample were seriously considering suicide when they called, and they had a plan for their suicide. Researchers also found that among follow-up participants, there was a significant decrease in psychological pain, hopelessness, and intent to die between initiation of the call (time 1) to follow-up (time 3). Between time 2 (end of the call) to time 3, the effect remained for psychological pain and hopelessness, but was not significant for intent to die, suggesting that greater effort at outreach

**Comment [A]:** This text is somewhat confusing. The fact that the effect for intent to die did not "remain" significant suggest that it went back up to what it was when they initiated the call. Also this ends on a disconcerting note. In the other places where you had an important null result you included an idea about why and what was needed (e.g., CBG). Can you do that here too?

during and following the call is needed for the callers with high levels of suicide intent (Gould, Kalafat, Harrismunfakh, & Kleinman, 2007).

Comment [A]: Fix formatting

Comment [A]: Can't fix without changing the margins to non-justified.

- **Treatment for people at-risk of suicide.** The *Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)* program aims to prevent suicide among older primary care patients by reducing suicide ideation and depression. *IMPACT* facilitates the development of a therapeutic alliance, a personalized treatment plan that includes patient preferences, as well as proactive follow-up (biweekly during an acute phase and monthly during continuation phase) by a depression care manager (Hunkeler et al., 2006). The program has been shown to significantly improve quality of life, and to reduce functional impairment, depression and suicidal ideation over 24-months of follow-up (Hunkeler et al., 2006; Unutzer et al., 2006) relative to patients who received care as usual.

*Collaborative Assessment and Management of Suicidality (CAMS)*, is a therapeutic approach for suicide-specific assessment and treatment. The program's flexible approach can be used across treatment settings and clinician theoretical orientations and involves the clinician and patient working together in an interactive assessment process to develop patient-specific treatment plans. Sessions are collaborative and involve constant patient input about what is and is not working with the ultimate goal of enhancing the therapeutic alliance and increasing treatment motivation in the suicidal patient. *CAMS* was tested and supported in 6 correlational studies (Jobes, 2012), in a variety of inpatient and outpatient settings, and in one RCT with several additional RCTs under way. A feasibility trial with a community-based sample of suicidal outpatients randomly assigned to *CAMS* or enhanced care as usual (intake with a psychiatrist or psychiatric nurse practitioner followed by 1-11 visits with a case manager and medication as needed) found better treatment retention among the *CAMS* group and significant improvements in suicidal ideation, overall symptom distress, and feelings of hopelessness at the 12 month follow-up (Comtois et al., 2011).

Other examples include *Dialectical Behavioral Therapy (DBT)* and *Attachment-Based Family Therapy (ABFT)*. *DBT* is a multicomponent therapy for individuals at high risk for suicide and who may struggle with impulsivity and emotional regulation issues. The components of *DBT* include individual therapy, group skills training, between-session telephone coaching and a therapist consultation team. In a randomized controlled trial of women with recent suicidal or self-injurious behavior, those receiving *DBT* were half as likely to make a suicide attempt at two-year follow-up than women receiving community treatment (23% vs 46%), required less hospitalization for suicide ideation, and had lower medical risk across all suicide attempts and self-injurious acts combined (Linehan et al., 2006).



*ABFT* is a program for adolescents aged 12-18 and is designed to treat clinically diagnosed major depressive disorder, eliminate suicidal ideation, and reduce dispositional anxiety (Diamond et al., 2010). A randomized controlled trial of *ABFT* found that suicidal adolescents assigned to *ABFT* experienced significantly greater improvement in suicidal ideation over 24 weeks of follow-up than did adolescents assigned to enhanced usual care. Additionally, a significantly higher percentage of *ABFT* participants reported no suicidal ideation in the week prior to assessment at 12 weeks than did adolescents receiving enhanced usual care (69.2% vs. 34.6%) and at 24 weeks (82.1% vs. 46.2%) (Diamond et al., 2010).

The Veterans Affairs *Translating Initiatives for Depression into Effective Solutions* project (*TIDES*) uses a depression care liaison to link primary care and mental health services. The depression care liaison assesses and educates patients and follows up with both patients and providers between primary care visits to optimize treatment. This collaborative care increases the efficiency of providing mental health services by bringing mental health care to the primary care setting, where most patients are first detected and subsequently treated for many mental health conditions. An evaluation of *TIDES* found significant decreases in depression severity scores among 70% of primary care patients (Rubenstein et al., 2010). *TIDES* also demonstrated 85% and 95% compliance with medication and follow-up visits, respectively (Rubenstein et al., 2010).

- **Treatment to prevent re-attempts.** Several strategies that aim to prevent re-attempts have demonstrated impact on reducing suicide deaths. For example, *Emergency Department Brief Intervention with Follow-up Visits* is a program that involves a one-hour discharge information session that addresses suicidal ideation and attempts, distress, risk and protective factors, alternatives to self-harm, and referral options, combined with nine follow-up contacts over 18 months (at 1, 2, 4, 7, 11 weeks and 4, 6, 12, 18 months). Follow-up contacts are either conducted by phone or through home visits according to a specific timeline for up to 18 months. A randomized controlled trial that enrolled suicide attempters from eight hospital emergency departments in five countries (Brazil, India, Sri Lanka, Iran, and China) found that a brief intervention combined with nine follow-up visits over 18 months was associated with significantly fewer deaths from suicide relative to a treatment-as-usual group (0.2% versus 2.2%, respectively) (Fleischmann et al., 2008).

Another example of treatment to prevent re-attempts involves *active follow-up contact approaches* such as postcards, letters, and telephone calls intended to increase a patient's sense of connectedness with health care providers and decrease isolation. These approaches include expression of care and support and typically invite patients to reconnect with their provider. Contacts are made periodically (e.g., monthly or every few months in the first 12 months post-discharge with some programs continuing contact for two or more years). In a meta-analysis conducted by Inagaki et al. (2015), interventions to prevent repeat suicide attempts in patients

admitted to an emergency department for suicide attempt were found to reduce reattempts by approximately 17% for up to 12 months post-discharge; however, the effects of these approaches beyond 12 months on reattempts has not yet been demonstrated. Also, because the number of trials and associated sample sizes included in this meta-analysis were small, it was not possible to determine the effect of active contact and follow-up approaches on death by suicide.

In a randomized controlled trial of the post-crisis suicide prevention long-term follow-up contact approach, Motto and Bostrom (2001) found that patients who refused ongoing care but who were randomized to be contacted by letter four times per year had a lower rate of suicide over two years of follow-up than did patients in the control group who received no further contact. Other studies have also shown post-crisis letters and coping cards to be protective against suicide ideation and attempts (Hassanian-Moghaddam, Sarjami, Kolahi, & Carter, 2011; Wang et al., 2016).

Finally, *Cognitive Behavior Therapy for Suicide Prevention (CBT-SP)* is an example of a therapeutic approach to prevent re-attempts. It uses a risk-reduction, relapse prevention approach that includes an analysis of proximal risk factors and stressors (e.g., relationship problems, school or work-related difficulties) leading up to and following the suicidal event; safety plan development; skill building; and psychoeducation. *CBT-SP* also has family skill modules focused on family support and communication patterns as well as improving the family's problem solving skills. A randomized controlled trial of *CBT-SP* found that 10-session outpatient cognitive therapy designed to prevent repeat suicide attempts resulted in a 50% reduction in the likelihood of a suicide reattempt among adults who had been admitted to an emergency department for a suicide attempt relative to treatment as usual (Brown et al., 2005).



## Lessen Harms and Prevent Future Risk

### Rationale

Millions of people are bereaved by suicide every year in the United States and throughout the world. Risk of suicide and suicide risk factors has been shown to increase among people who have lost a friend/peer, family member, co-worker, or other close contact to suicide (Pitman, Osborn, King, & Erlangsen, 2014). Care and attention to the bereaved is therefore of high importance. Despite often good intentions, media and others responding to suicide may add to this risk. For example, research suggests that exposure to sensationalized or otherwise uninformed reporting on suicide may heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to what is known as suicide contagion (Etzersdorfer & Sonneck, 1998; Niederkrotenthaler & Sonneck, 2007). While the evidence is still being built in this area, particularly with regard to the impact of policy and practices on suicide and suicide attempts in the United States, measures to care for the bereaved population through such means as postvention interventions (e.g. counseling, support groups and debriefing sessions) and safe reporting on suicide have shown impacts in other countries.

### Approaches

Some approaches that can be used to lessen harms and reduce future risk of suicide include caring for the bereaved and safe reporting following a suicide.

- **Postvention** approaches are implemented *after* a suicide has taken place and may include debriefing sessions, counseling, and/or bereavement support groups for surviving friends and family members/loved ones. These programs have not typically been evaluated for their impact on suicide or suicidal behavior but may reduce survivors' guilt, feelings of depression, and complicated grief (Szumilas & Kutcher, 2011).
- **Safe reporting following a suicide.** The manner in which information on a recent suicide is communicated to the public (e.g. school assemblies, mass media, social media) can heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to suicide contagion. Reports that are inclusive of suicide prevention messages, stories of hope and resilience, risk and protective factors, and links to helping resources (e.g., hotline), and that avoid sensationalizing events or reducing suicide to one cause, can help reduce the likelihood of suicide contagion.

### Potential Outcomes

- Reductions in ideation/attempts

- Reductions in psychological distress
- Increases in treatment seeking
- Improvements in reporting following suicide
- Reductions in contagion effects related to suicide

## Evidence

Current evidence suggests that lessening harm through postvention and safe reporting can impact risk and protective factors for suicide.

- **Postvention** programs are implemented with the goal of providing support to survivors of others' suicide to reduce their own risk of suicide. One example of a postvention program, *StandBy Response Service (StandBy)*, provides clients with face-to-face outreach and telephone support through a professional crisis response team. Site coordinators develop customized case management plans, referring clients to other existing community services matched to their needs (Visser, Comans, & Scuffham, 2014). In a study by Visser et al. (2014), *StandBy* clients were significantly less likely to be at high risk for suicidality (suicide ideation and attempts) and had less psychological distress than a suicide bereaved comparison group who had not had contact with the *StandBy* program (48% and 64% respectively). Additionally, research suggests that active postvention approaches in which outreach to suicide survivors occurs at the scene of a suicide is associated with intake into treatment sooner, greater attendance at support group meetings, and attendance at more meetings compared to passive postvention (versus passive approaches where survivors self-refer for services) (Cerel & Campbell, 2008).
- **Safe reporting and messaging about suicide.** One way to ensure safe reporting and messaging about suicide is to encourage news media adhere to *Recommendations for Reporting on Suicide* (<http://www.reportingonsuicide.org>). The most compelling evidence supporting these recommendations for reporting comes from Austria. After a sharp increase in suicides on the Viennese subway, media guidelines were introduced and an interrupted time series design was used to evaluate the national impact of the guidelines on subsequent suicides. Changes in the quality and quantity of media reporting resulted in a nationwide significant reduction of 81 suicides annually (Niederkrotenthaler & Sonneck, 2007). Finally, research suggests that not only does reporting on suicide in a negative way (e.g., reporting on suicide myths and repetition) have harmful effects on suicide, but reporting on positive coping skills in the face of adversity can also demonstrate protective effects against suicide (Niederkrotenthaler et al., 2010). Reports of individual suicidal ideation not accompanied by reports of suicide or suicide attempts, along with reports describing a "mastery" of a crisis situation where adversities were overcome, was



associated with significant decreases in suicide rates in the time period immediately following such reports (Niederkrotenthaler et al., 2010).

## Sector Involvement

Public health can play an important and unique role in addressing suicide. Public health agencies, which typically place prevention at the forefront of efforts and work to create broad population-level impact, can bring critical leadership and resources to bear on this problem. For example, these agencies can serve as a convener, bringing together partners and stakeholders to plan, prioritize, and coordinate suicide prevention efforts. Public health agencies are also well positioned to collect and disseminate data, implement preventive measures, evaluate programs, and track progress. Although public health can play a leadership role in preventing suicide, the strategies and approaches outlined in this technical package cannot be accomplished by the public health sector alone. As noted in the National Strategy to Prevent Suicide, the integration and coordination of prevention activities across sectors and settings is critical for expanding the reach and impact of suicide prevention efforts.

Other sectors vital to implementing this package include, but are not limited to, education, government (local, state, and federal), social services, health services, business, labor, justice, housing, media, and organizations that comprise the civil society sector such as faith-based organizations, youth-serving organizations, foundations, and other non-governmental organizations. Collectively, these sectors can make a difference in preventing suicide by impacting the various contexts and underlying risks that contribute to suicide.

The strategies and approaches described in this technical package are summarized in Appendix A along with the relevant sectors that are well positioned to lead implementation efforts. For example, business and labor, the health sector (including insurers, providers, and health systems), and government entities are in the best position to implement programs and policies that *Strengthen Economic Supports* and *Strengthen Access and Delivery of Suicide Care*. These types of supports go beyond individual behavior change and require commitment and support from those sectors that can directly address some of the underlying risks and the environmental contexts that increase the risk for suicide. Public health entities can play an important role by gathering and synthesizing information to inform policy, raise awareness, and evaluate the effectiveness of various policies. Moreover, partnerships with non-governmental and community organizations can be instrumental in increasing awareness of and garnering support for policies affecting individuals and families.

The public health sector has been at the forefront of many community-based prevention efforts, working collaboratively with schools and community-based organizations, to change social norms and positively impact health behavior. Public health is well suited to take on a similar leadership role in *Promoting Connectedness* through peer norm and community engagement activities and supporting the development, evaluation, and adoption of effective programs that *Teach Coping and Problem-Solving*

*Skills* to prevent suicide from happening in the first place. These programs are often delivered in school and community settings, making education and non-governmental organizations vital partners in prevention.

Businesses, workplaces, and local and state government entities, on the other hand, are in the best position to establish policies and support practices that *Create Protective Environments* where people live, work, and play. Public health entities can play an important role by gathering and synthesizing information, working with other governmental agencies (e.g., criminal justice, defense) and agencies within the executive branch of their state or local government in support of policy and other approaches, and evaluating the effectiveness of measures taken. In a similar fashion, public health entities can partner with schools, workplaces, and community organizations to implement and evaluate prevention programs, policies and practices geared toward creating safe, healthy, and supportive environments.

Finally, this technical package includes a number of interventions delivered in hospital, primary care, behavioral health care, and community settings designed to *Identify and Support People At-Risk*. The intensity and activities for many of these interventions require the expertise of professionals who are licensed and trained to deliver critical intervention support. The health, social services, and justice sectors can work collaboratively to support individuals at high-risk for suicide and their families. These activities also require coordination of supports across various service providers and community organizations.

Regardless of strategy, action by many sectors will be necessary for the successful implementation of this package. In this regard, all sectors can play an important and influential role in preventing suicide from happening in the first place and lessening the immediate and long-term harms of suicidal behavior by helping those in times of crisis get the services and support they need.



## Monitoring and Evaluation

Monitoring and evaluation are necessary components of the public health approach to prevention. It is important to have timely and reliable data to monitor the extent of the problem and to evaluate the impact of prevention efforts. Data are also necessary for prevention planning and implementation.

Gathering ongoing and systematic data is important for prevention efforts. However, it is also important to gather data that are uniform and consistent across systems. Consistent data allow public health and other entities to better gauge the scope of the problem, identify high-risk groups, and monitor the effects of prevention programs and policies. Currently, it is common for different sectors, agencies, and organizations to employ varying definitions of suicidal ideation, behavior, and death that can make it difficult to consistently monitor specific outcomes across sectors and over time. For example, the manner in which deaths are classified can change from one jurisdiction to another, and can change based on local medical and/or medicolegal standards (Crosby, Ortega, et al., 2011). CDC's uniform definitions and recommended data elements for self-directed violence provide a useful framework to help ensure that data are collected in a consistent manner across surveillance systems (e.g., Crosby, Ortega, et al., 2011).

Surveillance systems exist at the federal, state, and local levels. It is important to assess the availability of surveillance data and data systems across these levels to identify and address gaps in the systems. CDC's *National Vital Statistics System (NVSS)* and the *National Violent Death Reporting System (NVDRS)* are examples of surveillance systems that provide data on deaths from suicide. *NVSS* is a nationwide surveillance system that collects demographic, geographic, and cause-of-death data from death certificates. *NVDRS* is a state-based surveillance system (currently in 40 states, the District of Columbia, and Puerto Rico) that combines data from death certificates, law enforcement reports, and coroner or medical examiner reports to provide detailed information on the circumstances of violent deaths, including suicide, which can assist communities in guiding prevention approaches (Blair, Fowler, Jack, & Crosby, 2016). Data from state and local Child Death Review teams and Suicide Death Review Teams (which are in a few states) offer another source to identify deaths and obtain insight into the gaps in services, systems, and modifiable risk factors for suicide.

The *National Electronic Injury Surveillance System-All Injury Program (NEISS-AIP)* provides nationally representative data about all types and causes of nonfatal injuries treated in U.S. hospital emergency departments, and can be used to assess national rates of, and trends in, self-harm injuries by cause (e.g., falls, poisoning, etc.), age, race/ethnicity, sex, disposition (where the injured person goes when released from the Emergency Department).

In addition to information on deaths and nonfatal injuries, there are also surveillance systems that provide national, state, and some local estimates of suicidal behavior. The *Youth Risk Behavior Surveillance System (YRBSS)* collects information from a nationally representative sample of 9-12 grade



students and is a key resource in monitoring health-risk behaviors among youth, including whether youth have seriously considered attempting suicide, attempted suicide, made a plan, or required treatment by a doctor or nurse for a suicide attempt that resulted in an injury, poisoning, or overdose (Brener et al., 2013). The YRBSS data are obtained from a national school-based survey conducted by CDC as well as from state, territorial, tribal, and large urban school district surveys conducted by education and health agencies. The *National Survey on Drug Use and Health (NSDUH)* is an annual survey of the civilian, non-institutionalized population aged 12 years and older. *NSDUH* provides both national and state-level estimates of substance use (alcohol, tobacco, illicit drugs, and non-medical use of prescription drugs); mental health (past year mental illness, co-occurring illnesses); and service utilization, along with suicide ideation, suicide plans, and suicide attempts. *NSDUH* is a key resource to track trends in suicide-related risk factors in the population and to help identify groups at increased risk.

It is also important at all levels (local, state, and federal) to address gaps in responses, track progress of prevention efforts and evaluate the impact of those efforts, including the impact of this technical package. Evaluation data, produced through program implementation and monitoring, is essential to provide information on what does and does not work to reduce rates of suicide and its associated risk and protective factors. Theories of change and logic models that identify short, intermediate, and long-term outcomes are an important part of program evaluation.

The evidence-base for suicide prevention has advanced greatly over the last few decades. However, additional research is needed to understand the impact of programs, policies, and practices on suicide (and suicide attempts, at a minimum), as opposed to merely examining their effectiveness on risk factors. More research is also needed to examine the effectiveness of primary prevention strategies (before risk occurs) and community-level strategies to prevent suicide at the population level. It will be important for researchers to test the effectiveness of combinations of the strategies and approaches included in this package. Most existing evaluations focus on approaches implemented in isolation, but there is potential to understand the synergistic effects within a comprehensive prevention approach. Lastly, there are also many potential opportunities to build and strengthen partnerships across program areas (e.g., violence prevention, substance abuse prevention) to evaluate the impact of different approaches on multiple outcomes.

## Conclusion

Suicide is a serious public health problem whose rates have been on the rise for more than a decade and whose costs stretch well into the billions of dollars each year. While suicide is a rare outcome statistically, its human impact has a ripple effect that is far-reaching. Each of us likely interacts with suicide survivors, those with lived experience, and those with thoughts of suicide on a daily basis – at home, at work, and in our communities. Suicide and suicide attempts are public health issues of societal concern. There are a number of barriers that have impeded progress, including, for example, stigma related to help-seeking,



mental illness, being a survivor and fear related to asking someone about suicidal thoughts. Fortunately, like many public health problems, suicide is preventable, and more is being done to prevent suicide than ever before, as evidenced by the work of the National Action Alliance for Suicide Prevention, the release of the first world report on suicide, and more timely surveillance data, to name just a few examples.

In an effort to continue pushing the field and society further towards prevention, this technical package includes strategies and approaches that ideally would be used in a comprehensive, multi-level and multi-sectoral way. It includes strategies and approaches to prevent suicide from occurring in the first place, as well as strategies focused on lessening the immediate and long-term harms of suicidal behavior. It includes strategies that range from a focus on the whole population regardless of risk to strategies designed to support people at highest risk. Importantly, this technical package extends the bounds of the typical prevention strategies to consider approaches that go beyond individual behavior change to better address risk factors impacting communities and populations more broadly (e.g., economic policies to strengthen housing and financial security).

While the evidence base continues to emerge, the collection of programs, policies, and practices laid out here are available for implementation now. In keeping with good public health practice, the intent is that monitoring and evaluation will play a key role in that implementation. Moreover, as new evidence becomes available, this technical package can be refined to reflect the current state of the science.

In closing, and in keeping with a message of resilience as spoken by those with lived experience, ‘hope, help, and healing is possible.’

## References

- Archer, J., Bower, P., Gilbody, S., Lovell, K., Richards, D., Gask, L., . . . Coventry, P. (2012). Collaborative care for depression and anxiety problems. *Cochrane Database Syst Rev*, 10 (CD006525).
- Arsenault-Lapierre, G., Kim, C., & Turecki, G. (2004). Psychiatric diagnoses in 3275 suicides: a meta-analysis. *BMC Psychiatry*, 4, 37. doi:10.1186/1471-244X-4-37
- Bachynski, K. E., Canham-Chervak, M., Black, S. A., Dada, E. O., Millikan, A. M., & Jones, B. H. (2012). Mental health risk factors for suicides in the US Army, 2007–8. *Injury Prevention*, 18(6), 405-412.
- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*: Prentice-Hall, Inc.
- Barker, E., Kölves, K., & De Leo, D. (2014). Management of Suicidal and Self-Harming Behaviors in Prisons: Systematic Literature Review of Evidence-Based Activities. *Archives of Suicide Research*, 18(3), 227-240. doi:10.1080/13811118.2013.824830
- Beautrais, A. L. (2001). Effectiveness of barriers at suicide jumping sites: A case study. *Aust NZ J Psychiat*, 35. doi:10.1080/0004867010060501
- Beautrais, A. L., Gibb, S. J., Fergusson, D. M., Horwood, L. J., & Larkin, G. L. (2009). Removing bridge barriers stimulates suicides: An unfortunate natural experiment. *Aust NZ J Psychiat*, 43. doi:10.1080/00048670902873714
- Bellis, M. A., Hughes, K., Leckenby, N., Jones, L., Baban, A., Kachaeva, M., . . . Ulukol, B. (2014). Adverse childhood experiences and associations with health-harming behaviours in young adults: surveys in eight eastern European countries. *Bulletin of the World Health Organization*, 92(9), 641-655.
- Beyer, K. M., Layde, P. M., Hamberger, L. K., & Laud, P. W. (2015). Does neighborhood environment differentiate intimate partner femicides from other femicides? *Violence Against Women*, 21(1), 49-64. doi:10.1177/1077801214564075
- Blair, J. M., Fowler, K. A., Jack, S. P., & Crosby, A. E. (2016). The National Violent Death Reporting System: overview and future directions. *Inj Prev*, 22 Suppl 1, i6-i11. doi:10.1136/injuryprev-2015-041819
- Bossarte, R. M., Karras, E., Lu, N., Tu, X., Stephens, B., Draper, J., & Kemp, J. E. (2014). Associations between the Department of Veterans Affairs' suicide prevention campaign and calls to related crisis lines. *Public Health Rep*, 129(6), 516-525.
- Branas, C. C., Cheney, R. A., MacDonald, J. M., Tam, V. W., Jackson, T. D., & Ten Have, T. R. (2011). A difference-in-differences analysis of health, safety, and greening vacant urban space. *Am J Epidemiol*, 174(11), 1296-1306. doi:10.1093/aje/kwr273
- Brown, G. K., Ten Have, T., Henriques, G. R., Xie, S. X., Hollander, J. E., & Beck, A. T. (2005). Cognitive therapy for the prevention of suicide attempts: a randomized controlled trial. *JAMA*, 294(5), 563-570. doi:10.1001/jama.294.5.563
- Bruce, M. L., Ten Have, T. R., Reynolds III, C. F., Katz, I. I., Schulberg, H. C., Mulsant, B. H., . . . Alexopoulos, G. S. (2004). Reducing suicidal ideation and depressive symptoms in depressed older primary care patients: a randomized controlled trial. *JAMA*, 291(9), 1081-1091.
- Capaldi, D. M., Knoble, N. B., Shortt, J. W., & Kim, H. K. (2012). A Systematic Review of Risk Factors for Intimate Partner Violence. *Partner Abuse*, 3(2), 231-280. doi:10.1891/1946-6560.3.2.231
- Carter, M., McGee, R., Taylor, B., & Williams, S. (2007). Health outcomes in adolescence: associations with family, friends and school engagement. *J Adolesc*, 30(1), 51-62. doi:10.1016/j.adolescence.2005.04.002
- Centers for Disease Control and Prevention. (2009). Strategic direction for the prevention of suicidal behavior: Promoting individual, family, and community connectedness to prevent suicidal behavior. Retrieved from: [http://www.cdc.gov/ViolencePrevention/pdf/Suicide\\_Strategic\\_Direction\\_Full\\_version-a.pdf](http://www.cdc.gov/ViolencePrevention/pdf/Suicide_Strategic_Direction_Full_version-a.pdf)
- Centers for Disease Control and Prevention. (2016). Web-Based Injury Statistics Query and Reporting System (WISQARS). Retrieved December 28, 2016 Available at: <http://www.cdc.gov/injury/wisqars/index.html>



- Cerel, J., & Campbell, F. R. (2008). Suicide survivors seeking mental health services: a preliminary examination of the role of an active postvention model. *Suicide Life Threat Behav*, 38(1), 30-34. doi:10.1521/suli.2008.38.1.30
- Cerel, J., Maple, M., De Venne, A., Moore, M., Flaherty, C., & Brown, M. (2016). Exposure to Suicide in the Community: Prevalence and Correlates in One US State. *Public Health Reports*, 131(1).
- Cerel, J., McIntosh, J. L., Neimeyer, R. A., Maple, M., & Marshall, D. (2014). The Continuum of "Survivorship": Definitional Issues in the Aftermath of Suicide. *Suicide and life-threatening behavior*, 44(6), 591-600. doi:10.1111/sltb.12093
- Chapman, A. L., & Dixon-Gordon, K. L. (2007). Emotional antecedents and consequences of deliberate self-harm and suicide attempts. *Suicide Life Threat Behav*, 37(5), 543-552. doi:10.1521/suli.2007.37.5.543
- Chapman, D. P., Whitfield, C. L., Felitti, V. J., Dube, S. R., Edwards, V. J., & Anda, R. F. (2004). Adverse childhood experiences and the risk of depressive disorders in adulthood. *J Affect Disord*, 82(2), 217-225.
- Cherpitel, C. J., Borges, G. L. G., & Wilcox, H. C. (2004). Acute alcohol use and suicidal behavior: A review of the literature. *Alcoholism: Clinical and Experimental Research*, 28(5 SUPPL.), 18S-28S.
- Classen, T. J., & Dunn, R. A. (2012). The effect of job loss and unemployment duration on suicide risk in the United States: a new look using mass-layoffs and unemployment duration. *Health Econ*, 21(3), 338-350. doi:10.1002/hecl.1719
- Coffey, C. E. (2006). Pursuing perfect depression care. *Psychiatr Serv*, 57(10), 1524-1526. doi:10.1176/ps.2006.57.10.1524
- Coffey, C. E. (2007). Building a system of perfect depression care in behavioral health. *Jt Comm J Qual Patient Saf*, 33(4), 193-199.
- Coffey, C. E., Coffey, M. J., & Ahmedani, B. K. (2013). An update on perfect depression care. *Psychiatr Serv*, 64(4), 396. doi:10.1176/appi.PS.640422
- Coffey, M., Coffey, C., & Ahmedani, B. K. (2015). Suicide in a health maintenance organization population. *JAMA Psychiatry*, 72(3), 294-296. doi:10.1001/jamapsychiatry.2014.2440
- Comtois, K. A., Jobes, D. A., S. O'Connor, S., Atkins, D. C., Janis, K., E. Chessen, C., . . . Yuodelis-Flores, C. (2011). Collaborative assessment and management of suicidality (CAMS): feasibility trial for next-day appointment services. *Depress Anxiety*, 28(11), 963-972. doi:10.1002/da.20895
- Cox, G. R., Owens, C., Robinson, J., Nicholas, A., Lockley, A., Williamson, M., . . . Pirkis, J. (2013). Interventions to reduce suicides at suicide hotspots: a systematic review. *BMC Public Health*, 13(1), 1-12. doi:10.1186/1471-2458-13-214
- Crosby, A. E., Espitia-Hardeman, V., Ortega, L., & Lozano, B. (2013). Alcohol and suicide. In *Alcohol: Science, Policy and Public Health*. Oxford University Press. 190-193.
- Crosby, A. E., Han, B., Ortega, L., Parks, S. E., & Gfroerer, J. (2011). Suicidal Thoughts and Behaviors Among Adults Aged ≥18 Years — United States, 2008–2009. *MMWR*, 60(No. SS-13), 1-22.
- Crosby, A. E., Han, B., Ortega, L. A., Parks, S. E., & Gfroerer, J. (2011). Suicidal thoughts and behaviors among adults aged ≥18 years--United States, 2008-2009. *MMWR Surveill Summ*, 60(13), 1-22.
- Crosby, A. E., Ortega, L., & Melanson, C. (2011). *Self-directed Violence Surveillance: Uniform Definitions and Recommended Data Elements, Version 1.0*. Atlanta, GA: Centers for Disease Control and Prevention, National Center for Injury Prevention and Control.
- Crosby, A. E., & Sacks, J. J. (2002). Exposure to Suicide: Incidence and Association with Suicidal Ideation and Behavior: United States, 1994. *Suicide and life-threatening behavior*, 32(3), 321-328. doi:10.1521/suli.32.3.321.22170
- Cunningham, P. J. (2009). Beyond parity: primary care physicians' perspectives on access to mental health care. *Health Aff (Millwood)*, 28(3), w490-501. doi:10.1377/hlthaff.28.3.w490
- Curtin, S. C., Warner, M., & Hedegaard, H. (2016). *Increase in suicide in the United States, 1999-2014*. NCHS Data Brief, no 241. Hyattsville, MD: National Center for Health Statistics.

- Cylus, J., Glymour, M. M., & Avendano, M. (2014). Do generous unemployment benefit programs reduce suicide rates? A state fixed-effect analysis covering 1968-2008. *Am J Epidemiol*, 180(1), 45-52. doi:10.1093/aje/kwu106
- Dahlberg, L. L., & Krug, E. G. (2002). Violence-a global public health problem. In E. Krug, L. L. Dahlberg, J. A. Mercy, A. B. Zwi, & R. Lozano (Eds.), *World Report on Violence and Health* (pp. 1-56). Geneva, Switzerland: World Health Organization.
- David-Ferdon, C., Crosby, A. E., Caine, E. D., Hindman J., Reed, G. A., & Iskander, J. (2016). CDC Public Health Grand Rounds: Preventing Suicide through a Comprehensive Public Health Approach. *MMWR Morb Mortal Wkly Rep*, 65, 894-987.
- Deisenhammer, E. A., Ing, C. M., Strauss, R., Kemmler, G., Hinterhuber, H., & Weiss, E. M. (2009). The duration of the suicidal process: how much time is left for intervention between consideration and accomplishment of a suicide attempt? *J Clin Psychiatry*, 70(1), 19-24.
- Diamond, G. S., Wintersteen, M. B., Brown, G. K., Diamond, G. M., Gallop, R., Shelef, K., & Levy, S. (2010). Attachment-based family therapy for adolescents with suicidal ideation: a randomized controlled trial. *J Am Acad Child Adolesc Psychiatry*, 49(2), 122-131.
- Dube, S. R., Anda, R. F., Felitti, V. J., Chapman, D. P., Williamson, D. F., & Giles, W. H. (2001). Childhood abuse, household dysfunction, and the risk of attempted suicide throughout the life span: findings from the Adverse Childhood Experiences Study. *JAMA*, 286(24), 3089-3096.
- Dunne, E. J., McIntosh, J. L., & Dunne-Maxim, K. (Eds.). (1987). *Suicide and its aftermath: Understanding and counseling the survivors*. New York: Norton.
- Durkheim, E. (1897/1951). *Suicide: A study in sociology* (JA Spaulding & G. Simpson, trans.). Glencoe, IL: Free Press. (Original work published 1897).
- Edwards, R. W., Jumper-Thurman, P., Plested, B. A., Oetting, E. R., & Swanson, L. (2000). Community readiness: Research to practice. *Journal of Community Psychology*, 28(3), 291-307.
- Escobedo, L. G., & Ortiz, M. (2002). The relationship between liquor outlet density and injury and violence in New Mexico. *Accid Anal Prev*, 34(5), 689-694.
- Etzersdorfer, E., & Sonneck, G. (1998). Preventing suicide by influencing mass-media reporting: The Viennese experience, 1980-1996. *Arch Suicide Res*, 4(1), 67-74.
- Felitti, V. J., Anda, R. F., Nordenberg, D., Williamson, D. F., Spitz, A. M., Edwards, V., . . . Marks, J. S. (1998). Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: The Adverse Childhood Experiences (ACE) Study. *Am J Prev Med*, 14(4), 245-258.
- Flavin, P., & Radcliff, B. (2009). Public policies and suicide rates in the American states. *Social Indicators Research*, 90(2), 195-209.
- Fleischmann, A., Bertolote, J. M., Wasserman, D., De Leo, D., Bolhari, J., Botega, N. J., . . . Thanh, H. T. (2008). Effectiveness of brief intervention and contact for suicide attempters: a randomized controlled trial in five countries. *Bulletin of the World Health Organization*, 86(9), 703-709. doi:S0042-96862008000900014 [pii]
- Florence, C., Simon, T., Haegerich, T., Luo, F., & Zhou, C. (2015). Estimated lifetime medical and work-loss costs of fatal injuries-United States, 2013. *MMWR: Morbidity and mortality weekly report*, 64(38), 1074-1077.
- Fowler, K. A., Gladden, R. M., Vagi, K. J., Barnes, J., & Frazier, L. (2015). Increase in suicides associated with home eviction and foreclosure during the US housing crisis: findings from 16 National Violent Death Reporting System States, 2005-2010. *Am J Public Health*, 105(2), 311-316. doi:10.2105/AJPH.2014.301945
- Frieden, T. R. (2014). Six components necessary for effective public health program implementation. *Am J Public Health*, 104(1), 17-22. doi:10.2105/AJPH.2013.301608
- Giesbrecht, N., Huguette, N., Ogden, L., Kaplan, M. S., McFarland, B. H., Caetano, R., . . . Nolte, K. B. (2015). Acute alcohol use among suicide decedents in 14 US states: impacts of off-premise and on-premise alcohol outlet density. *Addiction*, 110(2), 300-307. doi:10.1111/add.12762



- Gilbody, S., Bower, P., Fletcher, J., Richards, D., & Sutton, A. J. (2006). Collaborative care for depression: a cumulative meta-analysis and review of longer-term outcomes. *Archives of internal medicine*, 166(21), 2314-2321.
- Godoy Garraza, L., Walrath, C., Goldston, D. B., Reid, H., & McKeon, R. (2015). Effect of the Garrett Lee Smith Memorial Suicide Prevention Program on Suicide Attempts Among Youths. *JAMA Psychiatry*, 72(11), 1143-1149. doi:10.1001/jamapsychiatry.2015.1933
- Gould, M. S., Cross, W., Pisani, A. R., Munfakh, J. L., & Kleinman, M. (2013). Impact of Applied Suicide Intervention Skills Training on the National Suicide Prevention Lifeline. *Suicide Life Threat Behav*, 43(6), 676-691. doi:10.1111/sltb.12049
- Gould, M. S., Kalafat, J., Harrismunfakh, J. L., & Kleinman, M. (2007). An evaluation of crisis hotline outcomes. Part 2: Suicidal callers. *Suicide Life Threat Behav*, 37(3), 338-352. doi:10.1521/suli.2007.37.3.338
- Grossman, D. C., Mueller, B. A., Riedy, C., Dowd, M. D., Villaveces, A., Prodzinski, J., . . . Harruff, R. (2005). Gun storage practices and risk of youth suicide and unintentional firearm injuries. *JAMA*, 293(6), 707-714. doi:10.1001/jama.293.6.707
- Gruenewald, P. J., & Remer, L. (2006). Changes in outlet densities affect violence rates. *Alcohol Clin Exp Res*, 30(7), 1184-1193. doi:10.1111/j.1530-0277.2006.00141.x
- Haddon, W. (1980). Advances in the epidemiology of injuries as a basis for public policy. *Public Health Reports*, 95(5), 411-421.
- Haegerich, T. M., & Dahlberg, L. L. (2011). Violence as a public health risk. *American Journal of Lifestyle Medicine*, 5(5), 392-406. 1559827611409127.
- Hailey, D., Roine, R., & Ohinmaa, A. (2008). The effectiveness of telemental health applications: a review. *The Canadian Journal of Psychiatry*, 53(11), 769-778.
- Hamby, S., & Grych, J. (2013). The web of violence: exploring connections among different forms of interpersonal violence and abuse. *Briefs in Sociology*. New York, NY: Springer.
- Han, B., Crosby, A. E., Ortega, L. A., Parks, S. E., Compton, W. M., & Gfroerer, J. (2016). Suicidal ideation, suicide attempt, and occupations among employed adults aged 18–64 years in the United States. *Comprehensive psychiatry*, 66, 176-186.
- Harris, E. C., & Barraclough, B. (1997). Suicide as an outcome for mental disorders. A meta-analysis. *Br J Psychiatry*, 170, 205-228.
- Harris, E. C., & Barraclough, B. (1998). Excess mortality of mental disorder. *Br J Psychiatry*, 173, 11-53.
- Harris, K. M., Carpenter, C., & Bao, Y. (2006). The effects of state parity laws on the use of mental health care. *Med Care*, 44(6), 499-505. doi:10.1097/01.mlr.0000215813.16211.00
- Hassanian-Moghaddam, H., Sarjami, S., Kolahi, A. A., & Carter, G. L. (2011). Postcards in Persia: randomised controlled trial to reduce suicidal behaviours 12 months after hospital-treated self-poisoning. *British Journal of Psychiatry*, 198(4), 309-316.
- Hawkins, J. D., Catalano, R. F., & Kuklinski, M. R. (2014). Communities that care *Encyclopedia of Criminology and Criminal Justice* (pp. 393-408): Springer.
- Hawton, K. (2007). Restricting access to methods of suicide: Rationale and evaluation of this approach to suicide prevention. *Crisis*, 28(suppl 1), 4-9. doi:10.1027/0227-5910.28.s1.4
- Hayes, L. M. (1995). Prison Suicide: An Overview and a Guide to Prevention. *The Prison Journal*, 75(4), 431-456. doi:10.1177/0032855595075004003
- Hayes, L. M. (2013). Suicide prevention in correctional facilities: reflections and next steps. *Int J Law Psychiatry*, 36(3-4), 188-194. doi:10.1016/j.ijlp.2013.04.010
- Herman, K. C., Borden, L. A., Reinke, W. M., & Webster-Stratton, C. (2011). The Impact of the Incredible Years Parent, Child, and Teacher Training Programs on Children's Co-Occurring Internalizing Symptoms. *Sch Psychol Q*, 26(3), 189-201. doi:10.1037/a0025228
- Houle, J. N., & Light, M. T. (2014). The home foreclosure crisis and rising suicide rates, 2005 to 2010. *Am J Public Health*, 104(6), 1073-1079. doi:10.2105/AJPH.2013.301774

- Hunkeler, E. M., Katon, W., Tang, L., Williams, J. W., Jr., Kroenke, K., Lin, E. H., . . . Unutzer, J. (2006). Long term outcomes from the IMPACT randomised trial for depressed elderly patients in primary care. *BMJ*, 332(7536), 259-263. doi:10.1136/bmj.38683.710255.BE
- Inagaki, M., Kawashima, Y., Kawanishi, C., Yonemoto, N., Sugimoto, T., Furuno, T., . . . Yamada, M. (2015). Interventions to prevent repeat suicidal behavior in patients admitted to an emergency department for a suicide attempt: a meta-analysis. *J Affect Disord*, 175, 66-78. doi:10.1016/j.jad.2014.12.048
- Jobes, D. A. (2012). The Collaborative Assessment and Management of Suicidality (CAMS): an evolving evidence-based clinical approach to suicidal risk. *Suicide Life Threat Behav*, 42(6), 640-653. doi:10.1111/j.1943-278X.2012.00119.x
- Johnson, F. W., Gruenewald, P. J., & Remer, L. G. (2009). Suicide and alcohol: do outlets play a role? *Alcohol Clin Exp Res*, 33(12), 2124-2133. doi:10.1111/j.1530-0277.2009.01052.x
- Kann, L., McManus, T., Harris, W. A., Shanklin, S. L., Flint, K. H., Hawkins, J., . . . Zaza, S. (2016). Youth Risk Behavior Surveillance - United States, 2015. *MMWR Surveill Summ*, 65(6), 1-174. doi:10.15585/mmwr.ss6506a1
- Kaplan, M. S., McFarland, B. H., Huguet, N., Conner, K., Caetano, R., Giesbrecht, N., & Nolte, K. B. (2013). Acute alcohol intoxication and suicide: a gender-stratified analysis of the National Violent Death Reporting System. *Inj Prev*, 19(1), 38-43. doi:10.1136/injuryprev-2012-040317
- Kellam, S. G., Brown, C. H., Poduska, J. M., Ialongo, N. S., Wang, W., Toyinbo, P., . . . Wilcox, H. C. (2008). Effects of a universal classroom behavior management program in first and second grades on young adult behavioral, psychiatric, and social outcomes. *Drug Alcohol Depend*, 95 Suppl 1, S5-S28. doi:10.1016/j.drugalcdep.2008.01.004
- Kessler, R. C., Demler, O., Frank, R. G., Olfson, M., Pincus, H. A., Walters, E. E., . . . Zaslavsky, A. M. (2005). Prevalence and treatment of mental disorders, 1990 to 2003. *N Engl J Med*, 352(24), 2515-2523. doi:10.1056/NEJMsa043266
- Kleiman, E. M., Riskind, J. H., Schaefer, K. E., & Weingarden, H. (2012). The moderating role of social support on the relationship between impulsivity and suicide risk. *Crisis*, 33(5), 273-279. doi:10.1027/0227-5910/a000136
- Klomek, A. B., Sourander, A., & Gould, M. (2010). The association of suicide and bullying in childhood to young adulthood: a review of cross-sectional and longitudinal research findings. *The Canadian Journal of Psychiatry*, 55(5), 282-288.
- Knox, K. L., Litts, D. A., Talcott, G. W., Feig, J. C., & Caine, E. D. (2003). Risk of suicide and related adverse outcomes after exposure to a suicide prevention programme in the US Air Force: cohort study. *BMJ*, 327(7428), 1376.
- Knox, K. L., Pflanz, S., Talcott, G. W., Campise, R. L., Lavigne, J. E., Bajorska, A., . . . Caine, E. D. (2010). The US Air Force suicide prevention program: implications for public health policy. *Am J Public Health*, 100(12), 2457-2463. doi:10.2105/ajph.2009.159871
- Lang, M. (2013). The impact of mental health insurance laws on state suicide rates. *Health Econ*, 22(1), 73-88. doi:10.1002/hec.1816
- Leeb, R. T., Lewis, T., & Zolotor, A. J. (2011). A review of physical and mental health consequences of child abuse and neglect and implications for practice. *American Journal of Lifestyle Medicine*, 5(5), 454-468.
- Lineberry, T. W., & O'Connor, S. S. (2012). Suicide in the US Army. *Mayo Clinic Proceedings*, 87(9), 871-878. doi:10.1016/j.mayocp.2012.07.002
- Linehan, M. M., Comtois, K. A., Murray, A. M., Brown, M. Z., Gallop, R. J., Heard, H. L., . . . Lindenboim, N. (2006). Two-year randomized controlled trial and follow-up of dialectical behavior therapy vs therapy by experts for suicidal behaviors and borderline personality disorder. *Arch Gen Psychiatry*, 63(7), 757-766. doi:10.1001/archpsyc.63.7.757
- Lipton, R., & Gruenewald, P. (2002). The spatial dynamics of violence and alcohol outlets. *J Stud Alcohol*, 63(2), 187-195.



- Losel, F., & Farrington, D. P. (2012). Direct protective and buffering protective factors in the development of youth violence. *Am J Prev Med*, 43(2 Suppl 1), S8-S23. doi:10.1016/j.amepre.2012.04.029
- Maimon, D., Browning, C. R., & Brooks-Gunn, J. (2010). Collective efficacy, family attachment, and urban adolescent suicide attempts. *J Health Soc Behav*, 51(3), 307-324. doi:10.1177/0022146510377878
- Mark, T. L., Shern, D. L., Bagalman, J. E., & Cao, Z. (2007). Ranking America's mental health: An analysis of depression across the states. Alexandria, VA: Mental Health America.
- McIntosh, W. L., Spies, E., Stone, D. M., Lokey, C. N., Trudeau, A. R., & Bartholow, B. (2016). Suicide Rates by Occupational Group - 17 States, 2012. *MMWR Morb Mortal Wkly Rep*, 65(25), 641-645. doi:10.15585/mmwr.mm6525a1
- Miller, M., Warren, M., Hemenway, D., & Azrael, D. (2015). Firearms and suicide in US cities. *Inj Prev*, 21(e1), e116-119. doi:10.1136/injuryprev-2013-040969
- Mishara, B. L. (Ed.) (1995). *The Impact of Suicide*. New York: Springer.
- Mishara, B. L., & Martin, N. (2012). Effects of a comprehensive police suicide prevention program. *Crisis: Journal of Crisis Intervention & Suicide*, 33(3), 162-168.
- Mitchell, A. M., Kim, Y., Prigerson, H. G., & Mortimer-Stephens, M. (2004). Complicated grief in survivors of suicide. *Crisis*, 25(1), 12-18. doi:10.1027/0227-5910.25.1.12
- Mohr, D. C., Vella, L., Hart, S., Heckman, T., & Simon, G. (2008). The effect of telephone-administered psychotherapy on symptoms of depression and attrition: A meta-analysis. *Clinical Psychology: Science and Practice*, 15(3), 243-253.
- Motto, J. A., & Bostrom, A. G. (2001). A randomized controlled trial of postcrisis suicide prevention. *Psychiatr Serv*, 52(6), 828-833.
- Muennig, P., Cohen, A. K., Palmer, A., & Zhu, W. (2013). The relationship between five different measures of structural social capital, medical examination outcomes, and mortality. *Soc Sci Med*, 85, 18-26. doi:10.1016/j.socscimed.2013.02.007
- National Action Alliance for Suicide Prevention. (2014). Research Prioritization Task Force.(2014). *A prioritized research agenda for suicide prevention: An action plan to save lives*. Washington, D.C.: Author.
- National Action Alliance for Suicide Prevention Workplace Task Force. (2015). *Comprehensive Blueprint for Workplace Suicide Prevention*. Washington, D.C. : Author.
- National Action Alliance for Suicide Prevention: Clinical Workforce Preparedness Task Force. (2014). *Suicide prevention and the clinical workforce: Guidelines for training*. Washington, D.C.: Author.
- National Action Alliance for Suicide Prevention: Suicide Attempt Survivors Task Force. (2014). *The Way Forward: Pathways to hope, recovery, and wellness with insights from lived experience*. Washington, D.C. : Author.
- National Action Alliance for Suicide Prevention: Survivors of Suicide Loss Task Force. (2015). *Responding to Grief, Trauma, and Distress After a Suicide: U.S. National Guidelines*. Washington, D.C. : Author.
- Niederkrotenthaler, T., & Sonneck, G. (2007). Assessing the impact of media guidelines for reporting on suicides in Austria: Interrupted time series analysis. *Aust N Z J Psychiatry*, 41(5), 419-428. doi:10.1080/00048670701266680
- Niederkrotenthaler, T., Voracek, M., Herberth, A., Till, B., Strauss, M., Etzersdorfer, E., . . . Sonneck, G. (2010). Media and suicide. Papageno v Werther effect. *BMJ*, 341, c5841. doi:10.1136/bmj.c5841
- Olfson, M., Gerhard, T., Huang, C., Crystal, S., & Stroup, T. S. (2015). Premature Mortality Among Adults With Schizophrenia in the United States. *JAMA Psychiatry*, 72(12), 1172-1181. doi:10.1001/jamapsychiatry.2015.1737
- Owens, D. (2002). Fatal and non-fatal repetition of self-harm: Systematic review. *British Journal of Psychiatry*, 181(3), 193-199.
- Perron, S., Burrows, S., Fournier, M., Perron, P. A., & Ouellet, F. (2013). Installation of a bridge barrier as a suicide prevention strategy in Montreal, Quebec, Canada. *Am J Public Health*, 103(7), 1235-1239. doi:10.2105/ajph.2012.301089

- Pirkis, J., Too, L. S., Spittal, M. J., Krysinska, K., Robinson, J., & Cheung, Y. T. D. (2015). Interventions to reduce suicides at suicide hotspots: a systematic review and meta-analysis. *The Lancet Psychiatry*, 2(11), 994-1001. doi:http://dx.doi.org/10.1016/S2215-0366(15)00266-7
- Pitman, A., Osborn, D., King, M., & Erlangsen, A. (2014). Effects of suicide bereavement on mental health and suicide risk. *Lancet Psychiatry*, 1, 86-94.
- Plested, B. A., Edwards, R. W., & Jumper-Thurman, P. (2006). Community readiness: A handbook for successful change. *Fort Collins, CO: Tri-Ethnic Center for Prevention Research*.
- Pollock, L. R., & Williams, J. M. (2004). Problem-solving in suicide attempters. *Psychol Med*, 34(1), 163-167.
- Reid, M. J., Webster-Stratton, C., & Hammond, M. (2003). Follow-up of children who received the Incredible Years intervention for oppositional-defiant disorder: Maintenance and prediction of 2-year outcome. *Behavior Therapy*, 34(4), 471-491.
- Rowhani-Rahbar, A., Simonetti, J. A., & Rivara, F. P. (2016). Effectiveness of Interventions to Promote Safe Firearm Storage. *Epidemiol Rev*, 38(1), 111-124. doi:10.1093/epirev/mxv006
- Rubenstein, L. V., Chaney, E. F., Ober, S., Felker, B., Sherman, S. E., Lanto, A., & Vivell, S. (2010). Using evidence-based quality improvement methods for translating depression collaborative care research into practice. *Families, Systems, & Health*, 28(2), 91-113.
- Runyan, C. W., Becker, A., Brandspigel, S., Barber, C., Trudeau, A., & Novins, D. (2016). Lethal Means Counseling for Parents of Youth Seeking Emergency Care for Suicidality. *West J Emerg Med*, 17(1), 8-14. doi:10.5811/westjem.2015.11.28590
- Rush, B. R., Gliksman, L., & Brook, R. (1986). Alcohol availability, alcohol consumption and alcohol-related damage. I. The distribution of consumption model. *J Stud Alcohol*, 47(1), 1-10.
- Russell, S. T., & Joyner, K. (2001). Adolescent sexual orientation and suicide risk: Evidence from a national study. *American Journal of Public Health*, 91(8), 1276-1281.
- Shepard, D. S., Gurewich, D., Lwin, A. K., Reed, G. A., Jr., & Silverman, M. M. (2016). Suicide and Suicidal Attempts in the United States: Costs and Policy Implications. *Suicide Life Threat Behav*, 46(3), 352-362. doi:10.1111/sltb.12225
- Silverman, M. M., & Maris, R. W. (1995). The prevention of suicidal behaviors: An overview. *Suicide and life-threatening behavior*, 25(1), 10-21.
- Simon, O. R., Swann, A. C., Powell, K. E., Potter, L. B., Kresnow, M. J., & O'Carroll, P. W. (2001). Characteristics of impulsive suicide attempts and attempters. *Suicide Life Threat Behav*, 32(1 Suppl), 49-59.
- Spoth, R. L., Gyll, M., & Day, S. X. (2002). Universal family-focused interventions in alcohol-use disorder prevention: cost-effectiveness and cost-benefit analyses of two interventions. *J Stud Alcohol*, 63(2), 219-228.
- Stack, S., & Wasserman, I. (2007). Economic strain and suicide risk: a qualitative analysis. *Suicide and life-threatening behavior*, 37(1), 103-112.
- Stokes, M. L., McCoy, K. P., Abram, K. M., Byck, G. R., & Teplin, L. A. (2015). Suicidal Ideation and Behavior in Youth in the Juvenile Justice System: A Review of the Literature. *J Correct Health Care*, 21(3), 222-242. doi:10.1177/1078345815587001
- Sudak, H., Maxim, K., & Carpenter, M. (2008). Suicide and stigma: a review of the literature and personal reflections. *Acad Psychiatry*, 32(2), 136-142. doi:10.1176/appi.ap.32.2.136
- Szumilas, M., & Kutcher, S. (2011). Post-suicide intervention programs: a systematic review. *Can J Public Health*, 102(1), 18-29.
- Toosi, M. (2015). *Labor force projections to 2024: The labor force is growing, but slowly*. Washington, D.C.: Bureau of Labor Statistics.
- Turecki, G. (2014). Epigenetics and suicidal behavior research pathways. *Am J Prev Med*, 47(3), S144-S151.
- Tyrer, P., Reed, G. M., & Crawford, M. J. (2015). Classification, assessment, prevalence, and effect of personality disorder. *Lancet*, 385(9969), 717-726. doi:10.1016/S0140-6736(14)61995-4



- U.S. Department of Health and Human Services Health Resources and Services Administrations. (2016a). *Designated Health Professional Shortage Areas Statistics, As of November 4, 2016*. Retrieved from <http://datawarehouse.hrsa.gov/topics/shortageAreas.aspx>.
- U.S. Department of Health and Human Services Health Resources and Services Administrations. (2016b). *NHSC Clinician Retention: A Story of Dedication and Commitment*. Retrieved from <https://nhsc.hrsa.gov/currentmembers/membersites/retainproviders/retentionbrief.pdf>.
- U.S. Office of the Surgeon General, & National Action Alliance for Suicide Prevention. (2012). *2012 National Strategy for Suicide Prevention: Goals and Objectives for Action*. Washington, D.C.: HHS.
- U.S. Public Health Service. (1999). *The Surgeon General's Call to Action to Prevent Suicide*. Washington, D.C.
- Unutzer, J., Tang, L., Oishi, S., Katon, W., Williams, J. W., Jr., Hunkeler, E., . . . Langston, C. (2006). Reducing suicidal ideation in depressed older primary care patients. *J Am Geriatr Soc*, 54(10), 1550-1556.
- Visser, V. S., Comans, T. A., & Scuffham, P. A. (2014). Evaluation Of The Effectiveness Of A Community-Based Crisis Intervention Program For People Bereaved By Suicide. *Journal of Community Psychology*, 42(1), 19-28. doi:10.1002/jcop.21586
- Walrath, C., Garraza, L. G., Reid, H., Goldston, D. B., & McKeon, R. (2015). Impact of the Garrett Lee Smith youth suicide prevention program on suicide mortality. *Am J Public Health*, 105(5), 986-993. doi:10.2105/AJPH.2014.302496
- Wang, Y. C., Hsieh, L. Y., Wang, M. Y., Chou, C. H., Huang, M. W., & Ko, H. C. (2016). Coping Card Usage can Further Reduce Suicide Reattempt in Suicide Attempter Case Management Within 3-Month Intervention. *Suicide Life Threat Behav*, 46(1), 106-120. doi:10.1111/sltb.12177
- Wasserman, D., Hoven, C. W., Wasserman, C., Wall, M., Eisenberg, R., Hadlaczky, G., . . . Carli, V. (2014). School-based suicide prevention programmes: The SEYLE cluster-randomised, controlled trial. *The Lancet*, 385(9977), 1536-1544. doi:10.1016/S0140-6736(14)61213-7
- Webster-Stratton, C., & Hammond, M. (1997). Treating children with early-onset conduct problems: a comparison of child and parent training interventions. *J Consult Clin Psychol*, 65(1), 93-109.
- Webster-Stratton, C., Reid, M. J., & Hammond, M. (2001). Preventing conduct problems, promoting social competence: a parent and teacher training partnership in head start. *J Clin Child Psychol*, 30(3), 283-302. doi:10.1207/S15374424JCCP3003\_2
- Webster-Stratton, C. H., Reid, M. J., & Beauchaine, T. (2011). Combining parent and child training for young children with ADHD. *Journal of Clinical Child & Adolescent Psychology*, 40(2), 191-203.
- Webster-Stratton, C., Jamila Reid, M., & Stoolmiller, M. (2008). Preventing conduct problems and improving school readiness: evaluation of the incredible years teacher and child training programs in high-risk schools. *Journal of child psychology and psychiatry*, 49(5), 471-488.
- Wilcox, H. C., Kellam, S. G., Brown, C. H., Poduska, J. M., Ialongo, N. S., Wang, W., & Anthony, J. C. (2008). The impact of two universal randomized first- and second-grade classroom interventions on young adult suicide ideation and attempts. *Drug Alcohol Depend*, 95 Suppl 1, S60-73.
- Wilkins, N., Tsao, B., Hertz, M., Davis, R., & Klevens, J. (2014). *Connecting the Dots: An Overview of the Links Among Multiple Forms of Violence*. Atlanta, GA: National Center for Injury Prevention and Control, Centers for Disease Control and Prevention Oakland, CA: Prevention Institute.
- World Health Organization. (2013). *Global and Regional Estimates of Violence Against Women: Prevalence and Health Effects of Intimate Partner Violence and Non-Partner Sexual Violence*. Geneva: World Health Organization.
- World Health Organization. (2014). *Suicide Prevention: A Global Imperative*. Geneva, Switzerland: WHO Press.
- Wyman, P. A., Brown, C. H., LoMurray, M., Schmeelk-Cone, K., Petrova, M., Yu, Q., . . . Wang, W. (2010). An outcome evaluation of the Sources of Strength suicide prevention program delivered by adolescent peer leaders in high schools. *Am J Public Health*, 100(9), 1653-1661. doi:
- Yip, P., Caine, E., Yousuf, S., Chang, S.-S., Wu, K., & Chen, Y.-Y. (2012). Means restriction for suicide prevention. *Lancet*, 379(9834), 2393-2399. doi:10.1016/s0140-6736(12)60521-2

DRAFT



## Appendix A: Summary of Strategies and Approaches to Prevent Suicide

Strategy	Approach/Program, Practice or Policy	Best Available Evidence			Lead Sectors <sup>1</sup>
		Suicide	Suicide Attempts or Ideation	Other Risk/Protective Factors for Suicide	
Strengthen economic supports	Strengthen household financial security				Government (local, state, Federal)
	Unemployment benefit programs	✓		✓	
	Other income supports	✓			Business/labor
	Housing stabilization policies				Government (local, state, Federal)
	The National Neighborhood Stabilization Program			✓	
Strengthen access and delivery of suicide care	Coverage of mental health conditions in health insurance policies				Government (local, state, Federal)
	Mental Health Parity Laws	✓		✓	
	Reduce provider shortages in underserved areas				Healthcare
	National Health Service Corps (NHSC)			✓	
	Telemental health (TMH)			✓	Social services
	Safer suicide care through systems change				
	Henry Ford Perfect Depression Care (Precursor to Zero Suicide)	✓		✓	
Create protective environments	Reduce access to lethal means among persons at-risk				Government (local, state)
	Intervening at suicide hot spots	✓			
	Safe storage practices		✓	✓	Public Health
	Emergency Department Counseling on Access to Lethal Means (ED CALM)			✓	<a href="#">Healthcare</a>

		Best Available Evidence			
	Organizational policies and culture				
	Together for Life	✓			Business/Labor
	US Air Force Suicide Prevention Program	✓		✓	Justice
	Correctional suicide prevention	✓			Government (local, state, Federal)
	Community-based policies to reduce excessive alcohol use				Government (local, state)
	Alcohol outlet density	✓		✓	Business/labor
Promote connectedness	Peer norm programs				Public Health
	Sources of Strength			✓	Education
	Community engagement activities				Public Health
	Greening vacant urban spaces			✓	Government (local, <u>state</u> )
Teach coping and problem-solving skills	Social emotional learning programs				
	Youth Aware of Mental Health Program		✓	✓	Public Health
	Good Behavior Game		✓	✓	Education
	Parenting skill and family relationship approaches				Public Health
	The Incredible Years			✓	Education



		Best Available Evidence			
	<i>Strengthening Families 10–14</i>			✓	
Identify and support people at-risk	<b>Gatekeeper training</b>				Public Health
	<i>Applied Suicide Intervention Skills Training</i>			✓	Healthcare
	<i>Garret Lee Smith Federal Grant Program</i>	✓	✓		
	<b>Crisis Intervention</b>				Public Health
	<i>National Suicide Prevention Lifeline</i>		✓	✓	Social Services
	<b>Treatment for people at risk of suicide</b>				
	<i>Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)</i>		✓	✓	
	<i>Collaborative Assessment and Management of Suicidality (CAMS)</i>		✓	✓	Healthcare
	<i>Dialectical Behavioral Therapy (DBT)</i>		✓	✓	Social Services
	<i>Attachment-Based Family Therapy (ABFT)</i>		✓		Justice
	<i>Translating Initiatives for Depression into Effective Solutions project (TIDES)</i>			✓	
	<b>Treatment to prevent re-attempts</b>				
	<i>ED Brief Intervention with Follow-up Visits</i>	✓			Healthcare
	<i>Active follow-up contact approaches</i>	✓	✓		Social services
	<i>CBT for Suicide Prevention</i>		✓		

		Best Available Evidence			
Lessen harms and prevent future risk	<b>Postvention</b>				Healthcare
	<i>StandBy Response Service</i>		✓	✓	
	<b>Safe reporting following a suicide</b>				Public Health
	<i>Media Guidelines</i>	✓			Media

<sup>1</sup>This column refers to the lead sectors well positioned to bring leadership and resources to implementation efforts. For each strategy, there are many other sectors such as non-governmental organizations that are instrumental to prevention planning and implementing specific activities.



DRAFT NARRATIVE FOR CDC CLEARANCE

The information in this narrative has not been cleared for dissemination.  
Please do not cite, copy or disseminate

**Preventing Suicide:  
A Technical Package of Policy, Programs, and Practices**

**Prepared by:**

Deb Stone, ScD, MSW, MPH  
Kristin Holland, PhD, MPH  
Brad Bartholow, PhD  
Alex Crosby, MD, MPH  
Shane Davis, PhD  
Natalie Wilkins, PhD

**Division of Violence Prevention  
National Center for Injury Prevention and Control (NCIPC)  
Centers for Disease Control and Prevention**

**2017**

***Preventing Suicide: A Technical Package of Policies, Programs, and Practices* is a publication of the  
National Center for Injury Prevention and Control of the Centers for Disease Control and  
Prevention.**

Centers for Disease Control and Prevention  
Thomas R. Frieden, MD, MPH, Director

National Center for Injury Prevention and Control  
Debra E. Houry, MD, MPH, Director

Division of Violence Prevention  
James A. Mercy, PhD, Director

*Suggested Citation:* Stone, D.M., Holland, K.M., Bartholow, B., Crosby, A.E., Davis, S., and Wilkins, N.  
*Preventing Suicide: A Technical Package of Policies, Programs, and Practices*. Atlanta, GA: National  
Center for Injury Prevention and Control, Centers for Disease Control and Prevention, 2017.



## Contents

Acknowledgements.....	4
External Reviewers.....	5
Overview of Technical Package.....	6
Strengthen Economic Supports.....	14
Strengthen Access and Delivery of Suicide Care.....	17
Create Protective Environments.....	21
Promote Connectedness.....	26
Teach Coping and Problem-Solving Skills.....	28
Identify and Support People At-Risk.....	31
Lessen Harms and Prevent Future Risk.....	37
Sector Involvement.....	39
Monitoring and Evaluation.....	41
Conclusion.....	42
References.....	44
Appendix A.....	50

## Acknowledgements

We would like to thank the following individuals who contributed in specific ways to the development of this technical package. We give special thanks to Linda Dahlberg for her vision, guidance, and support throughout the development of this package. We thank Division, Center, and CDC leadership for their careful review and helpful feedback on earlier iterations of this document. We thank Alida Knuth for her formatting and design expertise. Last but definitely not least, we extend our thanks and gratitude to all the external reviewers for their helpful feedback, support and encouragement for this resource.



## External Reviewers

Casey Castaldi  
Prevention Institute

Carmen Clelland  
Office for State, Tribal, Local and Territorial  
Support, Centers for Disease Control and  
Prevention

Amalia Corby-Edwards  
American Psychological Association

Rachel Davis  
Prevention Institute

Pamela End of Horn  
Indian Health Service Headquarters

Craig Fisher  
American Psychological Association

Keita Franklin  
Department of Defense

Jill M. Harkavy Friedman  
American Foundation for Suicide Prevention

Jarrold Hindman  
Colorado Department of Public Health and  
Environment

Linda Langford  
Education Development Center, Inc.

Richard McKeon  
Substance Abuse and Mental Health Services  
Administration

Doreen S. Marshall  
American Foundation for Suicide Prevention

Christine Moutier  
American Foundation for Suicide Prevention

Jason H. Padgett  
Education Development Center, Inc.

Jerry Reed  
Education Development Center, Inc.

Christine Schuler  
National Institute for Occupational Safety and  
Health, Centers for Disease Control and  
Prevention

Morton Silverman  
Education Development Center, Inc.

Ellyson Stout  
Education Development Center, Inc.

Hope M. Tiesman  
National Institute for Occupational Safety and  
Health, Centers for Disease Control and  
Prevention

Dan Reidenberg  
Suicide Awareness Voices for Education (SAVE)

The experts above are listed with their affiliations at the time this document was reviewed.

## Overview

This technical package represents a select group of strategies based on the best available evidence to help communities and states sharpen their focus on prevention activities with the greatest potential to prevent suicide. These strategies include: strengthening economic supports; strengthening access and delivery of suicide care; creating protective environments; promoting connectedness; teaching coping and problem-solving skills; identifying and supporting people at-risk; and lessening harms and preventing future risk. The strategies represented in this package include those with a focus on preventing suicide from happening in the first place as well as approaches to lessen the immediate and long-term harms of suicidal behavior for individuals, families, communities, and society. The strategies in the technical package support the goals and objectives of the National Strategy for Suicide Prevention and the National Action Alliance for Suicide Prevention's priority to strengthen community-based prevention. Commitment, cooperation, and leadership from numerous sectors, including public health, education, justice, health care, social services, business, labor, and government ~~can bring about the successful~~could support the implementation of this package.

### What is a Technical Package?

A technical package is a compilation of a core set of strategies to achieve and sustain substantial reductions in a specific risk factor or outcome (Frieden, 2014). Technical packages help communities and states prioritize prevention activities based on the best available evidence. This technical package has three components. The first component is the **strategy** or the preventive direction or actions to achieve the goal of preventing suicide. The second component is the **approach**. The approach includes the specific ways to advance the strategy. This can be accomplished through *programs, policies, and practices*. The approaches included come primarily from studies based in the United States. The **evidence** for each of the approaches in preventing suicide or its associated risk factors is included as the third component. This package is intended as a resource to guide and inform prevention decision-making in communities and states.

### Preventing Suicide is a Priority

Suicide, as defined by the Centers for Disease Control and Prevention (CDC), is part of a broader class of behavior called *self-directed violence*. Self-directed violence refers to behavior directed at oneself that deliberately results in injury or the *potential* for injury (A.E. Crosby, Ortega, & Melanson, 2011). Self-directed violence may be *suicidal* or *non-suicidal* in nature. For the purposes of this document, we refer only to behavior where suicide is intended:

- **Suicide** is a death caused by self-directed injurious behavior with any intent to die as a result of the behavior.



- **Suicide attempt** is defined as a *non-fatal* self-directed and potentially injurious behavior with any intent to die as a result of the behavior. A suicide attempt may or may not result in injury.

**Suicide is highly prevalent.** Suicide presents a major challenge to public health in the United States and worldwide. It contributes to premature death, morbidity, lost productivity, and health care costs (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014). In 2014 (the most recent year of available death data), suicide was responsible for 42,773 deaths in the U.S., which is approximately one suicide every 12 minutes (Centers for Disease Control and Prevention, 2016). In 2014, suicide ranked as the 10th leading cause of death and has been among the top 12 leading causes of death since 1975 in the U.S (Centers for Disease Control and Prevention, 2016). Overall suicide rates increased 24% from 1999 to 2014 (Curtin, Warner, & Hedegaard, 2016). Suicide is a problem throughout the life span; it is the second leading cause of death among those aged 10–34 years; it ~~is~~ the fourth leading cause among persons in their 40s, and seventh leading cause among persons in their 50s.

Suicide rates vary by race/ethnicity, age, and other population characteristics, with the highest rates across the lifespan occurring among non-Hispanic American Indian/Alaska Native (AI/AN) and non-Hispanic White population groups. In 2014, the rates for these groups were 17.8 and 16.4 per 100,000 population, respectively (Centers for Disease Control and Prevention, 2016). Other population groups disproportionately impacted by suicide include middle-aged adults (whose rates increased 48% from 1999 to 2014, with steep increases seen among both males (43%) and females (63%) aged 45–64 years; (Curtin et al., 2016); Veterans and other military personnel (whose suicide rate nearly doubled from 2003 to 2008, surpassing the rate of suicide among civilians for the first time in decades; (Bachynski et al., 2012; Lineberry & O'Connor); workers in certain occupational groups (e.g., protective service occupations; workers in farming, fishing, and forestry; McIntosh et al., 2016); and lesbian, gay, bisexual, and/or queer (LGBQ) youth, who experience increased suicidal ideation and behavior compared to their heterosexual counterparts (Kann et al., 2016; Russell & Joyner, 2001).

Suicides reflect only a portion of the problem (A.E. Crosby, Han, Ortega, Parks, & Gfroerer, 2011). Substantially more people are hospitalized as a result of nonfatal suicidal behavior (i.e. suicide attempts) than are fatally injured, and an even greater number are either treated in ambulatory settings (e.g., emergency departments) or not treated at all (A.E. Crosby, Han, et al., 2011). For example, during 2014, among adults aged 18 years and older, for every one suicide there were 9 adults treated in hospital emergency departments for self-harm injuries, 27 who reported making a suicide attempt, and over 227 who reported seriously considering suicide (i.e. ideation) (Ferdon et al., In press).

**Suicide is associated with several risk and protective factors.** Suicide, like other human behaviors, has no single determining cause. Instead, suicide occurs in response to multiple biological, psychological, interpersonal, environmental and societal influences that interact with one another, often over time.

**Comment [A]:** EndNote issue in formatting. Missing publication year for Lineberry & O'Connor citation.



The social-ecological model – encompassing multiple levels of focus from the individual, relationship, community, and societal – is a useful framework for viewing and understanding suicide risk factors identified in the literature (Dahlberg & Krug, 2002). Risk and protective factors for suicide exist at each level. For example, risk factors include:

- **Individual level:** history of depression and other mental illnesses, hopelessness, substance abuse, certain health conditions, previous suicide attempt, violence victimization and perpetration, and genetic and biological determinants
- **Relationship level:** high conflict or violent relationships, sense of isolation and lack of social support, family/loved one's history of suicide, financial and work stress
- **Community level:** inadequate community connectedness, barriers to health care (e.g., lack of access to providers and medications)
- **Societal level:** availability of lethal means of suicide, unsafe media portrayals of suicide, stigma associated with help-seeking and mental illness (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014).

It is important to recognize that the vast majority of individuals who are depressed, attempt suicide, or ~~who have other~~ noted risk factors ~~noted~~, do *not* die by suicide. Furthermore, the relevance of each risk factor can vary by age, race, gender, sexual orientation, residential geography, and socio-cultural and economic status (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014).

Protective factors, or those influences that buffer against the risk for suicide, can also be found across the different levels of the social-ecological model. Protective factors identified in the literature include: effective coping and problem solving skills, moral objections to suicide, strong and supportive relationships with partners, friends, and family; connectedness to school, community, and other social institutions; availability of quality and ongoing physical and mental health care, and reduced access to lethal means (U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012; World Health Organization, 2014). These protective factors can either counter a specific risk factor or buffer against a number of risks associated with suicide.

**Suicide is connected to other forms of violence.** Exposure to violence (e.g., child abuse and neglect, bullying, peer violence, dating violence, sexual violence, and intimate partner violence) is associated with ~~increaseds the~~ risk of depression, post-traumatic stress disorder (PTSD), anxiety, suicide, and suicide attempts (Bossarte et al., 2014; D. P. Chapman et al., 2004; Dube et al., 2001; Felitti et al., 1998; Klomek, Sourander, & Gould, 2010; Leeb, Lewis, & Zolotor, 2011; World Health Organization, 2013). Women exposed to partner violence are nearly 5 times more likely to attempt suicide as women not exposed to partner violence (WHO, 2013). Exposure to adverse experiences in childhood, such as physical, sexual, emotional abuse and neglect, and living in homes with violence, mental health, substance abuse



problems and other instability, is associated with ~~increased~~ the risk for suicide and suicide attempts several fold (Bellis et al., 2014; Dube et al., 2001). The psychosocial effects of violence in childhood and adolescence can be observed decades later, including severe problems with finances, family, jobs, and stress – factors that can increase the risk for suicide. Suicide and other forms of violence often share the same individual, relationship, community, and societal risk factors suggesting that efforts to prevent interpersonal violence may also prove beneficial in preventing suicide (Haegerich & Dahlberg, 2011; Hamby & Grych, 2013; Wilkins, Tsao, Hertz, Davis, & Klevens, 2014). Further, just as risk factors may be shared across suicide and interpersonal violence, so too may protective factors overlap. For example, connectedness to one's community (Kleiman, Riskind, Schaefer, & Weingarden, 2012), school (Carter, McGee, Taylor, & Williams, 2007), family (Maimon, Browning, & Brooks-Gunn, 2010), caring adults (Capaldi, Knoble, Shortt, & Kim, 2012; Losel & Farrington, 2012), and pro-social peers (Wyman et al., 2010) can enhance resilience and help reduce risk for ~~to~~ suicide and other forms of violence.

Comment [A]: Edits requested to avoid implying a causal link.

**The health and economic consequences of suicide are substantial.** Suicide and suicide attempts have far reaching consequences for individuals, families, and communities (Dunne, McIntosh, & Dunne-Maxim, 1987; Mishara, 1995; National Action Alliance for Suicide Prevention: Suicide Attempt Survivors Task Force, 2014; National Action Alliance for Suicide Prevention: Survivors of Suicide Loss Task Force, 2015). In an early study, Crosby and Sacks (2002) estimated that 7% of the U.S. adult population, or 13.2 million adults, knew someone in the prior 12 months who had died by suicide. They also estimated that for each suicide, 425 adults were exposed, or knew about the death. In a more recent study, in one state, Cerel et al (2016) found that 48% of the population knew at least one person who died by suicide in their lifetime. Research indicates that the impact of knowing someone who died by suicide and/or having lived experience (i.e., personally have attempted suicide, have had suicidal thoughts, or have been impacted by suicidal loss) is much more extensive than injury and death. People with lived experience may suffer long-term health and mental health consequences ranging from anger, guilt, and physical impairment, depending on the means and severity of the attempt (A. L. Chapman & Dixon-Gordon, 2007). Similarly, survivors of a loved one's suicide may experience ongoing pain and suffering including complicated grief (Mitchell, Kim, Prigerson, & Mortimer-Stephens, 2004), stigma, depression, anxiety, post-traumatic stress disorder, and increased risk of suicidal ideation and suicide (Cerel, McIntosh, Neimeyer, Maple, & Marshall, 2014; Sudak, Maxim, & Carpenter, 2008). Less discussed but no less important, are the financial and occupational effects for those left behind (Florence, Simon, Haegerich, Luo, & Zhou, 2015).

The economic toll of suicide is immense as well. According to conservative estimates, in 2013, suicide cost \$50.8 billion in estimated lifetime medical and work-loss costs alone (Florence et al., 2015). Adjusting for potential under-reporting of suicide and drawing upon health expenditures per capita, GDP per capita, and variability among states in per capita health care expenditures and income, another study estimated the total lifetime costs associated with nonfatal injuries and deaths caused by self-directed violence to be approximately \$93.5 billion in 2013 (Shepard, Gurewich, Lwin, Reed, & Silverman, 2016). The overwhelming burden of these costs were from lost productivity over the life course, with the



average cost per suicide being over \$1.3 million (Shepard et al., 2016). The true economic costs are likely higher, as neither study included monetary figures related to other societal costs such as those associated with the pain and suffering of family members or other impacts.

**Suicide can be prevented.** Like most public health problems, suicide is preventable (U.S. Public Health Service, 1999). While progress will continue to be made into the future, evidence for numerous programs, practices, and policies currently exists, and many programs are ready to be implemented now. Just as suicide is not caused by a single factor, research suggests that reductions in suicide will not be prevented by any single strategy or approach (Silverman & Maris, 1995; U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). Rather, suicide prevention is best achieved by a focus across the individual, relationship, family, community, and societal-levels and across all sectors, private and public (e.g., business, public health, physical and behavioral healthcare, justice, education, and labor; National Action Alliance for Suicide Prevention, 2014; World Health Organization, 2014).

### Assessing the Evidence

This technical package includes programs, practices, and policies with evidence of impact on suicide or risk or protective factors for suicide. To be considered for inclusion in the technical package, the program, practice, or policy selected had to meet at least one of these criteria: a) meta-analyses or systematic reviews showing impact on suicide; b) evidence from at least one rigorous (e.g., randomized controlled trial [RCT] or quasi-experimental design) evaluation study that found significant preventive effects on suicide; c) meta-analyses or systematic reviews showing impact on risk or protective factors for suicide, or d) evidence from at least one rigorous (e.g., RCT or quasi-experimental design) evaluation study that found significant impacts on risk or protective factors for suicide. Finally, consideration was also given to the likelihood of achieving beneficial effects on multiple forms of violence; no evidence of harmful effects on specific outcomes or with particular subgroups; and feasibility of implementation in a U.S. context if the program, policy, or practice has been evaluated in another country.

Within this technical package, some approaches do not yet have research evidence demonstrating impact on rates of suicide but instead are supported by evidence indicating impacts on risk or protective factors for suicide (e.g., help-seeking, stigma reduction, depression, connectedness). In terms of the strength of the evidence, programs that have demonstrated effects on suicidal behavior (e.g., reductions in deaths, attempts) provide a higher-level of evidence, but the evidence base is not that strong in all areas. For instance, there has been less evaluation of community engagement and family programs on suicidal behavior. Thus, approaches in this package that have effects on risk or protective factors reflect the developing nature of the evidence base and the use of the best available evidence at a given time.

It is also important to note that there is often significant heterogeneity among the programs, policies, or practices that fall within one approach or strategy area in terms of the nature and quality of the available



evidence. Not all programs, policies, or practices that utilize the same approach are equally effective, and even those that are effective may not work across all populations. Tailoring programs and more evaluation may be necessary to address different population groups. The evidence-based programs, practices, or policies included in the package are not intended to be a comprehensive list for each approach, but rather to serve as examples that have been shown to impact suicide or have beneficial effects on risk or protective factors for suicide.

### Context and Cross-Cutting Themes

One important feature of the package is the complementary, but potentially synergistic impact of the strategies and approaches. The strategies and approaches included in this technical package represent different levels of the social ecology, with efforts intended to impact community and societal levels, as well individual and relationship levels. The strategies and approaches are intended to work in combination and reinforce each other to prevent suicide (see box below). The strategies are arranged in order such that those strategies hypothesized to have the greatest potential for broad public health impact on suicide are included first, followed by those that might impact more select populations (e.g., persons who have already made a suicide attempt).

Preventing Suicide	
Strategy	Approach
Strengthen economic supports	<ul style="list-style-type: none"> <li>Strengthen household financial security</li> <li>Housing stabilization policies</li> </ul>
Strengthen access and delivery of suicide care	<ul style="list-style-type: none"> <li>Coverage of mental health conditions in health insurance policies</li> <li>Reduce provider shortages in underserved areas</li> <li>Safer suicide care through systems change</li> </ul>
Create protective environments	<ul style="list-style-type: none"> <li>Reduce access to lethal means among persons at-risk of suicide</li> <li>Organizational policies and culture</li> <li>Community-based policies to reduce excessive alcohol use</li> </ul>
Promote connectedness	<ul style="list-style-type: none"> <li>Peer norm programs</li> <li>Community engagement activities</li> </ul>
Teach coping and problem-solving skills	<ul style="list-style-type: none"> <li>Social-emotional learning programs</li> <li>Parenting skill and family relationship approaches</li> </ul>
Identify and support people at risk	<ul style="list-style-type: none"> <li>Gatekeeper training</li> <li>Crisis Intervention</li> <li>Treatment for people at risk of suicide</li> <li>Treatment to prevent re-attempts</li> </ul>
Lessen harms and prevent future risk	<ul style="list-style-type: none"> <li>Postvention</li> <li>Safe reporting following a suicide</li> </ul>

It is important to note that these strategies are not mutually exclusive but each has an immediate focus. For instance, social emotional learning programs, an approach under the *Teach Coping and Problem-Solving Skills* strategy, sometimes include components to change peer norms and the broader environment. The primary focus of these programs, however, is to provide children and youth with skills to resolve problems in relationships, school, and with peers, and to help youth address other negative influences (e.g., substance use) associated with suicide.

The goal of this package is to stress the importance of comprehensive prevention efforts and to provide examples of effective programs addressing each level of the social ecology, with the knowledge that some programs, practices, and policies may impact multiple levels. Further, those that involve multiple sectors and that impact multiple levels of the social ecology are more likely to have a greater impact on the overall burden of suicide.

Suicide ideation, thoughts, attempts, and deaths vary by gender, race/ethnicity, age, occupation, and other important population characteristics. Further, certain transition periods are also associated with higher rates of suicide (e.g., transition from working into retirement, transition from active duty military status to civilian status). In fact, suicide risk can change along with dynamic risk factors. For example, individuals' coping skills may change during periods of crisis and heightened stress, limiting their normal ability to effectively solve problems and cope. Research indicates that suicide risk changes as a result of the number and intensity of key risk and protective factors experienced (Turecki, 2014). Ideally, the availability of multiple strategies and approaches tailored to the social, economic, cultural, and environmental context of individuals and communities are desirable as they may increase the likelihood of removing barriers to supportive and effective care and provide opportunities to develop individual and community resilience.

Identifying programs, practices, and policies with evidence of impact on suicide, suicide attempts, or beneficial effects on risk or protective factors for suicide is only the first step. In practice, the effectiveness of the programs, policies and practices identified in this package will be strongly dependent on how well programs are implemented, as well as the partners and communities in which they are implemented. Practitioners in the field may be in the best position to assess the needs and strengths of their communities and work with community members to make decisions about the combination of approaches included here that are best suited to their context.

Data-driven strategic planning processes can help communities with this work (e.g., see Edwards, Jumper-Thurman, Plested, Oetting, & Swanson, 2000; Hawkins, Catalano, & Kuklinski, 2014; Plested, Edwards, & Jumper-Thurman, 2006). These planning processes engage and guide community stakeholders through a prevention planning process designed to address a community's profile of risk and protective factors with evidence-based programs, practices, and policies. These processes can also be used to monitor implementation, track outcomes, and make adjustments as indicated by the data. The readiness of the program for broad dissemination and implementation (e.g., availability of program



materials, training and technical assistance) can also influence program effects. Implementation guidance to assist practitioners, organizations and communities will be developed separately.

This package includes strategies where public health agencies are well positioned to bring leadership and resources to implementation efforts. It also includes strategies where public health can serve as an important collaborator (e.g., strategies addressing community and societal level risks), but where leadership and commitment from other sectors such as business, labor or health care is critical to implement a particular policy or program (e.g., workplace policies; treatment to prevent re-attempts). The role of various sectors in the implementation of a strategy or approach in preventing suicide is described further in the section on *Sector Involvement*.

In the sections that follow, the strategies and approaches with the best available evidence for preventing suicide are described.

## Strengthen Economic Supports

### Rationale

Studies from the U.S. examining historical trends indicate that suicide rates increase during economic recessions marked by high unemployment rates, job losses, and economic instability and decrease during economic expansions and periods marked by low unemployment rates, particularly for working-age individuals 25 to 64 years old (Luo et al., 2011; Fowler et al., 2015). Economic and financial strain, such as job loss, long periods of unemployment, reduced income, difficulty covering medical, food, and housing expenses, and even the anticipation of such financial stress may increase an individual's risk for suicide or may indirectly increase risk by exacerbating related physical and mental health problems. Buffering these risks can, therefore, potentially protect against suicide (Stack & Wasserman, 2007). For example, strengthening economic support systems can help people stay in their homes or obtain affordable housing while also paying for necessities such as food and medical care, job training, child care, among other expenses required for daily living. In providing this support, stress and anxiety and the potential for a crisis situation may be reduced, thereby preventing suicide. Although more research is needed to understand how economic factors interact with other factors to increase suicide risk, the available evidence suggests that strengthening economic supports may be one opportunity to buffer suicide risk.

### Approaches

Economic supports for individuals and families can be strengthened by targeting household financial security and ensuring stability in housing during periods of economic stress.

- **Strengthening household financial security** can potentially buffer the risk of suicide by providing individuals with the financial means to lessen the stress and hardship associated with a job loss or other unanticipated financial problems. The provision of unemployment benefits and other forms of temporary assistance, livable wages, medical benefits, and retirement and disability insurance to help cover the cost of necessities or to offset costs in the event of disability, are examples of ways to strengthen household financial security.
- **Housing stabilization policies** aim to keep people in their homes and provide housing options for those in need during times of financial insecurity. This may occur through programs that provide affordable housing such as through government subsidies or through other options available to potential homebuyers such as loan modification programs, move-out planning, or financial counseling services that help minimize the risk or impact of foreclosures and eviction.



### Potential Outcomes

- Reductions in foreclosure rates
- Reductions in eviction rates
- Reductions in emotional distress
- Reductions in suicide

### Evidence

There is evidence suggesting that strengthening household financial security and stabilizing housing can reduce suicide risk.

- **Strengthen household financial security.** The *Federal-State Unemployment Insurance Program* allows states to define the maximum amount and duration of unemployment benefits that workers are entitled to receive after a job loss (Cylus, Glymour, & Avendano, 2014). An examination of variations in *unemployment benefit programs* across states demonstrated that the impact of unemployment on rates of suicide was offset in those states that provided greater than average unemployment benefits (mean level: \$7,990 per person in U.S. constant dollars; Cylus et al., 2014). The effects of *unemployment benefit programs* were also consistent by sex and age group. Another U.S. study examining the link between unemployment and suicide rates using monthly suicide data, length of unemployment (less than 5 weeks, 5-14 weeks, 15-26 weeks, and greater than 26 weeks), and job losses found that the duration of unemployment, as opposed to just the loss of job, predicted suicide risk (Classen & Dunn, 2012). Together, these results suggest that not only should state unemployment benefit programs be generous in their financial allocations, but also in their duration.

Other measures to strengthen household financial security (e.g., transfer payments related to retirement and disability insurance, unemployment insurance compensation, medical benefits, and other forms of family assistance) have also shown an impact on rates of suicide. A study by Flavin and Radcliff (2009) examined the impact of states' per capita spending on transfer payments, medical benefits, and family assistance (Temporary Assistance to Needy Families – TANF) and total state spending on suicide rates between 1990-2000, controlling for a number of suicide risk factors (e.g., residential mobility, divorce rate, unemployment rate) at the state level. As per capita spending on total transfer payments, medical benefits, and family assistance increased there was an associated decrease in state suicide rates. ~~Moreover, it wasn't spending in general that was associated with the reduction but spending on these types of assistance.~~ In terms of lives saved, Flavin & Radcliff calculated the cost of reducing a state's suicide rate by a full point for the years studied. At the national level, they estimated ~~that~~ 3,000 fewer suicides would occur per year nationwide if every state increased its per capita spending on these types of assistance by \$45 per year (Flavin & Radcliff, 2009). Although this was a correlational study,

Comment [A]: Is this intentionally vague? Why not just state TANF.

the results demonstrate the potential benefits of policies that reach particularly vulnerable individuals during periods of great need and increased risk for suicide. More evaluation studies are needed to further understand the outcomes impacted by programs such as these.

- **Housing stabilization policies.** The *National Neighborhood Stabilization Program* was designed to help neighborhoods suffering from high rates of foreclosure and abandonment by slowing the deterioration of the neighborhoods and providing affordable housing options for low, moderate, and middle-income homebuyers. This program also offers financial assistance to eligible individuals for the purchase of a new home. Although this program has not been rigorously evaluated for its impact on suicide outcomes, it addresses foreclosure and eviction, which are risk factors for suicide. A longitudinal analysis of annual data on suicides and foreclosures demonstrated that as the proportion of foreclosed properties increased in U.S. states, so did the state suicide rate, particularly among working-aged adults (Houle & Light, 2014). Another study of data from 16 U.S. states participating in the National Violent Death Reporting System found that suicides precipitated by home foreclosures and evictions increased more than 100% from 2005 (before the housing crisis began) to 2010 (after it had peaked; Fowler, Gladden, Vagi, Barnes, and Frazier (2015)). Most of these suicides occurred prior to the actual loss of the decedent's home. These findings suggest that integrating suicide prevention resources, messaging, and referrals into financial, foreclosure, and move-out planning and counseling services may help to prevent suicide.



## Strengthen Access and Delivery of Suicide Care

### Rationale

While most people with mental health problems do not attempt or die by suicide (Olfson, Gerhard, Huang, Crystal, & Stroup, 2015; Owens, 2002), and the level of risk conferred by different types of mental illness varies (Arsenault-Lapierre, Kim, & Turecki, 2004; E. C. Harris & Barraclough, 1997; Tyrer, Reed, & Crawford, 2015), previous research indicates that mental illness is an important risk factor for suicide (E. C. Harris & Barraclough, 1998; World Health Organization, 2014). State-level suicide rates have also been found to be correlated with general mental health measures such as depression (Lang, 2013; Mark, Shern, Bagalman, & Cao, 2007). Findings from the National Comorbidity Survey indicate that relatively few people in the U.S. with mental health disorders receive treatment for those conditions (Kessler et al., 2005). Lack of access to mental health care is one of the contributing factors related to the underuse of mental health services (Cunningham, 2009). Identifying ways to improve access to timely, affordable, and quality mental health and suicide care for people in need is a critical component to prevention (World Health Organization, 2014). Additionally, research suggests that services provided are maximized when health and behavioral health care systems are set up to effectively and efficiently deliver such care (C.E. Coffey, 2007). Apart from treatment benefits, these approaches can also normalize help-seeking behavior and increase the use of such services.

### Approaches

There are a number of approaches that can be used to strengthen access and delivery of suicide care, including:

- **Coverage of mental health conditions in health insurance policies.** Federal and state laws include provisions for equal coverage of mental health services in health insurance plans that is on par with coverage for other health concerns (i.e., mental health parity). Benefits and services covered include such things as the number of visits, co-pays, deductibles, inpatient/outpatient services, prescription drugs, and hospitalizations. If a state has a stronger mental health parity law than the federal parity law, then insurance plans regulated by the state must follow the state parity law. If a state has a weaker parity law than the federal parity law (e.g., includes coverage for some mental health conditions but not others), then the federal parity law will replace the state law. Equal coverage does not necessarily imply good coverage as health insurance plans vary in the extent to which benefits and services are offered to address various health conditions. Rather it helps to ensure that mental health services are covered on par with other health concerns.
- **Reduce provider shortages in underserved areas.** Access to effective and state-of-the-art mental health care is largely dependent upon the training and the size of the mental health care workforce. Over 85 million Americans live in areas with an insufficient number of mental health

Comment [A]: Double check and make sure that this will not need an ACA review

providers; this shortage is particularly severe among low-income urban and rural communities (U.S. Department of Health and Human Services Health Resources and Services Administrations, 2016a). There are a range number of ways to increase the number and distribution of practicing mental health providers in underserved areas including offering financial incentives through existing state and federal programs (e.g., loan repayment programs) and expanding telemental health services. Such approaches can increase the likelihood that those in need will be able to access affordable, quality care for mental health problems, which can reduce risk for suicide.

Comment [A]: define.

- **Safer suicide care through systems change.** Access to health and behavioral health care services is critical for people at risk of suicide; however this is just one piece of the puzzle. Care should also be *delivered* efficiently and effectively. More specifically, care should take place within a system that supports suicide prevention and patient safety through strong leadership, workforce training, systematic identification and assessment of suicide risk, implementation of evidence-based treatments (see *Identify and Support People At-Risk*, p.31), continuity of care, and continuous quality improvement. Care that is patient-centered and promotes equity for all patients is also of critical importance (National Action Alliance for Suicide Prevention: Clinical Workforce Preparedness Task Force, 2014).

#### Potential Outcomes

- Increases in access to mental health services
- Increase in utilization of mental health services
- Reductions in symptoms of mental illnesses and suicidality
- Reductions in rates of suicide attempts
- Reductions in rates of suicide

#### Evidence

There is evidence suggesting that coverage of mental health conditions in health insurance policies and improving access and the delivery of care can reduce risk factors associated with suicide and may directly impact suicide rates.

- **Coverage of mental health conditions in health insurance policies.** The National Survey of Drug Use and Health is a nationally representative survey of the U.S. population that provides data on substance use, mental health conditions, and services utilization. Using data from this survey, K. M. Harris, Carpenter, and Bao (2006) found that 12 months after states enacted *mental health parity laws*, self-reported use of mental healthcare services significantly increased. Moreover, subsequent research by Lang (2013) examined state mental health laws and suicide rates between 1990 and 2004 and found that mental health parity laws, specifically, were associated



with an approximate 5% reduction in suicide rates. This reduction, in the 29 states with parity laws, equated to the prevention of 592 suicides per year (Lang, 2013).

- **Reduce provider shortages in underserved areas.** One example of a program to improve access to mental health care providers is the *National Health Service Corps (NHSC)*, which offers financial incentives to attract mental/behavioral health clinicians to underserved areas. Programs such as *NHSC* encourage individuals to work in the mental health profession in locations designated as Health Professional Shortage Areas (HPSAs) in exchange for student loan debt repayment. A 2012 retention survey conducted by the Health Resources and Services Administration (HRSA), found that 61% of mental and behavioral health care providers continued to practice in designated mental health shortage areas after their four year commitment to The National Health Service Corps (U.S. Department of Health and Human Services Health Resources and Services Administrations, 2016b). Although this program has not been evaluated for impact on suicide, it addresses access to care, which is a critical component to suicide prevention.

*Telemental health (TMH)* services refer to the use of telephone, video and web-based technologies for providing psychiatric or psychological care at a distance. *TMH* can be used in a variety of settings (e.g. outpatient clinics, hospitals, military treatment facilities) to treat a wide range of mental health conditions. It can also improve access to care for patients in isolated areas, as well as reduce travel time and expenses, reduce delays in receiving care, and improve satisfaction interacting with the mental health care system. A systematic review of *TMH* services found that services rated as high or good quality were effective in treating mental health conditions such as depression, schizophrenia, substance abuse, and suicidal ideation and suicide deaths among other outcomes (Hailey, Roine, & Ohinmaa, 2008). Further, Mohr and colleagues (2008) conducted a meta-analysis examining the effect of psychotherapy delivered specifically via telephone and found that it significantly reduced depressive symptoms in comparison to face-to-face psychotherapy. They also found that treatment attrition rates were significantly lower among patients receiving telephone-administered psychotherapy compared to patients receiving face-to-face therapy. Thus, *TMH* may not only offer improved access to mental health care, but it may also ensure continuity of care, and thereby further reduce the risk for suicide.

- **Safer suicide care through systems change.** *Henry Ford Health* *Healthcare System*, which is a large health maintenance organization (HMO) in the state of Michigan, pioneered the *Perfect Depression Care* program, the pre-cursor to what is now called *Zero Suicide*. The overall goal of *Perfect Depression Care* was to eliminate suicide among HMO members. More broadly, the goal of the program was to redesign delivery of depression care to achieve “breakthrough improvement” in quality and safety by focusing on effectiveness, safety, patient centeredness, timeliness, efficiency, and equity among patients. The program screened and assessed each

patient for suicide risk and implemented coordinated continuous follow-up care system wide (C. E. Coffey, 2006). An examination of the impact of the program found that there was a dramatic and statistically significant decrease in the rate of suicide between the baseline years, 1999 and 2000, prior to the intervention to the intervention years, 2002-2009. During this time period, the suicide rate fell by 82% (C. E. Coffey, 2006; C. E. Coffey, Coffey, & Ahmedani, 2013). Further, among HMO members who received mental health specialty services, the suicide rate significantly decreased over time from 1999 to 2010 (110.3 to 47.6 per 100,000 population;  $p<.04$ ) with a mean of 36.2 per 100,000 over the period. Additionally, for those HMO members who accessed only general medical services as opposed to specialty mental health services, the suicide rate increased from 2.7 to 5.6 per 100,000 ( $p<.01$ ). Similarly, in the state of Michigan, rates of suicide in the general population increased over the period from 9.8 to 12.5 per 100,000 ( $p<.001$ ) (M. Coffey, Coffey, & Ahmedani, 2015).



## Create Protective Environments

### Rationale

Prevention efforts that focus not only on individual behavior change (e.g., help-seeking, treatment interventions) but on changes to the environment can increase the likelihood of positive behavioral and health outcomes (Haddon, 1980). Creating environments that address risk and protective factors where individuals live, work, and play, can help prevent suicide (Dahlberg & Krug, 2002; U.S. Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012). For example, rates of suicide are high among middle-aged adults (who comprise 42.6% of the workforce; Toosi, 2015); among certain occupational groups (e.g., farming, fishing, forestry, and construction; Han et al., 2016; McIntosh et al., 2016), and among people in detention facilities (e.g. jail, prison), to name a few. Thus, settings where these populations work and reside are ideal for implementing programs, practices and policies to buffer against suicide. Changes to organizational culture through the implementation of supportive policies, for instance, can change social norms, encourage help-seeking, and demonstrate that good health and mental health are valued and that stigma and other risk factors for suicide are not (Knox et al., 2010; National Action Alliance for Suicide Prevention Workplace Task Force, 2015). Similarly, modifying the characteristics of the physical environment to prevent harmful behavior such as access to lethal means can reduce suicide rates, particularly in times of crisis or transition (Beautrais, Gibb, Fergusson, Horwood, & Larkin, 2009; A.E. Crosby, Espitia-Hardeman, Ortega, & Lozano, 2013; Kaplan et al., 2013; Miller, Warren, Hemenway, & Azrael, 2015; Runyan et al., 2016; Stokes, McCoy, Abram, Byck, & Teplin, 2015).

### Approaches

The current evidence suggests three potential approaches for creating environments that protect against suicide.

- **Reduce access to lethal means among persons at-risk of suicide.** Means of suicide such as firearms, hanging/suffocation, or jumping from heights provide little opportunity for rescue and, as such, have high case fatality rates (e.g., about 85% of people who use a firearm in a suicide attempt will die from the injury). Research also indicates that: 1) the interval between deciding to act and attempting suicide can be as short as 5 or 10 minutes (Deisenhammer et al., 2009; Simon et al., 2001), and 2) ~~that~~ people tend *not* to substitute a different method when a highly lethal method is unavailable or difficult to access (Hawton, 2007; Yip et al., 2012). Therefore, increasing the time interval between deciding to act and the suicide attempt, for example, by making it more difficult to access lethal means, can be lifesaving. The following are examples of approaches reducing access to lethal means for persons at-risk of suicide:



- *Intervening at Suicide Hotspots.* Suicide hotspots, or places where suicides may take place relatively easily, include tall structures (e.g., bridges, cliffs, balconies, and rooftops), railway tracks, and isolated locations such as parks. Efforts to prevent suicide at these locations include erecting barriers or limiting access to prevent jumping, and installing signs and telephones to encourage individuals who are considering suicide, to seek help (Cox et al., 2013).
- *Safe Storage Practices.* Safe storage of medications, firearms, and other household products can reduce the risk for suicide by separating vulnerable individuals from easy access to lethal means. Such practices may include education and counseling around storing firearms--locked in a secure place (e.g., in a gun safe or lock box), unloaded and separate from the ammunition--and keeping medicines in a locked cabinet or other secure location away from people who may be at risk or who have made prior attempts (Rowhani-Rahbar, Simonetti, & Rivara, 2016; Runyan et al., 2016).
- **Organizational policies and culture** that promote protective environments may be implemented in places of employment, detention facilities, and other secured environments (e.g. residential settings). Such policies and cultural values encourage leadership from the top down and may promote prosocial behavior (e.g., asking for help), skill building, positive social norms, assessment, referral and access to helping services (e.g. mental health, substance abuse treatment, financial counseling), and development of crisis response plans, postvention and other measures to foster a safe physical environment. Such policies and cultural shifts can positively impact organizational climate and morale and help prevent suicide and its related risk factors (e.g. depression, social isolation) (Hayes, 2013; National Action Alliance for Suicide Prevention Workplace Task Force, 2015).
- **Community-based policies to reduce excessive alcohol use.** Research studies in the United States have found that greater alcohol availability is positively associated with alcohol-involved suicides (Escobedo & Ortiz, 2002; Giesbrecht et al., 2015). Policies to reduce excessive alcohol use broadly include zoning to limit alcohol outlet locations and density, taxes on alcohol, and bans on the sale of alcohol for individuals under the legal drinking age. These policies are important because acute alcohol use has been found to be associated with more than one-third of suicides and approximately 40% of suicide attempts (Cherpitel, Borges, & Wilcox, 2004).

### Potential Outcomes

- Increases in safe storage of lethal means
- Reductions in rates of suicide
- Reductions in suicide attempts



- Reductions in suicide deaths
- Increases in help-seeking
- Reductions in alcohol-related suicide deaths

## Evidence

The evidence suggests that creating protective environments can reduce suicide and suicide attempts and increase protective behaviors.

- **Reduce access to lethal means among persons at-risk of suicide.** A meta-analysis examining the impact of *suicide hotspot interventions* implemented in combination or in isolation, both in the U.S. and abroad, found associated reduced rates of suicide (Cox et al., 2013; Pirkis et al., 2015). For example, after erecting a barrier on the Jacques-Cartier bridge in Canada, the suicide rate from jumping from the bridge decreased from about 10 suicide deaths per year to about 3 deaths per year (Perron, Burrows, Fournier, Perron, & Ouellet, 2013). Moreover, the reduction in suicides by jumping was sustained even when all bridges and nearby jumping sites were considered, suggesting little to no displacement of suicides to other jumping sites (Perron et al., 2013). Further evidence for the effectiveness of bridge barriers was demonstrated by a study examining the impact of the *removal* of safety barriers from the Grafton Bridge in Auckland, New Zealand. After removal of the barrier, both the number and rate of suicide increased five-fold (Beautrais, 2001; Beautrais et al., 2009).

Another form of means reduction involves implementation of *safe storage practices*. In a case-control study of firearm-related events identified from 37 counties in Washington, Oregon, and Missouri, and from 5 trauma centers, Grossman et al. (2005) found that storing firearms unloaded, separate from ammunition, in a locked place or secured with a safety device was protective of suicide attempts among adolescents. Further, a recent systematic review of clinic and community-based education and counseling interventions suggested that the provision of safety devices significantly increased safe firearm storage practices compared to counseling alone or compared to the provision of economic incentives to acquire safety devices on one's own (Rowhani-Rahbar et al., 2016).

Another program, The *Emergency Department Counseling on Access to Lethal Means (ED CALM)*, trained psychiatric emergency clinicians in a large children's hospital to provide lethal means counseling and safe storage boxes to parents of patients under age 18 receiving care for suicidal behavior. In a pre-post quality improvement project, Runyan et al. (2016) found that at post-test 76% (of the 55% of parents followed up, n=114) reported that all medications in the home were locked up as compared to fewer than 10% at the time of the initial emergency department visit. Among parents who indicated the presence of guns in the home at pre-test (i.e. 67%), all (100%) reported guns were currently locked up at post-test (Runyan et al., 2016).

- **Organizational policies and culture.** *Together for Life* is a workplace program of the Montreal Police Force implemented to address suicide among officers. Policy and program components were designed to foster an organizational culture that promoted mutual support and solidarity among all members of the Force. The program included training of supervisors, managers and all units to improve competencies in identifying suicidal risk and to improve use and awareness of existing resources. The program also included an education campaign to improve awareness and help-seeking (Mishara & Martin, 2012). Police suicides were tracked over 12 years and compared to rates in the control city of Quebec. The suicide rate in the intervention group decreased significantly by 78.9% to a rate of 6.4 suicides per 100,000 population per year compared to an 11% increase in the control city (29.0 per 100,000; Mishara & Martin, 2012).

Another example of this approach is the *United States Air Force Suicide Prevention Program*. The program included 11 policy and education initiatives and was designed to change the culture of the Air Force surrounding suicide. The program uses leaders as role models and agents of change, establishes expectations for behavior related to awareness of suicide risk, develops population skills and knowledge (i.e., education and training), and investigates every suicide (i.e., outcomes measurement). The program represents a fundamental shift from viewing suicide and mental illness solely as medical problem and instead sees them as larger service-wide problems impacting the whole community (Knox, Litts, Talcott, Feig, & Caine, 2003). Using a time-series design to examine the impact of the program on various violence-related outcomes, researchers found that the program was associated with a 33% relative risk reduction in suicide (Knox et al., 2003). The program was also associated with relative risk reductions in related outcomes including moderate and severe family violence (30% and 54%, respectively), homicide (51%), and accidental death (18%) (Knox et al., 2003). A longitudinal assessment of the program over the period 1981 to 2008 (16 years before the 1997 launch of the program and 11 years post-launch) found significantly lower rates of suicide after the program was launched than before **launch** (Knox et al., 2010). These effects were sustained over time, except in 2004, which the authors found was associated with **less rigorous implementation** in that year than in the other years (Knox et al., 2010).

Finally, while the evidence is still being built for *suicide prevention in correctional facilities*, preliminary evidence suggests ~~that~~ organizational policies and practices that include routine suicide prevention training for all staff, standardized intake screening and risk assessment, provision of shared information between staff members, especially in transitioning or transferring of inmates, varying levels of observation, safe physical environment, emergency response protocols, notification of suicidal behavior/suicide through the chain of command, and critical incident stress debriefing and death review can potentially reduce suicide. When these policies and practices were implemented across 11 state prisons in Louisiana, suicide rates

**Comment [A]:** What does this mean and pertinence to fidelity?



dropped from a rate of 23.1 per 100,000 before the intervention to 12.4 per 100,000 the following year (Hayes, 1995). Other similar programs have seen declines in suicide both in the United States and internationally (Barker, Kőlves, & De Leo, 2014).

**Comment [A]:** Compute a 46% reduction in the rate. Suggest emphasizing this large effect.

**Comment [A]:** Citations?

**Comment [A]:** Please clarify the results from this study, did this result in an increase in suicide or decrease? Not clear.

- **Community-based policies to reduce excessive alcohol use.** While multiple policies to limit excessive use of alcohol exist, several studies on alcohol outlet *density*, specifically, suggest that measures to reduce alcohol outlet density can potentially reduce alcohol-involved suicides. Additionally, a longitudinal analysis of alcohol outlet density, suicide mortality, and hospitalizations for suicide attempts over 6 years in 581 California zip codes indicated that the density of bars, specifically, is inversely related to suicide and suicide attempts, particularly in rural areas (Johnson, Gruenewald, & Remer, 2009).

## Promote Connectedness

### Rationale

Sociologist, Emile Durkheim theorized in 1897 that weak social bonds, i.e. lack of connectedness, are among the chief causes for suicidality (Durkheim, 1897/1951). *Connectedness* is the degree to which an individual or group of individuals are socially close, interrelated, or share resources with others (Centers for Disease Control and Prevention, 2009). Social connections can be formed within and between multiple levels of the social ecology (Dahlberg & Krug, 2002), for instance between individuals (e.g. peers, neighbors, co-workers), families, schools, neighborhoods, workplaces, faith communities, cultural groups, and society as a whole. Related to connectedness, *social capital* refers to a sense of trust in one's community and neighborhood, social integration, and also the availability and participation in social organizations (Beyer, Layde, Hamberger, & Laud, 2015; Muennig, Cohen, Palmer, & Zhu, 2013). Many ecological cross-sectional and longitudinal studies have examined the impact of aspects of social capital on depression symptoms, depressive disorder, mental health more generally, and suicide. While the evidence is limited, existing studies suggest ~~the pattern is towards a~~ positive association between social capital measured by social trust, community/neighborhood engagement, and improved mental health. Connectedness and social capital together ~~can serve to~~ may protect against suicidal behaviors by decreasing isolation, encouraging adaptive coping behaviors, increasing belongingness, ~~personal~~ value, and worth, ~~all of which to~~ helps individuals ~~to~~ build resilience in the face of adversity. Connectedness can also provide individuals with better access to formal supports and resources, mobilize communities to meet the needs of its members and provide collective primary prevention activities to the community as a whole (Centers for Disease Control and Prevention, 2009).

### Approaches

Promoting connectedness among individuals and within communities through modeling peer norms and enhancing community engagement may protect against suicide.

- **Peer norm programs** seek to normalize protective factors for suicide such as help-seeking, reaching out and talking to trusted adults, and promote peer connectedness. By leveraging the leadership qualities and social influence of peers, these approaches can be used to shift group-level beliefs and promote positive social and behavioral change. These approaches typically target youth and are delivered in school settings but can also be implemented in community settings.
- **Community engagement activities.** Community engagement is an aspect of social capital. Community engagement approaches may involve residents participating in a range of activities, including religious activities, community clean-up and greening activities, and physical exercise. These activities provide opportunities for residents to become more involved in the community and to connect with other community members, organizations, and resources, resulting in

**Comment [A]:** Add verb here to be consistent with sentence structure, suggest rewriting this sentence or re-order?



enhanced overall physical health, reduced stress, and decreased depressive symptoms, thereby reducing risk of suicide.

### Potential Outcomes

- Reductions in maladaptive coping attitudes and behaviors
- Increases in healthy coping attitudes and behaviors
- Increases in referrals for youth in distressed
- Increases help-seeking behaviors
- Increases in positive perceptions of adult support

### Evidence

Current evidence suggests a number of positive benefits of peer norm and community engagement activities, although more evaluation research is needed to examine whether these improvements in factors that protect against suicidal behavior translate into reduced suicide attempts and deaths.

- **Peer norm programs.** Evaluations show that programs such as *Sources of Strength* can improve school norms and beliefs about suicide that are created and disseminated by student peers. In a randomized controlled trial of *Sources of Strength* conducted with 18 high-schools (6 metropolitan, 12 rural), Wyman et al. (2010) found that the program improved adaptive norms regarding suicide among peer leaders, connectedness to adults, and school engagement. Peer leaders were also more likely than controls to refer a suicidal friend to an adult. For students, the program resulted in increased perceptions of adult support for suicidal youths, particularly among those with a history of suicidal ideation, and the acceptability of help-seeking behaviors. Finally, trained peer leaders also reported a greater decrease in maladaptive coping attitudes compared with untrained leaders (Wyman et al., 2010).
- **Community engagement activities.** A vacant lot greening initiative was undertaken in Philadelphia between 1999 and 2008. Local residents and community members worked together to green 4,436 lots (or 7.8 million square feet) in 4 areas of the city. Researchers found significant reductions in community residents' self-reported level of stress, which is a risk factor for suicide, and engagement in more physical exercise, a protective factor for suicide, than residents in control vacant lot areas. There is some evidence for oOther benefits, i-includinged reductions in firearm assaults and vandalism (Branas et al., 2011).

**Comment [A]:** Edit requested because this evidence is mixed. Their more recent results were not significant.

## Teach Coping and Problem-Solving Skills

### Rationale

Building life skills prepares individuals to successfully tackle every day challenges and adapt to stress and adversity. Life skills encompasses many concepts, but most often include coping and problem-solving skills, emotional regulation, conflict resolution, and critical thinking. Life skills are important in shielding individuals from suicidal behaviors (World Health Organization, 2014). Suicide prevention programs that focus on life and social skills training are drawn from social cognitive theories (Bandura, 1986), surmising that suicidal behavior is attributed to either direct learning and modeling or environmental and individual (e.g. hopelessness) characteristics. The inability to employ adequate strategies to cope with immediate stressors or identify and find solutions for problems has been characterized among suicide attempters (Pollock & Williams, 2004). Teaching and providing youth with the skills to tackle every day challenges and stressors is, therefore, an important developmental component to suicide prevention.

### Approaches

Social emotional learning programs and parenting skill and family relationship programs are two approaches for teaching coping and problem-solving skills.

- **Social emotional learning programs** focus on developing and strengthening communication and problem-solving skills, emotion regulation, conflict resolution, help seeking and coping skills. These approaches address a range of risk and protective factors for suicidal behavior. They provide children and youth with skills to resolve problems in relationships, school, and with peers, and help youth to address other negative influences (e.g., substance use) associated with suicide. These approaches are typically delivered to all students in a particular grade or school, although some programs also focus on groups of students considered to be at high risk for suicide. Opportunities to practice and reinforce skills are an important part of programs that work (Herman, Borden, Reinke, & Webster-Stratton, 2011).
- **Parenting skill and family relationship programs** provide caregivers with support and are designed to strengthen parenting skills, enhance positive parent-child interactions, and improve children's behavioral and emotional skills and abilities. Programs are typically designed for parents or caregivers with children in a specific age range and can be self-directed or delivered to individual families or groups of families. Some programs have sessions primarily with parents or caregivers while others include sessions for parents or caregivers, youth, and the family. Specific program content typically varies by the age of the child but often has consistent themes of child development, parent-child communication and relationships, and youth's interpersonal and problem-solving skills.



### Potential Outcomes

- Reductions in suicide attempts and suicide ideation
- Reductions in suicide risk behaviors (i.e., depression, anxiety, conduct problems, substance abuse)
- Improvements in help-seeking behavior
- Improvements in social competence and emotional regulation skills
- Improvements in problem-solving and conflict management skills

### Evidence

Several social emotional learning and parenting and family relationship programs have been shown in rigorous evaluations to improve resilience and reduce problem behavior and risk factors for various behaviors, including ones closely related to suicide, such as depression, internalizing behaviors, and substance abuse (M. S. Knox, Burkhardt, & Hunter, 2010).

- **Social emotional learning programs.** The *Youth Aware of Mental Health Program (YAM)* is a program developed for teenagers aged 14-16 that uses interactive dialogue and role-playing to teach adolescents about the risk and protective factors associated with suicide (including knowledge about depression and anxiety) and enhances their problem-solving skills for dealing with adverse life events, stress, school and other problems (Wasserman et al., 2014). In a cluster-randomized controlled trial conducted across 10 European Union countries and 168 schools, students in schools randomized to *YAM* were significantly less likely to attempt suicide and have severe suicidal ideation at the 12-month follow-up compared to students in control schools which received educational materials and care as usual. Overall, the relative risk of youth suicide attempts among the *YAM* group was reduced by over 50% demonstrating that out of 1000 students, five attempted suicide in the *YAM* group compared to 11 in the control group. Additionally, related to severe suicide ideation, in the *YAM* group absolute risk fell by 0.50% and relative risk fell by 49.6% (Wasserman et al., 2014).

Another example is the *Good Behavior Game (GBG)*, which is a classroom-based program for elementary school children aged 6-10. The program uses a team-based behavior management strategy that promotes good behavior by setting clear expectations for good behavior and consequences for maladaptive behavior. The goal of the *GBG* program is to create an integrated classroom social system that is supportive of all children being able to learn with little aggressive or disruptive behavior (Wilcox et al., 2008). Two cohorts of youths participated in the program in 1985-86 and 1986-87 school years when they were in the first and second grades. A number of proximal and distal outcomes were assessed among the two cohorts over time. With respect to distal suicide-related outcomes, an outcome evaluation of the *GBG* indicated that individuals in the first cohort who were assigned to participate in *GBG* when they were in the first grade reported half the adjusted odds of suicidal ideation

**Comment [A]:** Explain the difference between absolute and relative risk for lay readers; or just report relative risk.

and suicide attempts when assessed approximately 15 years later, between the ages of 19 to 21, compared to peers who had been in a standard classroom setting. The beneficial effect of the program was consistent for suicidal ideation regardless of whether baseline covariates were included. The GBG effect on attempts was less robust in some adjusted models including caregiver mental health. In the second cohort of GBG students, neither suicidal ideation nor suicide attempts were significantly different between GBG and the control interventions (Wilcox et al., 2008). The researchers believed this may have been due to a lack of implementation fidelity. GBG was also found to be associated with reduced risk of later substance abuse, a risk factor for suicide (Kellam et al., 2008).

- **Parenting skill and family relationship programs.** Parenting and family skills training approaches have shown promising impacts in preventing key risk factors associated with suicide. For example, the *Incredible Years (IY)* is a comprehensive group training program for parents, teachers and children designed to reduce conduct and substance abuse problems, two important suicide risk factors in youth by improving protective factors such as responsive and positive parent-teacher-child interactions and relationships, emotion self-regulation and social competence (all protective factors for suicide) (Herman et al., 2011). The program includes 9-20 sessions offered in community-based settings (e.g., religious, recreation centers, mental health treatment centers, and hospitals). Several studies have demonstrated the effect of the IY program on reducing internalizing symptoms, such as anxiety and depression, and child conduct problems (C. H. Webster-Stratton, Reid, & Beauchaine, 2011; Webster-Stratton, Jamila Reid, & Stoolmiller, 2008). The program is also associated with improved problem-solving and conflict management; these skills were maintained at 1-year follow-up (Reid, Webster-Stratton, & Hammond, 2003; C. Webster-Stratton & Hammond, 1997; C. Webster-Stratton, Reid, & Hammond, 2001). The program demonstrated greater benefits as the dosage of the intervention increased (Herman et al., 2011).

Additionally, *Strengthening Families 10–14* is a program that involves sessions between parents, youth, and family with the goal of improving parents' skills for disciplining, managing emotions and conflict, and communicating with their children; promoting youths' interpersonal and problem-solving skills; and creating family activities to build cohesion and positive parent-child interactions. The premise of the program is that developing these skills for both parents and children will reduce internalizing behavior and adolescent substance abuse, two important risk factors for suicide (Spath, Gyll, & Day, 2002). *Strengthening Families* has been shown to significantly decrease externalizing behaviors, such as aggression, alcohol use, and drug use among youth participants, as well as reduce depression, alcohol use, and drug use among participating families (Spath et al., 2002).

**Comment [A]:** How so?

**Comment [A]:** In the last version you had added "and pointed to the need for GBG to be delivered with precision, consistency, and teacher support." It could help to put something like this back in at the end of this sentence.

**Comment [A]:** One or both cohort? Please confirm.

**Comment [A]:** Specific outcomes or all outcomes?

**Comment [A]:** Number of sessions? Do Herman et al. indicate the ideal number of sessions (range from 9 to 20)?



## Identify and Support **People At-Risk**

Comment [A]: Suggest: At-Risk People

### Rationale

In order to decrease suicide, care of, and attention to, vulnerable populations is necessary, as these groups tend to experience suicidal behavior at higher than average rates. Such vulnerable populations include, but are not limited to, individuals with lower socio-economic status or who are living with a mental health problem; people who have previously attempted suicide; Veterans and active duty military personnel; individuals who are institutionalized, have been victims of violence, or are homeless; individuals of sexual minority status; and members of certain racial and ethnic minority groups (Bachynski et al., 2012; Centers for Disease Control and Prevention, 2016; Curtin et al., 2016; Kann et al., 2016; Lineberry & O'Connor; Russell & Joyner, 2001). Supporting these **at-risk** groups requires proactive case finding and effective response, crisis intervention, and evidence-based treatment. Finding optimal ways of identifying at-risk individuals, customizing services to make them more accessible (e.g., internet-based services when appropriate) and engaging people in evidence-based care (e.g. through such measures as collaborative treatment), remain key challenges. Simply improving or expanding services does not guarantee that those services will be used by people most in need, nor will it necessarily increase the number of people who follow recommended referrals or treatment. For example, some people living in –disadvantaged communities may face social and economic issues that can adversely affect their ability to access supportive services.

### Approaches

The following approaches focus on identifying and supporting people at increased risk.

- **Gatekeeper training** is designed to train teachers, coaches, clergy, emergency responders, primary and urgent care providers, and others in the community to identify people who may be at risk of suicide and to respond effectively, including facilitating treatment seeking and support services. Gatekeeper training may be implemented in a variety of settings to identify and support people at risk.
- **Crisis intervention.** These approaches provide support and referral services, typically by connecting a person in crisis (or a friend or family member of someone at-risk) to trained volunteers or professional staff via telephone hotline, online chat, text messaging, or in-person. Crisis intervention approaches are intended to impact key risk factors for suicide, including feelings of depression, hopelessness, and subsequent mental health care utilization. Similar to means reduction, crisis interventions can put space or time between an individual who may be considering suicide and harmful behavior.
- **Treatment for people at-risk of suicide** can include various forms of psychotherapy delivered by licensed providers to help individuals with mental health problems and other suicide risk factors

with problem-solving and emotion regulation. Treatment usually takes place in a one-on-one or group format between patients and clinicians and can vary in duration from several weeks to ongoing therapy, as needed. Treatment that employs collaborative (i.e., between patient and therapist or care manager) and/or integrated care (e.g., linkage between primary care and behavioral health care) can help engage and motivate patients, thereby increasing retention in therapy and decreasing suicide risk (Archer et al., 2012; Bruce et al., 2004; Gilbody, Bower, Fletcher, Richards, & Sutton, 2006).

- **Treatment to prevent re-attempts.** These approaches typically include follow-up contact and use diverse modalities (e.g., home visits, mail, telephone, e-mail) to engage recent suicide attempt survivors in continued treatment to prevent re-attempts. Treatment may focus on improved coping skills, mindfulness, and other emotional regulation skills, and may include case management home visits to increase adherence to treatment and continuity of care; and one-on-one interpersonal therapy and/or group therapy. Approaches that engage and connect attempters to peers and providers are especially important because many attempters do not present to aftercare; 12%-25% reattempt within a year, and 3%-9% of attempt survivors die by suicide within 1 to 5 years of their initial attempt (Inagaki et al., 2015)

### Potential Outcomes

- Reductions in suicide attempts
- Reductions in suicide deaths
- Reductions in symptoms of mental illnesses and suicidal ideation
- Reductions in mental health-related sequelae
- Reductions in re-attempts
- Increases in connectedness
- Improvements in coping skills
- Increases in identification of individuals at-risk for suicidal behavior
- Increases in treatment engagement by at-risk individuals
- Increases in community members trained to identify at-risk individuals
- Increases in referrals for health care

### Evidence

The current evidence suggests that identifying people at risk of suicide and the continued provision of treatment and support for these individuals can positively impact suicide and its associated risk factors.

- **Gatekeeper training.** *Applied Suicide Intervention Skills Training (ASIST)* is a widely implemented training program that helps hotline counselors, emergency workers, and other gatekeepers to



identify and connect with suicidal individuals, understand their reasoning for living and dying, and assist with safely connecting those in need to available resources. In a study employing a randomized controlled trial, Gould, Cross, Pisani, Munfakh, & Kleinman (2013) evaluated the training across the *National Suicide Prevention Lifeline* network of hotlines over the period 2008-2009. Using data from 1,410 suicidal individuals who called 17 Lifeline centers, the researchers found that compared to callers who spoke to counselors that received the usual care training, individuals who spoke with counselors without training in *ASIST* were significantly more likely to feel depressed, suicidal, more overwhelmed, and less hopeful by the end of their call to the hotline ~~compared to those with training in ASIST.~~ Counselors trained in *ASIST* were also more skilled at keeping callers on the phone longer and establishing a connection with them. However, training in *ASIST* did not result in more comprehensive suicide risk assessments than usual care training (Gould et al., 2013).

Comment [A]: Awkward sentence structure. Please revise.

Gatekeeper training has also been a primary component of the *Garret Lee Smith (GLS) Suicide Prevention Program*, which is in place in 49 states and 48 tribes. A multi-site evaluation assessed the impact of community gatekeeper training on suicide attempts and deaths by comparing the change in suicide rates and nonfatal suicidal behavior among young people aged 10-24 in counties implementing *GLS* trainings, with the trajectory observed in similar counties that did not implement these trainings. Counties that implemented *GLS* trainings had significantly lower youth suicide rates one year following the training implementation (Walrath, Garraza, Reid, Goldston, & McKeon, 2015). This finding equates to a decrease of 1 suicide death per 100,000 among youth ages 10 to 24, or the prevention of approximately 237 deaths in the age group, between 2007 and 2010. Counties implementing *GLS* program activities also had significantly lower suicide attempt rates among youth ages 16 to 23 in the year following implementation of the *GLS* program than did similar counties that did not implement *GLS* activities (4.9 fewer attempts per 1000 youths; Godoy Garraza, Walrath, Goldston, Reid, & McKeon, 2015). More than 79,000 suicide attempts may have been prevented during the period ~~examined~~, following implementation of the *GLS* program.

- **Crisis intervention.** Suicide prevention hotlines are one way to provide crisis intervention. In an evaluation of the effectiveness of the *National Suicide Prevention Lifeline* to prevent suicide, 1,085 suicidal individuals who called the hotline completed a standard risk assessment for suicide, and 380 of those completed a follow-up assessment between 1 and 52 days (mean=13.5 days) after the initial assessment. Researchers found that over half of the initial sample were seriously considering suicide when they called, and they had a plan for their suicide. Researchers also found that among follow-up participants, there was a significant decrease in psychological pain, hopelessness, and intent to die between initiation of the call (time 1) to follow-up (time 3). Between time 2 (end of the call) to time 3, the effect remained for psychological pain and

hopelessness, but was not significant for intent to die (Gould, Kalafat, Harrismunfakh, & Kleinman, 2007).

- **Treatment for people at-risk of suicide.** The *Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)* program aims to prevent suicide among older primary care patients by reducing suicide ideation and depression. *IMPACT* facilitates the development of a therapeutic alliance, a personalized treatment plan that includes patient preferences, as well as proactive follow-up (biweekly during an acute phase and monthly during continuation phase) by a depression care manager (Hunkeler et al., 2006). The program has been shown to significantly improve quality of life, and to reduce functional impairment, depression and suicidal ideation over 24-months of follow-up (Hunkeler et al., 2006; Unutzer et al., 2006) relative to patients who received care as usual.

*Collaborative Assessment and Management of Suicidality (CAMS)*, is a therapeutic approach for suicide-specific assessment and treatment. The program's flexible approach can be used across treatment settings and clinician theoretical orientations and involves the clinician and patient working together in an interactive assessment process to develop patient-specific treatment plans. Sessions are collaborative and involve constant patient input about what is and is not working with the ultimate goal of enhancing the therapeutic alliance and increasing treatment motivation in the suicidal patient. *CAMS* ~~been was~~ tested and supported in 6 correlational studies (Jobes, 2012), in a variety of inpatient and outpatient settings, and in one RCT with several additional RCTs under way. A feasibility trial with a community-based sample of suicidal outpatients randomly assigned to *CAMS* or enhanced care as usual (intake with a psychiatrist or psychiatric nurse practitioner followed by 1-11 visits with a case manager and medication as needed) found better treatment retention among the *CAMS* group and significant improvements in suicidal ideation, overall symptom distress, and feelings of hopelessness at the 12 month follow-up (Comtois et al., 2011).

Other examples include *Dialectical Behavioral Therapy (DBT)* and *Attachment-Based Family Therapy (ABFT)*. *DBT* is a multicomponent therapy for individuals at high risk for suicide and who may struggle with impulsivity and emotional regulation. The components of *DBT* include individual therapy, group skills training, between-session telephone coaching and a therapist consultation team. In a randomized controlled trial of women with recent suicidal or self-injurious behavior, those receiving *DBT* were half as likely to make a suicide attempt at two-year follow-up than women receiving community treatment (23% vs 46%), required less hospitalization for suicide ideation, and had lower medical risk across all suicide attempts and self-injurious acts combined (Linehan et al., 2006).

**Comment [A]:** This text is somewhat confusing. The fact that the effect for intent to die did not "remain" significant suggest that it went back up to what it was when they initiated the call. Also this ends on a disconcerting note. In the other places where you had an important null result you included an idea about why and what was needed (e.g., CBG). Can you do that here too?

**Comment [A]:** Fix formatting

**Comment [A]:** Emotion regulation issues? Or emotion dysregulation.



*ABFT* is a program for adolescents aged 12-18 and is designed to treat clinically diagnosed major depressive disorder, eliminate suicidal ideation, and reduce dispositional anxiety (Diamond et al., 2010). A randomized controlled trial of *ABFT* found that suicidal adolescents assigned to *ABFT* experienced significantly greater improvement in suicidal ideation over 24 weeks of follow-up than did adolescents assigned to enhanced usual care. Additionally, a significantly higher percentage of *ABFT* participants reported no suicidal ideation in the week prior to assessment at 12 weeks than did adolescents receiving enhanced usual care (69.2% vs. 34.6%) and at 24 weeks (82.1% vs. 46.2%) (Diamond et al., 2010).

The Veterans Affairs *Translating Initiatives for Depression into Effective Solutions* project (*TIDES*) uses a depression care liaison to link primary care and mental health services. The depression care liaison assesses and educates patients and follows up with both patients and providers between primary care visits to optimize treatment. This collaborative care increases the efficiency of providing mental health services by bringing mental health care to the primary care setting, where most patients are first detected and subsequently treated for many mental health conditions. An evaluation of *TIDES* found significant decreases in depression severity scores among 70% of primary care patients (Rubenstein et al., 2010). *TIDES* also demonstrated 85% and 95% compliance with medication and follow-up visits, respectively (Rubenstein et al., 2010).

- **Treatment to prevent re-attempts.** Several strategies that aim to prevent re-attempts have demonstrated impact on reducing suicide deaths. For example, *Emergency Department Brief Intervention with Follow-up Visits* is a program that involves a one-hour discharge information session that addresses suicidal ideation and attempts, distress, risk and protective factors, alternatives to self-harm, and referral options, combined with nine follow-up contacts over 18 months (at 1, 2, 4, 7, 11 weeks and 4, 6, 12, 18 months). Follow-up contacts are either conducted by phone or through home visits according to a specific time-line for up to 18-months. A randomized controlled trial that enrolled suicide attempters from eight hospital emergency departments in five countries (Brazil, India, Sri Lanka, Iran, and China) found that a brief intervention combined with 9-nine follow-up visits over 18-months was associated with significantly fewer deaths from suicide relative to a treatment-as-usual group (0.2% versus 2.2%, respectively) (Fleischmann et al., 2008).

Another example of treatment to prevent re-attempts involves *active follow-up contact approaches* such as postcards, letters, and telephone calls intended to increase a patient's sense of connectedness with health care providers and decrease isolation. These approaches include expression of care and support and typically invite patients to reconnect with their provider. Contacts are made periodically (e.g., monthly or every few months in the first 12 months post-discharge with some programs continuing contact for two or more years). In a meta-analysis conducted by Inagaki et al. (2015), interventions to prevent repeat suicide attempts in patients

admitted to an emergency department for suicide attempt were found to reduce reattempts by approximately 17% for up to 12 months post-discharge; however, the effects of these approaches beyond 12 months on reattempts has not yet been demonstrated. Also, because the number of trials and associated sample sizes included in this meta-analysis were small, it was not possible to determine the effect of active contact and follow-up approaches on death by suicide.

In a randomized controlled trial of the post-crisis suicide prevention long-term follow-up contact approach, Motto and Bostrom (2001) found that patients who refused ongoing care but who were randomized to be contacted by letter four times per year had a lower rate of suicide over two years of follow-up than did patients in the control group who received no further contact. Other studies have also shown post-crisis letters and coping cards to be protective against suicide ideation and attempts (Hassanian-Moghaddam, Sarjami, Kolahi, & Carter, 2011; Wang et al., 2016).

Finally, *Cognitive Behavior Therapy for Suicide Prevention (CBT-SP)* is an example of a therapeutic approach to prevent re-attempts. It uses a risk-reduction, relapse prevention approach that includes an analysis of proximal risk factors and stressors (e.g., relationship problems, school or work-related difficulties) leading up to and following the suicidal event; safety plan development; skill building; and psychoeducation. *CBT-SP* also has family skill modules focused on family support and communication patterns as well as improving the family's problem solving skills. A randomized controlled trial of *CBT-SP* found that 10-session outpatient cognitive therapy designed to prevent repeat suicide attempts resulted in a 50% reduction in the likelihood of a suicide reattempt among adults who had been admitted to an emergency department for a suicide attempt relative to treatment as usual (Brown et al., 2005).



## Lessen Harms and Prevent Future Risk

### Rationale

Millions of people are bereaved by suicide every year in the United States and throughout the world. Risk of suicide and suicide risk factors has been shown to increase among people who have lost a friend/peer, family member, co-worker, or other close contact to suicide (Pitman, Osborn, King, & Erlangsen, 2014). Care and attention to the bereaved is therefore of high importance. Despite often good intentions, media and others responding to suicide may add to this risk. For example, research suggests that exposure to sensationalized or otherwise uninformed reporting on suicide may heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to what is known as suicide contagion (Etzersdorfer & Sonneck, 1998; Niederkrotenthaler & Sonneck, 2007). While the evidence is still being built in this area, particularly with regard to the impact of policy and practices on suicide and suicide attempts in the United States, measures to care for the bereaved population through such means as postvention interventions (e.g. counseling, support groups and debriefing sessions) and safe reporting on suicide have shown impacts in other countries.

### Approaches

Some approaches that can be used to lessen harms and reduce future risk of suicide include caring for the bereaved and safe reporting following a suicide.

- **Postvention** approaches are implemented *after* a suicide has taken place and may include debriefing sessions, counseling, and/or bereavement support groups for surviving friends and family members/loved ones. These programs have not typically been evaluated for their impact on suicide or suicidal behavior but may reduce survivors' guilt, feelings of depression, and complicated grief (Szumilas & Kutcher, 2011).
- **Safe reporting following a suicide.** The manner in which information on a recent suicide is communicated to the public (e.g. school assemblies, mass media, social media) can heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to suicide contagion. Reports that are **both** inclusive of suicide prevention messages, stories of hope and resilience, risk and protective factors, and links to helping resources (e.g., hotline), and that avoid sensationalizing events or reducing suicide to one cause, can help reduce the likelihood of suicide contagion.

### Potential Outcomes

- Reductions in ideation/attempts



- Reductions in psychological distress
- Increases in treatment seeking
- Improvements in reporting following suicide
- Reductions in contagion effects related to suicide

## Evidence

Current evidence suggests that lessening harm through postvention and safe reporting can impact risk and protective factors for suicide.

- **Postvention** programs are implemented with the goal of providing support to survivors of others' suicide to reduce their own risk of suicide. One example of a postvention program, *StandBy Response Service (StandBy)*, provides clients with face-to-face outreach and telephone support through a professional crisis response team. Site coordinators develop customized case management plans, referring clients to other existing community services matched to their needs (Visser, Comans, & Scuffham, 2014). In a study by Visser et al. (2014), *StandBy* clients were significantly less likely to be at high risk for suicidality (suicide ideation and attempts) and had less psychological distress than a suicide bereaved comparison group who had not had contact with the *StandBy* program (48% and 64% respectively). Additionally, research suggests that active postvention approaches in which outreach to suicide survivors occurs at the scene of a suicide is associated with intake into treatment sooner, greater attendance at support group meetings, and attendance at more meetings compared to passive postvention (versus passive approaches where survivors self-refer for services) (Cerel & Campbell, 2008).
- **Safe reporting and messaging about suicide.** One way to ensure safe reporting and messaging about suicide is to encourage news media adhere to *Recommendations for Reporting on Suicide* (<http://www.reportingonsuicide.org>). The most compelling evidence supporting these recommendations for reporting comes from Austria. After a sharp increase in suicides on the Viennese subway, media guidelines were introduced and an interrupted time series design was used to evaluate the national impact of the guidelines on subsequent suicides. Changes in the quality and quantity of media reporting resulted in a nationwide significant reduction of 81 suicides annually (Niederkrotenthaler & Sonneck, 2007). Finally, research suggests that not only does reporting on suicide in a negative way (e.g., reporting on suicide myths and repetition) have harmful effects on suicide, but reporting on positive coping skills in the face of adversity can also demonstrate protective effects against suicide (Niederkrotenthaler et al., 2010). Reports of individual suicidal ideation not accompanied by reports of suicide or suicide attempts, along with reports describing a "mastery" of a crisis situation where adversities were overcome, was associated with significant decreases in suicide rates in the time period immediately following such reports (Niederkrotenthaler et al., 2010).



## Sector Involvement

Public health can play an important and unique role in addressing suicide. Public health agencies, which typically place prevention at the forefront of efforts and work to create broad population-level impact, can bring critical leadership and resources to bear on this problem. For example, these agencies can serve as a convener, bringing together partners and stakeholders to plan, prioritize, and coordinate suicide prevention efforts. Public health agencies are also well positioned to collect and disseminate data, implement preventive measures, evaluate programs, and track progress. Although public health can play a leadership role in preventing suicide, the strategies and approaches outlined in this technical package cannot be accomplished by the public health sector alone. As noted in the National Strategy to Prevent Suicide, the integration and coordination of prevention activities across sectors and settings is critical for expanding the reach and impact of suicide prevention efforts.

Other sectors vital to implementing this package include, but are not limited to, education, government (local, state, and federal), social services, health services, business, labor, justice, housing, media, and organizations that comprise the civil society sector such as faith-based organizations, youth-serving organizations, foundations, and other non-governmental organizations. Collectively, these sectors can make a difference in preventing suicide by impacting the various contexts and underlying risks that contribute to suicide.

The strategies and approaches described in this technical package are summarized in Appendix A along with the relevant sectors that are well positioned to lead implementation efforts. For example, business and labor, the health sector (including insurers, providers, and health systems), and government entities are in the best position to implement programs and policies that *Strengthen Economic Supports* and *Strengthen Access and Delivery of Suicide Care*. These types of supports go beyond individual behavior change and require commitment and support from those sectors that can directly address some of the underlying risks and the environmental contexts that increase the risk for suicide. Public health entities can play an important role by gathering and synthesizing information to inform policy, raise awareness, and evaluate the effectiveness of various policies. Moreover, partnerships with non-governmental and community organizations can be instrumental in increasing awareness of and garnering support for policies affecting individuals and families.

The public health sector has been at the forefront of many community-based prevention efforts, working collaboratively with schools and community-based organizations, to change social norms and positively impact health behavior. Public health is well suited to take on a similar leadership role in *Promoting Connectedness* through peer norm and community engagement activities and supporting the development, evaluation, and adoption of effective programs that *Teach Coping and Problem-Solving Skills* to prevent suicide from happening in the first place. These programs are often delivered in school and community settings, making education and non-governmental organizations vital partners in prevention.

Businesses, workplaces, and local and state government entities, on the other hand, are in the best position to establish policies and support practices that *Create Protective Environments* where people live, work, and play. Public health entities can play an important role by gathering and synthesizing information, working with other governmental agencies (e.g., criminal justice, defense) and agencies within the executive branch of their state or local government in support of policy and other approaches, and evaluating the effectiveness of measures taken. In a similar fashion, public health entities can partner with schools, workplaces, and community organizations to implement and evaluate prevention programs, policies and practices geared toward creating safe, healthy, and supportive environments.

Finally, this technical package includes a number of interventions delivered in hospital, primary care, behavioral health care, and community settings designed to *Identify and Support People At-Risk*. The intensity and activities for many of these interventions require the expertise of professionals who are licensed and trained to deliver critical intervention support. The health, social services, and justice sectors can work collaboratively to support individuals at high-risk for suicide and their families. These activities also require coordination of supports across various service providers and community organizations.

Regardless of strategy, action by many sectors will be necessary for the successful implementation of this package. In this regard, all sectors can play an important and influential role in preventing suicide from happening in the first place and lessening the immediate and long-term harms of suicidal behavior by helping those in times of crisis get the services and support they need.



## Monitoring and Evaluation

Monitoring and evaluation are necessary components of the public health approach to prevention. It is important to have timely and reliable data to monitor the extent of the problem and to evaluate the impact of prevention efforts. Data are also necessary for prevention planning and implementation.

Gathering ongoing and systematic data is important for prevention efforts. However, it is also important to gather data that are uniform and consistent across systems. Consistent data allow public health and other entities to better gauge the scope of the problem, identify high-risk groups, and monitor the effects of prevention programs and policies. Currently, it is common for different sectors, agencies, and organizations to employ varying definitions of suicidal ideation, behavior, and death that can make it difficult to consistently monitor specific outcomes across sectors and over time. For example, the manner in which deaths are classified can change from one jurisdiction to another, and can change based on local medical and/or medicolegal standards (A.E. Crosby, Ortega, et al., 2011). CDC's uniform definitions and recommended data elements for self-directed violence provide a useful framework to help ensure that data are collected in a consistent manner across surveillance systems (e.g., A.E. Crosby, Ortega, et al., 2011).

Surveillance systems exist at the federal, state, and local levels. It is important to assess the availability of surveillance data and data systems across these levels to identify and address gaps in the systems. CDC's *National Vital Statistics System (NVSS)* and the *National Violent Death Reporting System (NVDRS)* are examples of surveillance systems that provide data on deaths from suicide. *NVSS* is a nationwide surveillance system that collects demographic, geographic, and cause-of-death data from death certificates. *NVDRS* is a state-based surveillance system (currently in 40 states, the District of Columbia, and Puerto Rico) that combines data from death certificates, law enforcement reports, and coroner or medical examiner reports to provide detailed information on the circumstances of violent deaths, including suicide, which can assist communities in guiding prevention approaches (Blair, Fowler, Jack, & Crosby, 2016). Data from state and local Child Death Review teams and Suicide Death Review Teams (which are in a few states) offer another source to identify deaths and obtain insight into the gaps in services, systems, and modifiable risk factors for suicide.

The *National Electronic Injury Surveillance System-All Injury Program (NEISS-AIP)* provides nationally representative data about all types and causes of nonfatal injuries treated in U.S. hospital emergency departments, and can be used to assess national rates of, and trends in, self-harm injuries by cause (e.g., falls, poisoning, etc.), age, race/ethnicity, sex, disposition (where the injured person goes when released from the Emergency Department).

In addition to information on deaths and nonfatal injuries, there are also surveillance systems that provide national, state, and some local estimates of suicidal behavior. The *Youth Risk Behavior Surveillance System (YRBSS)* collects information from a nationally representative sample of 9-12 grade



students and is a key resource in monitoring health-risk behaviors among youth, including whether youth have seriously considered attempting suicide, attempted suicide, made a plan, or required treatment by a doctor or nurse for a suicide attempt that resulted in an injury, poisoning, or overdose (Brener et al., 2013). The YRBSS data are obtained from a national school-based survey conducted by CDC as well as from state, territorial, tribal, and large urban school district surveys conducted by education and health agencies. The *National Survey on Drug Use and Health (NSDUH)* is an annual survey of the civilian, non-institutionalized population aged 12 years and older. *NSDUH* provides both national and state-level estimates of substance use (alcohol, tobacco, illicit drugs, and non-medical use of prescription drugs); mental health (past year mental illness, co-occurring illnesses); and service utilization, along with suicide ideation, suicide plans, and suicide attempts. *NSDUH* is a key resource to track trends in suicide-related risk factors in the population and to help identify groups at increased risk.

It is also important at all levels (local, state, and federal) to address gaps in responses, track progress of prevention efforts and evaluate the impact of those efforts, including the impact of this technical package. Evaluation data, produced through program implementation and monitoring, is essential to provide information on what does and does not work to reduce rates of suicide and its associated risk and protective factors. Theories of change and logic models that identify short, intermediate, and long-term outcomes are an important part of program evaluation.

The evidence-base for suicide prevention has advanced greatly over the last few decades. However, additional research is needed to understand the impact of programs, policies, and practices on suicide (and suicide attempts, at a minimum), as opposed to merely examining their effectiveness on risk factors.

More research is also needed to examine the effectiveness of primary prevention strategies (before risk occurs) and community-level strategies to prevent suicide at the population level. It will be important for researchers to test the effectiveness of combinations of the strategies and approaches included in this package. Most existing evaluations focus on approaches implemented in isolation, but there is potential to understand the synergistic effects within a comprehensive prevention approach. Lastly, there are also many potential opportunities to build and strengthen partnerships across program areas (e.g., violence prevention, substance abuse prevention) to evaluate the impact of different approaches on multiple outcomes.

## Conclusion

Suicide is a serious public health problem whose rates have been on the rise for more than a decade and whose costs stretch well into the billions of dollars each year. While suicide is a rare outcome statistically, its human impact has a ripple effect that is far-reaching. Each of us likely interacts with suicide survivors, those with lived experience, and those with thoughts of suicide on a daily basis – at home, at work, and in our communities. Suicide and suicide attempts are public health issues of societal concern. There are a number of barriers that have impeded progress, including, for example, stigma related to help-seeking,



mental illness, being a survivor and fear related to asking someone about suicidal thoughts. Fortunately, like many public health problems, suicide is preventable, and more is being done to prevent suicide than ever before, as evidenced by the work of the National Action Alliance for Suicide Prevention, the release of the first world report on suicide, and more timely surveillance data, to name just a few examples.

In an effort to continue pushing the field and society further towards prevention, this technical package includes strategies and approaches that ideally would be used in a comprehensive, multi-level and multi-sectoral way. It includes strategies and approaches to prevent suicide from occurring in the first place, as well as strategies focused on lessening the immediate and long-term harms of suicidal behavior. It includes strategies that range from a focus on the whole population regardless of risk to strategies designed to support people at highest risk. Importantly, this technical package extends the bounds of the typical prevention strategies to consider approaches that go beyond individual behavior change to better address risk factors impacting communities and populations more broadly (e.g., economic policies to strengthen housing and financial security).

While the evidence base continues to emerge, the collection of programs, policies, and practices laid out here are available for implementation now. In keeping with good public health practice, the intent is that monitoring and evaluation will play a key role in that implementation. Moreover, as new evidence becomes available, this technical package can be refined to reflect the current state of the science.

In closing, and in keeping with a message of resilience as spoken by those with lived experience, ‘hope, help, and healing is possible.’

## References

- Archer, J., Bower, P., Gilbody, S., Lovell, K., Richards, D., Gask, L., . . . Coventry, P. (2012). Collaborative care for depression and anxiety problems. *The Cochrane Library*.
- Arsenault-Lapierre, G., Kim, C., & Turecki, G. (2004). Psychiatric diagnoses in 3275 suicides: a meta-analysis. *BMC Psychiatry*, 4, 37. doi:10.1186/1471-244X-4-37
- Bachynski, K. E., Canham-Chervak, M., Black, S. A., Dada, E. O., Millikan, A. M., & Jones, B. H. (2012). Mental health risk factors for suicides in the US Army, 2007–8. *Injury Prevention*, 18(6), 405–412.
- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*: Prentice-Hall, Inc.
- Barker, E., Kölves, K., & De Leo, D. (2014). Management of Suicidal and Self-Harming Behaviors in Prisons: Systematic Literature Review of Evidence-Based Activities. *Archives of Suicide Research*, 18(3), 227–240. doi:10.1080/13811118.2013.824830
- Beautrais, A. L. (2001). Effectiveness of barriers at suicide jumping sites: A case study. *Aust NZ J Psychiat*, 35. doi:10.1080/0004867010060501
- Beautrais, A. L., Gibb, S. J., Fergusson, D. M., Horwood, L. J., & Larkin, G. L. (2009). Removing bridge barriers stimulates suicides: An unfortunate natural experiment. *Aust NZ J Psychiat*, 43. doi:10.1080/00048670902873714
- Bellis, M. A., Hughes, K., Leckenby, N., Jones, L., Baban, A., Kachaeva, M., . . . Ulukol, B. (2014). Adverse childhood experiences and associations with health-harming behaviours in young adults: surveys in eight eastern European countries. *Bulletin of the World Health Organization*, 92(9), 641–655.
- Beyer, K. M., Layde, P. M., Hamberger, L. K., & Laud, P. W. (2015). Does neighborhood environment differentiate intimate partner femicides from other femicides? *Violence Against Women*, 21(1), 49–64. doi:10.1177/1077801214564075
- Blair, J. M., Fowler, K. A., Jack, S. P., & Crosby, A. E. (2016). The National Violent Death Reporting System: overview and future directions. *Inj Prev*, 22 Suppl 1, i6–i11. doi:10.1136/injuryprev-2015-041819
- Bossarte, R. M., Karras, E., Lu, N., Tu, X., Stephens, B., Draper, J., & Kemp, J. E. (2014). Associations between the Department of Veterans Affairs' suicide prevention campaign and calls to related crisis lines. *Public Health Rep*, 129(6), 516–525.
- Branas, C. C., Cheney, R. A., MacDonald, J. M., Tam, V. W., Jackson, T. D., & Ten Have, T. R. (2011). A difference-in-differences analysis of health, safety, and greening vacant urban space. *Am J Epidemiol*, 174(11), 1296–1306. doi:10.1093/aje/kwr273
- Brown, G. K., Ten Have, T., Henriques, G. R., Xie, S. X., Hollander, J. E., & Beck, A. T. (2005). Cognitive therapy for the prevention of suicide attempts: a randomized controlled trial. *JAMA*, 294(5), 563–570. doi:10.1001/jama.294.5.563
- Bruce, M. L., Ten Have, T. R., Reynolds III, C. F., Katz, I. I., Schulberg, H. C., Mulsant, B. H., . . . Alexopoulos, G. S. (2004). Reducing suicidal ideation and depressive symptoms in depressed older primary care patients: a randomized controlled trial. *JAMA*, 291(9), 1081–1091.
- Capaldi, D. M., Knoble, N. B., Shortt, J. W., & Kim, H. K. (2012). A Systematic Review of Risk Factors for Intimate Partner Violence. *Partner Abuse*, 3(2), 231–280. doi:10.1891/1946-6560.3.2.231
- Carter, M., McGee, R., Taylor, B., & Williams, S. (2007). Health outcomes in adolescence: associations with family, friends and school engagement. *J Adolesc*, 30(1), 51–62. doi:10.1016/j.adolescence.2005.04.002
- Centers for Disease Control and Prevention. (2009). Strategic direction for the prevention of suicidal behavior: Promoting individual, family, and community connectedness to prevent suicidal behavior. Retrieved from Available at: [http://www.cdc.gov/ViolencePrevention/pdf/Suicide\\_Strategic\\_Direction\\_Full\\_version-a.pdf](http://www.cdc.gov/ViolencePrevention/pdf/Suicide_Strategic_Direction_Full_version-a.pdf)
- Centers for Disease Control and Prevention. (2016). Web-Based Injury Statistics Query and Reporting System (WISQARS). Retrieved June 3, 2016 Available at: <http://www.cdc.gov/injury/wisqars/index.html>

**Comment [A]:** Double-check EndNote-formatted references. There are several instances where the publication year and issue/page numbers are incomplete. [Due to EndNote format, unable to specifically point out all of the issues in this document.]

There are also formatting issues in the text, especially with the insertion of the authors initials in embedded citations.



- Cerel, J., & Campbell, F. R. (2008). Suicide survivors seeking mental health services: a preliminary examination of the role of an active postvention model. *Suicide Life Threat Behav*, 38(1), 30-34. doi:10.1521/suli.2008.38.1.30
- Cerel, J., Maple, M., De Venne, A., Moore, M., Flaherty, C., & Brown, M. (2016). Exposure to Suicide in the Community: Prevalence and Correlates in One US State. *Public Health Reports*, 131(1).
- Cerel, J., McIntosh, J. L., Neimeyer, R. A., Maple, M., & Marshall, D. (2014). The Continuum of "Survivorship": Definitional Issues in the Aftermath of Suicide. *Suicide and life-threatening behavior*, 44(6), 591-600. doi:10.1111/sltb.12093
- Chapman, A. L., & Dixon-Gordon, K. L. (2007). Emotional antecedents and consequences of deliberate self-harm and suicide attempts. *Suicide Life Threat Behav*, 37(5), 543-552. doi:10.1521/suli.2007.37.5.543
- Chapman, D. P., Whitfield, C. L., Felitti, V. J., Dube, S. R., Edwards, V. J., & Anda, R. F. (2004). Adverse childhood experiences and the risk of depressive disorders in adulthood. *J Affect Disord*, 82(2), 217-225.
- Cherpitel, C. J., Borges, G. L. G., & Wilcox, H. C. (2004). Acute alcohol use and suicidal behavior: A review of the literature. *Alcoholism: Clinical and Experimental Research*, 28(5 SUPPL.), 18S-28S.
- Classen, T. J., & Dunn, R. A. (2012). The effect of job loss and unemployment duration on suicide risk in the United States: a new look using mass-layoffs and unemployment duration. *Health Econ*, 21(3), 338-350. doi:10.1002/hecl.1719
- Coffey, C. E. (2006). Pursuing perfect depression care. *Psychiatr Serv*, 57(10), 1524-1526. doi:10.1176/ps.2006.57.10.1524
- Coffey, C. E. (2007). Building a system of perfect depression care in behavioral health. *Jt Comm J Qual Patient Saf*, 33(4), 193-199.
- Coffey, C. E., Coffey, M. J., & Ahmedani, B. K. (2013). An update on perfect depression care. *Psychiatr Serv*, 64(4), 396. doi:10.1176/appi.PS.640422
- Coffey, M., Coffey, C., & Ahmedani, B. K. (2015). Suicide in a health maintenance organization population. *JAMA Psychiatry*, 72(3), 294-296. doi:10.1001/jamapsychiatry.2014.2440
- Comtois, K. A., Jobes, D. A., S. O'Connor, S., Atkins, D. C., Janis, K., E. Chessen, C., . . . Yuodelis-Flores, C. (2011). Collaborative assessment and management of suicidality (CAMS): feasibility trial for next-day appointment services. *Depress Anxiety*, 28(11), 963-972. doi:10.1002/da.20895
- Cox, G. R., Owens, C., Robinson, J., Nicholas, A., Lockley, A., Williamson, M., . . . Pirkis, J. (2013). Interventions to reduce suicides at suicide hotspots: a systematic review. *BMC Public Health*, 13(1), 1-12. doi:10.1186/1471-2458-13-214
- Crosby, A. E., Espitia-Hardeman, V., Ortega, L., & Lozano, B. (2013). Alcohol and suicide. *Alcohol: Science, Policy and Public Health*, 190.
- Crosby, A. E., Han, B., Ortega, L., Parks, S. E., & Gfroerer, J. (2011). Suicidal Thoughts and Behaviors Among Adults Aged ≥18 Years — United States, 2008–2009. *MMWR*, 60(No. SS-13), 1-22.
- Crosby, A. E., Ortega, L., & Melanson, C. (2011). *Self-directed Violence Surveillance: Uniform Definitions and Recommended Data Elements, Version 1.0*. Retrieved from Atlanta, GA:
- Crosby, A. E., & Sacks, J. J. (2002). Exposure to Suicide: Incidence and Association with Suicidal Ideation and Behavior: United States, 1994. *Suicide and life-threatening behavior*, 32(3), 321-328. doi:10.1521/suli.32.3.321.22170
- Cunningham, P. J. (2009). Beyond parity: primary care physicians' perspectives on access to mental health care. *Health Aff (Millwood)*, 28(3), w490-501. doi:10.1377/hlthaff.28.3.w490
- Curtin, S. C., Warner, M., & Hedegaard, H. (2016). *Increase in suicide in the United States, 1999-2014*. ( ). Hyattsville, MD: National Center for Health Statistics Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/25116188>.
- Cylus, J., Glymour, M. M., & Avendano, M. (2014). Do generous unemployment benefit programs reduce suicide rates? A state fixed-effect analysis covering 1968-2008. *Am J Epidemiol*, 180(1), 45-52. doi:10.1093/aje/kwu106

- Dahlberg, L. L., & Krug, E. G. (2002). Violence-a global public health problem. In E. Krug, L. L. Dahlberg, J. A. Mercy, A. B. Zwi, & R. Lozano (Eds.), *World Report on Violence and Health* (pp. 1-56). Geneva, Switzerland: World Health Organization.
- Deisenhammer, E. A., Ing, C. M., Strauss, R., Kemmler, G., Hinterhuber, H., & Weiss, E. M. (2009). The duration of the suicidal process: how much time is left for intervention between consideration and accomplishment of a suicide attempt? *J Clin Psychiatry*, 70(1), 19-24.
- Diamond, G. S., Wintersteen, M. B., Brown, G. K., Diamond, G. M., Gallop, R., Shelef, K., & Levy, S. (2010). Attachment-based family therapy for adolescents with suicidal ideation: a randomized controlled trial. *J Am Acad Child Adolesc Psychiatry*, 49(2), 122-131.
- Dube, S. R., Anda, R. F., Felitti, V. J., Chapman, D. P., Williamson, D. F., & Giles, W. H. (2001). Childhood abuse, household dysfunction, and the risk of attempted suicide throughout the life span: findings from the Adverse Childhood Experiences Study. *JAMA*, 286(24), 3089-3096.
- Dunne, E. J., McIntosh, J. L., & Dunne-Maxim, K. (Eds.). (1987). *Suicide and its aftermath: Understanding and counseling the survivors*. New York: Norton.
- Durkheim, E. (1897/1951). *Suicide: A study in sociology* (JA Spaulding & G. Simpson, trans.). Glencoe, IL: Free Press. (Original work published 1897).
- Edwards, R. W., Jumper-Thurman, P., Plested, B. A., Oetting, E. R., & Swanson, L. (2000). Community readiness: Research to practice. *Journal of Community Psychology*, 28(3), 291-307.
- Escobedo, L. G., & Ortiz, M. (2002). The relationship between liquor outlet density and injury and violence in New Mexico. *Accid Anal Prev*, 34(5), 689-694.
- Etzersdorfer, E., & Sonneck, G. (1998). Preventing suicide by influencing mass-media reporting: The Viennese experience, 1980-1996. *Arch Suicide Res*, 4.
- Felitti, V. J., Anda, R. F., Nordenberg, D., Williamson, D. F., Spitz, A. M., Edwards, V., . . . Marks, J. S. (1998). Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: The Adverse Childhood Experiences (ACE) Study. *Am J Prev Med*, 14(4), 245-258.
- Ferdon, C., Crosby, A. E., Caine, E. D., Hindman J., Reed, G. A., & Iskander, J. (In press). CDC Public Health Grand Rounds: Preventing Suicide through a Comprehensive Public Health Approach. *MMWR*.
- Flavin, P., & Radcliff, B. (2009). Public policies and suicide rates in the American states. *Social Indicators Research*, 90(2), 195-209.
- Fleischmann, A., Bertolote, J. M., Wasserman, D., De Leo, D., Bolhari, J., Botega, N. J., . . . Thanh, H. T. (2008). Effectiveness of brief intervention and contact for suicide attempters: a randomized controlled trial in five countries. *Bulletin of the World Health Organization*, 86(9), 703-709. doi:S0042-96862008000900014 [pii]
- Florence, C., Simon, T., Haegerich, T., Luo, F., & Zhou, C. (2015). Estimated lifetime medical and work-loss costs of fatal injuries-United States, 2013. *MMWR: Morbidity and mortality weekly report*, 64(38), 1074-1077.
- Fowler, K. A., Gladden, R. M., Vagi, K. J., Barnes, J., & Frazier, L. (2015). Increase in suicides associated with home eviction and foreclosure during the US housing crisis: findings from 16 National Violent Death Reporting System States, 2005-2010. *Am J Public Health*, 105(2), 311-316. doi:10.2105/AJPH.2014.301945
- Frieden, T. R. (2014). Six components necessary for effective public health program implementation. *Am J Public Health*, 104(1), 17-22. doi:10.2105/AJPH.2013.301608
- Giesbrecht, N., Huguette, N., Ogden, L., Kaplan, M. S., McFarland, B. H., Caetano, R., . . . Nolte, K. B. (2015). Acute alcohol use among suicide decedents in 14 US states: impacts of off-premise and on-premise alcohol outlet density. *Addiction*, 110(2), 300-307. doi:10.1111/add.12762
- Gilbody, S., Bower, P., Fletcher, J., Richards, D., & Sutton, A. J. (2006). Collaborative care for depression: a cumulative meta-analysis and review of longer-term outcomes. *Archives of internal medicine*, 166(21), 2314-2321.



- Godoy Garraza, L., Walrath, C., Goldston, D. B., Reid, H., & McKeon, R. (2015). Effect of the Garrett Lee Smith Memorial Suicide Prevention Program on Suicide Attempts Among Youths. *JAMA Psychiatry*, 72(11), 1143-1149. doi:10.1001/jamapsychiatry.2015.1933
- Gould, M. S., Cross, W., Pisani, A. R., Munfakh, J. L., & Kleinman, M. (2013). Impact of Applied Suicide Intervention Skills Training on the National Suicide Prevention Lifeline. *Suicide Life Threat Behav*, 43(6), 676-691. doi:10.1111/sltb.12049
- Gould, M. S., Kalafat, J., Harrismunfakh, J. L., & Kleinman, M. (2007). An evaluation of crisis hotline outcomes. Part 2: Suicidal callers. *Suicide Life Threat Behav*, 37(3), 338-352. doi:10.1521/suli.2007.37.3.338
- Grossman, D. C., Mueller, B. A., Riedy, C., Dowd, M. D., Villaveces, A., Prodzinski, J., . . . Harruff, R. (2005). Gun storage practices and risk of youth suicide and unintentional firearm injuries. *JAMA*, 293(6), 707-714. doi:10.1001/jama.293.6.707
- Haddon, W. (1980). Advances in the epidemiology of injuries as a basis for public policy. *Public Health Reports*, 95(5), 411-421.
- Haegerich, T. M., & Dahlberg, L. L. (2011). Violence as a public health risk. *American Journal of Lifestyle Medicine*, 1559827611409127.
- Hailey, D., Roine, R., & Ohinmaa, A. (2008). The effectiveness of telemental health applications: a review. *The Canadian Journal of Psychiatry*, 53(11), 769-778.
- Hamby, S., & Grych, J. (2013). The web of violence: exploring connections among different forms of interpersonal violence and abuse *Briefs in Sociology*. New York, NY: Springer.
- Han, B., Crosby, A. E., Ortega, L. A., Parks, S. E., Compton, W. M., & Gfroerer, J. (2016). Suicidal ideation, suicide attempt, and occupations among employed adults aged 18–64 years in the United States. *Comprehensive psychiatry*, 66, 176-186.
- Harris, E. C., & Barraclough, B. (1997). Suicide as an outcome for mental disorders. A meta-analysis. *Br J Psychiatry*, 170, 205-228.
- Harris, E. C., & Barraclough, B. (1998). Excess mortality of mental disorder. *Br J Psychiatry*, 173, 11-53.
- Harris, K. M., Carpenter, C., & Bao, Y. (2006). The effects of state parity laws on the use of mental health care. *Med Care*, 44(6), 499-505. doi:10.1097/01.mlr.0000215813.16211.00
- Hassanian-Moghaddam, H., Sarjami, S., Kolahi, A. A., & Carter, G. L. (2011). Postcards in Persia: randomised controlled trial to reduce suicidal behaviours 12 months after hospital-treated self-poisoning. *British Journal of Psychiatry*, 198(4), 309-316.
- Hawkins, J. D., Catalano, R. F., & Kuklinski, M. R. (2014). Communities that care *Encyclopedia of Criminology and Criminal Justice* (pp. 393-408): Springer.
- Hawton, K. (2007). Restricting access to methods of suicide: Rationale and evaluation of this approach to suicide prevention. *Crisis*, 28. doi:10.1027/0227-5910.28.s1.4
- Hayes, L. M. (1995). Prison Suicide: An Overview and a Guide to Prevention. *The Prison Journal*, 75(4), 431-456. doi:10.1177/0032855595075004003
- Hayes, L. M. (2013). Suicide prevention in correctional facilities: reflections and next steps. *Int J Law Psychiatry*, 36(3-4), 188-194. doi:10.1016/j.ijlp.2013.04.010
- Herman, K. C., Borden, L. A., Reinke, W. M., & Webster-Stratton, C. (2011). The Impact of the Incredible Years Parent, Child, and Teacher Training Programs on Children's Co-Occurring Internalizing Symptoms. *Sch Psychol Q*, 26(3), 189-201. doi:10.1037/a0025228
- Houle, J. N., & Light, M. T. (2014). The home foreclosure crisis and rising suicide rates, 2005 to 2010. *Am J Public Health*, 104(6), 1073-1079. doi:10.2105/AJPH.2013.301774
- Hunkeler, E. M., Katon, W., Tang, L., Williams, J. W., Jr., Kroenke, K., Lin, E. H., . . . Unutzer, J. (2006). Long term outcomes from the IMPACT randomised trial for depressed elderly patients in primary care. *BMJ*, 332(7536), 259-263. doi:10.1136/bmj.38683.710255.BE

- Inagaki, M., Kawashima, Y., Kawanishi, C., Yonemoto, N., Sugimoto, T., Furuno, T., . . . Yamada, M. (2015). Interventions to prevent repeat suicidal behavior in patients admitted to an emergency department for a suicide attempt: a meta-analysis. *J Affect Disord*, 175, 66-78. doi:10.1016/j.jad.2014.12.048
- Jobes, D. A. (2012). The Collaborative Assessment and Management of Suicidality (CAMS): an evolving evidence-based clinical approach to suicidal risk. *Suicide Life Threat Behav*, 42(6), 640-653. doi:10.1111/j.1943-278X.2012.00119.x
- Johnson, F. W., Gruenewald, P. J., & Remer, L. G. (2009). Suicide and alcohol: do outlets play a role? *Alcohol Clin Exp Res*, 33(12), 2124-2133. doi:10.1111/j.1530-0277.2009.01052.x
- Kann, L., McManus, T., Harris, W. A., Shanklin, S. L., Flint, K. H., Hawkins, J., . . . Zaza, S. (2016). Youth Risk Behavior Surveillance - United States, 2015. *MMWR Surveill Summ*, 65(6), 1-174. doi:10.15585/mmwr.ss6506a1
- Kaplan, M. S., McFarland, B. H., Huguet, N., Conner, K., Caetano, R., Giesbrecht, N., & Nolte, K. B. (2013). Acute alcohol intoxication and suicide: a gender-stratified analysis of the National Violent Death Reporting System. *Inj Prev*, 19(1), 38-43. doi:10.1136/injuryprev-2012-040317
- Kellam, S. G., Brown, C. H., Poduska, J. M., Ialongo, N. S., Wang, W., Toyinbo, P., . . . Wilcox, H. C. (2008). Effects of a universal classroom behavior management program in first and second grades on young adult behavioral, psychiatric, and social outcomes. *Drug Alcohol Depend*, 95 Suppl 1, S5-S28. doi:10.1016/j.drugalcdep.2008.01.004
- Kessler, R. C., Demler, O., Frank, R. G., Olfson, M., Pincus, H. A., Walters, E. E., . . . Zaslavsky, A. M. (2005). Prevalence and treatment of mental disorders, 1990 to 2003. *N Engl J Med*, 352(24), 2515-2523. doi:10.1056/NEJMsa043266
- Kleiman, E. M., Riskind, J. H., Schaefer, K. E., & Weingarden, H. (2012). The moderating role of social support on the relationship between impulsivity and suicide risk. *Crisis*, 33(5), 273-279. doi:10.1027/0227-5910/a000136
- Klomek, A. B., Sourander, A., & Gould, M. (2010). The association of suicide and bullying in childhood to young adulthood: a review of cross-sectional and longitudinal research findings. *The Canadian Journal of Psychiatry*, 55(5), 282-288.
- Knox, K. L., Litts, D. A., Talcott, G. W., Feig, J. C., & Caine, E. D. (2003). Risk of suicide and related adverse outcomes after exposure to a suicide prevention programme in the US Air Force: cohort study. *BMJ*, 327(7428), 1376.
- Knox, K. L., Pflanz, S., Talcott, G. W., Campise, R. L., Lavigne, J. E., Bajorska, A., . . . Caine, E. D. (2010). The US Air Force suicide prevention program: implications for public health policy. *Am J Public Health*, 100(12), 2457-2463. doi:10.2105/ajph.2009.159871
- Lang, M. (2013). The impact of mental health insurance laws on state suicide rates. *Health Econ*, 22(1), 73-88. doi:10.1002/hec.1816
- Leeb, R. T., Lewis, T., & Zolotor, A. J. (2011). A review of physical and mental health consequences of child abuse and neglect and implications for practice. *American Journal of Lifestyle Medicine*, 5(5), 454-468.
- Lineberry, T. W., & O'Connor, S. S. Suicide in the US Army. *Mayo Clinic Proceedings*, 87(9), 871-878. doi:10.1016/j.mayocp.2012.07.002
- Linehan, M. M., Comtois, K. A., Murray, A. M., Brown, M. Z., Gallop, R. J., Heard, H. L., . . . Lindenboim, N. (2006). Two-year randomized controlled trial and follow-up of dialectical behavior therapy vs therapy by experts for suicidal behaviors and borderline personality disorder. *Arch Gen Psychiatry*, 63(7), 757-766. doi:10.1001/archpsyc.63.7.757
- Losel, F., & Farrington, D. P. (2012). Direct protective and buffering protective factors in the development of youth violence. *Am J Prev Med*, 43(2 Suppl 1), S8-S23. doi:10.1016/j.amepre.2012.04.029
- Maimon, D., Browning, C. R., & Brooks-Gunn, J. (2010). Collective efficacy, family attachment, and urban adolescent suicide attempts. *J Health Soc Behav*, 51(3), 307-324. doi:10.1177/0022146510377878



- Mark, T. L., Shern, D. L., Bagalman, J. E., & Cao, Z. (2007). Ranking America's mental health: An analysis of depression across the states. *Alexandria, VA: Mental Health America*.
- McIntosh, W. L., Spies, E., Stone, D. M., Lokey, C. N., Trudeau, A. R., & Bartholow, B. (2016). Suicide Rates by Occupational Group - 17 States, 2012. *MMWR Morb Mortal Wkly Rep*, 65(25), 641-645. doi:10.15585/mmwr.mm6525a1
- Miller, M., Warren, M., Hemenway, D., & Azrael, D. (2015). Firearms and suicide in US cities. *Inj Prev*, 21(e1), e116-119. doi:10.1136/injuryprev-2013-040969
- Mishara, B. L. (Ed.) (1995). *The Impact of Suicide*. New York: Springer.
- Mishara, B. L., & Martin, N. (2012). Effects of a comprehensive police suicide prevention program. *Crisis: Journal of Crisis Intervention & Suicide*, 33(3), 162-168.
- Mitchell, A. M., Kim, Y., Prigerson, H. G., & Mortimer-Stephens, M. (2004). Complicated grief in survivors of suicide. *Crisis*, 25(1), 12-18. doi:10.1027/0227-5910.25.1.12
- Mohr, D. C., Vella, L., Hart, S., Heckman, T., & Simon, G. (2008). The effect of telephone-administered psychotherapy on symptoms of depression and attrition: A meta-analysis. *Clinical Psychology: Science and Practice*, 15(3), 243-253.
- Motto, J. A., & Bostrom, A. G. (2001). A randomized controlled trial of postcrisis suicide prevention. *Psychiatr Serv*, 52(6), 828-833.
- Muennig, P., Cohen, A. K., Palmer, A., & Zhu, W. (2013). The relationship between five different measures of structural social capital, medical examination outcomes, and mortality. *Soc Sci Med*, 85, 18-26. doi:10.1016/j.socscimed.2013.02.007
- National Action Alliance for Suicide Prevention. (2014). Research Prioritization Task Force.(2014). *A prioritized research agenda for suicide prevention: An action plan to save lives*.
- National Action Alliance for Suicide Prevention Workplace Task Force. (2015). *Comprehensive Blueprint for Workplace Suicide Prevention*. Washington, D.C. : Author.
- National Action Alliance for Suicide Prevention: Clinical Workforce Preparedness Task Force. (2014). *Suicide prevention and the clinical workforce: Guidelines for training*. Washington, D.C.: Author.
- National Action Alliance for Suicide Prevention: Suicide Attempt Survivors Task Force. (2014). *The Way Forward: Pathways to hope, recovery, and wellness with insights from lived experience*. Washington, D.C. : Author.
- National Action Alliance for Suicide Prevention: Survivors of Suicide Loss Task Force. (2015). *Responding to Grief, Trauma, and Distress After a Suicide: U.S. National Guidelines*. Washington, D.C. : Author.
- Niederkrotenthaler, T., & Sonneck, G. (2007). Assessing the impact of media guidelines for reporting on suicides in Austria: Interrupted time series analysis. *Aust N Z J Psychiatry*, 41. doi:10.1080/00048670701266680
- Niederkrotenthaler, T., Voracek, M., Herberth, A., Till, B., Strauss, M., Etzersdorfer, E., . . . Sonneck, G. (2010). Media and suicide. Papageno v Werther effect. *BMJ*, 341, c5841. doi:10.1136/bmj.c5841
- Olfson, M., Gerhard, T., Huang, C., Crystal, S., & Stroup, T. S. (2015). Premature Mortality Among Adults With Schizophrenia in the United States. *JAMA Psychiatry*, 72(12), 1172-1181. doi:10.1001/jamapsychiatry.2015.1737
- Owens, D. (2002). Fatal and non-fatal repetition of self-harm: Systematic review. *British Journal of Psychiatry*, 181(3), 193-199.
- Perron, S., Burrows, S., Fournier, M., Perron, P. A., & Ouellet, F. (2013). Installation of a bridge barrier as a suicide prevention strategy in Montreal, Quebec, Canada. *Am J Public Health*, 103(7), 1235-1239. doi:10.2105/ajph.2012.301089
- Pirkis, J., Too, L. S., Spittal, M. J., Krysinska, K., Robinson, J., & Cheung, Y. T. D. (2015). Interventions to reduce suicides at suicide hotspots: a systematic review and meta-analysis. *The Lancet Psychiatry*, 2(11), 994-1001. doi:http://dx.doi.org/10.1016/S2215-0366(15)00266-7
- Pitman, A., Osborn, D., King, M., & Erlangsen, A. (2014). Effects of suicide bereavement on mental health and suicide risk. *Lancet Psychiatry*, 1, 86-94.

- Plested, B. A., Edwards, R. W., & Jumper-Thurman, P. (2006). Community readiness: A handbook for successful change. *Fort Collins, CO: Tri-Ethnic Center for Prevention Research.*
- Pollock, L. R., & Williams, J. M. (2004). Problem-solving in suicide attempters. *Psychol Med*, 34(1), 163-167.
- Reid, M. J., Webster-Stratton, C., & Hammond, M. (2003). Follow-up of children who received the Incredible Years intervention for oppositional-defiant disorder: Maintenance and prediction of 2-year outcome. *Behavior Therapy*, 34(4), 471-491.
- Rowhani-Rahbar, A., Simonetti, J. A., & Rivara, F. P. (2016). Effectiveness of Interventions to Promote Safe Firearm Storage. *Epidemiol Rev*, 38(1), 111-124. doi:10.1093/epirev/mxv006
- Rubenstein, L. V., Chaney, E. F., Ober, S., Felker, B., Sherman, S. E., Lanto, A., & Vivell, S. (2010). Using evidence-based quality improvement methods for translating depression collaborative care research into practice. *Families, Systems, & Health*, 28(2), 91.
- Runyan, C. W., Becker, A., Brandspigel, S., Barber, C., Trudeau, A., & Novins, D. (2016). Lethal Means Counseling for Parents of Youth Seeking Emergency Care for Suicidality. *West J Emerg Med*, 17(1), 8-14. doi:10.5811/westjem.2015.11.28590
- Russell, S. T., & Joyner, K. (2001). Adolescent sexual orientation and suicide risk: Evidence from a national study. *American Journal of Public Health*, 91(8), 1276-1281.
- Shepard, D. S., Gurewich, D., Lwin, A. K., Reed, G. A., Jr., & Silverman, M. M. (2016). Suicide and Suicidal Attempts in the United States: Costs and Policy Implications. *Suicide Life Threat Behav*, 46(3), 352-362. doi:10.1111/sltb.12225
- Silverman, M. M., & Maris, R. W. (1995). The prevention of suicidal behaviors: An overview. *Suicide and life-threatening behavior*, 25(1), 10-21.
- Simon, O. R., Swann, A. C., Powell, K. E., Potter, L. B., Kresnow, M. J., & O'Carroll, P. W. (2001). Characteristics of impulsive suicide attempts and attempters. *Suicide Life Threat Behav*, 32(1 Suppl), 49-59.
- Spoth, R. L., Gyll, M., & Day, S. X. (2002). Universal family-focused interventions in alcohol-use disorder prevention: cost-effectiveness and cost-benefit analyses of two interventions. *J Stud Alcohol*, 63(2), 219-228.
- Stack, S., & Wasserman, I. (2007). Economic strain and suicide risk: a qualitative analysis. *Suicide and life-threatening behavior*, 37(1), 103-112.
- Stokes, M. L., McCoy, K. P., Abram, K. M., Byck, G. R., & Teplin, L. A. (2015). Suicidal Ideation and Behavior in Youth in the Juvenile Justice System: A Review of the Literature. *J Correct Health Care*, 21(3), 222-242. doi:10.1177/1078345815587001
- Sudak, H., Maxim, K., & Carpenter, M. (2008). Suicide and stigma: a review of the literature and personal reflections. *Acad Psychiatry*, 32(2), 136-142. doi:10.1176/appi.ap.32.2.136
- Szumilas, M., & Kutcher, S. (2011). Post-suicide intervention programs: a systematic review. *Can J Public Health*, 102(1), 18-29.
- Toosi, M. (2015). *Labor force projections to 2024: The labor force is growing, but slowly*. Washington, D.C.: Bureau of Labor Statistics.
- Turecki, G. (2014). Epigenetics and suicidal behavior research pathways. *Am J Prev Med*, 47(3), S144-S151.
- Tyrer, P., Reed, G. M., & Crawford, M. J. (2015). Classification, assessment, prevalence, and effect of personality disorder. *Lancet*, 385(9969), 717-726. doi:10.1016/S0140-6736(14)61995-4
- U.S. Department of Health and Human Services Health Resources and Services Administrations. (2016a). *Designated Health Professional Shortage Areas Statistics, As of November 4, 2016*. Retrieved from <http://datawarehouse.hrsa.gov/topics/shortageAreas.aspx>.
- U.S. Department of Health and Human Services Health Resources and Services Administrations. (2016b). *NHSC Clinician Retention: A Story of Dedication and Commitment*. Retrieved from <https://nhsc.hrsa.gov/currentmembers/membersites/retainproviders/retentionbrief.pdf>.
- U.S. Office of the Surgeon General, & National Action Alliance for Suicide Prevention. (2012). *2012 National Strategy for Suicide Prevention: Goals and Objectives for Action*. Washington, D.C.: HHS.



- U.S. Public Health Service. (1999). *The Surgeon General's Call to Action to Prevent Suicide*. Washington, D.C.
- Unutzer, J., Tang, L., Oishi, S., Katon, W., Williams, J. W., Jr., Hunkeler, E., . . . Langston, C. (2006). Reducing suicidal ideation in depressed older primary care patients. *J Am Geriatr Soc*, 54(10), 1550-1556.
- Visser, V. S., Comans, T. A., & Scuffham, P. A. (2014). Evaluation Of The Effectiveness Of A Community-Based Crisis Intervention Program For People Bereaved By Suicide. *Journal of Community Psychology*, 42(1), 19-28. doi:10.1002/jcop.21586
- Walrath, C., Garraza, L. G., Reid, H., Goldston, D. B., & McKeon, R. (2015). Impact of the Garrett Lee Smith youth suicide prevention program on suicide mortality. *Am J Public Health*, 105(5), 986-993. doi:10.2105/AJPH.2014.302496
- Wang, Y. C., Hsieh, L. Y., Wang, M. Y., Chou, C. H., Huang, M. W., & Ko, H. C. (2016). Coping Card Usage can Further Reduce Suicide Reattempt in Suicide Attempter Case Management Within 3-Month Intervention. *Suicide Life Threat Behav*, 46(1), 106-120. doi:10.1111/sltb.12177
- Wasserman, D., Hoven, C. W., Wasserman, C., Wall, M., Eisenberg, R., Hadlaczky, G., . . . Carli, V. (2014). School-based suicide prevention programmes: The SEYLE cluster-randomised, controlled trial. *The Lancet*, 385(9977), 1536-1544. doi:10.1016/S0140-6736(14)61213-7
- Webster-Stratton, C., & Hammond, M. (1997). Treating children with early-onset conduct problems: a comparison of child and parent training interventions. *J Consult Clin Psychol*, 65(1), 93-109.
- Webster-Stratton, C., Reid, M. J., & Hammond, M. (2001). Preventing conduct problems, promoting social competence: a parent and teacher training partnership in head start. *J Clin Child Psychol*, 30(3), 283-302. doi:10.1207/S15374424JCCP3003\_2
- Webster-Stratton, C. H., Reid, M. J., & Beauchaine, T. (2011). Combining parent and child training for young children with ADHD. *Journal of Clinical Child & Adolescent Psychology*, 40(2), 191-203.
- Webster-Stratton, C., Jamila Reid, M., & Stoolmiller, M. (2008). Preventing conduct problems and improving school readiness: evaluation of the incredible years teacher and child training programs in high-risk schools. *Journal of child psychology and psychiatry*, 49(5), 471-488.
- Wilcox, H. C., Kellam, S. G., Brown, C. H., Poduska, J. M., Ialongo, N. S., Wang, W., & Anthony, J. C. (2008). The impact of two universal randomized first- and second-grade classroom interventions on young adult suicide ideation and attempts. *Drug Alcohol Depend*, 95 Suppl 1, S60-73.
- Wilkins, N., Tsao, B., Hertz, M., Davis, R., & Klevens, J. (2014). Atlanta, GA: National Center for Injury Prevention and Control, Centers for Disease Control and Prevention.
- World Health Organization. (2013). *Global and Regional Estimates of Violence Against Women: Prevalence and Health Effects of Intimate Partner Violence and Non-Partner Sexual Violence*. Geneva: World Health Organization.
- World Health Organization. (2014). *Suicide Prevention: A Global Imperative*. Geneva, Switzerland: WHO Press.
- Wyman, P. A., Brown, C. H., LoMurray, M., Schmeelk-Cone, K., Petrova, M., Yu, Q., . . . Wang, W. (2010). An outcome evaluation of the Sources of Strength suicide prevention program delivered by adolescent peer leaders in high schools. *Am J Public Health*, 100(9), 1653-1661. doi:
- Yip, P., Caine, E., Yousuf, S., Chang, S.-S., Wu, K., & Chen, Y.-Y. (2012). Means restriction for suicide prevention. *Lancet*, 379. doi:10.1016/s0140-6736(12)60521-2

## Appendix A: Summary of Strategies and Approaches to Prevent Suicide

Strategy	Approach/Program, Practice or Policy	Best Available Evidence			Lead Sectors <sup>1</sup>
		Suicide	Suicide Attempts or Ideation	Other Risk/Protective Factors for Suicide	
Strengthen economic supports	<b>Strengthen household financial security</b>				Government (local, state, Federal)
	<i>Unemployment benefit programs</i>	✓		✓	
	<i>Other income supports</i>	✓			Business/labor
	<b>Housing stabilization policies</b>				Government (local, state, Federal)
	<i>The National Neighborhood Stabilization Program</i>			✓	
Strengthen access and delivery of suicide care	<b>Coverage of mental health conditions in health insurance policies</b>				Government (local, state, Federal)
	<i>Mental Health Parity Laws</i>	✓		✓	
	<b>Reduce provider shortages in underserved areas</b>				Healthcare
	<i>National Health Service Corps (NHSC)</i>			✓	
	<i>Telemental health (TMH)</i>			✓	Social services
	<b>Safer suicide care through systems change</b>				
Create protective environments	<i>Henry Ford Perfect Depression Care (Pre-cursor to Zero Suicide)</i>	✓		✓	
	<b>Reduce access to lethal means among persons at-risk</b>				Government (local, state)
	<i>Intervening at suicide hot spots</i>	✓			
	<i>Safe storage practices</i>		✓	✓	Public Health
	<i>Emergency Department Counseling on Access to Lethal Means (ED CALM)</i>			✓	
	<b>Organizational policies and culture</b>				

Comment [A]: Healthcare



		Best Available Evidence			
	<i>Together for Life</i>	✓			Business/Labor
	<i>US Air Force Suicide Prevention Program</i>	✓		✓	Justice
	<i>Correctional suicide prevention</i>	✓			Government (local, state, Federal)
	<b>Community-based policies to reduce excessive alcohol use</b>				Government (local, state)
	<i>Alcohol outlet density</i>	✓		✓	Business/labor
Promote connectedness	<b>Peer norm programs</b>				Public Health
	<i>Sources of Strength</i>			✓	Education
	<b>Community engagement activities</b>				Public Health
	<i>Greening vacant urban spaces</i>			✓	Government (local)
Teach coping and problem-solving skills	<b>Social emotional learning programs</b>				Public Health
	<i>Youth Aware of Mental Health Program</i>		✓	✓	Education
	<i>Good Behavior Game</i>		✓	✓	Public Health
	<b>Parenting skill and family relationship approaches</b>				Public Health
	<i>The Incredible Years</i>			✓	Education

Comment [A]: Local only?

		Best Available Evidence			
	<i>Strengthening Families 10–14</i>			✓	
Identify and support people at-risk	<b>Gatekeeper training</b>				Public Health
	<i>Applied Suicide Intervention Skills Training</i>			✓	Healthcare
	<i>Garret Lee Smith Federal Grant Program</i>	✓	✓		
	<b>Crisis Intervention</b>				Public Health
	<i>National Suicide Prevention Lifeline</i>		✓	✓	Social Services
	<b>Treatment for people at risk of suicide</b>				
	<i>Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)</i>		✓	✓	
	<i>Collaborative Assessment and Management of Suicidality (CAMS)</i>		✓	✓	Healthcare
	<i>Dialectical Behavioral Therapy (DBT)</i>		✓	✓	Social Services
	<i>Attachment-Based Family Therapy (ABFT)</i>		✓		Justice
	<i>Translating Initiatives for Depression into Effective Solutions project (TIDES)</i>			✓	
	<b>Treatment to prevent re-attempts</b>				
	<i>ED Brief Intervention with Follow-up Visits</i>	✓			Healthcare
	<i>Active follow-up contact approaches</i>	✓	✓		Social services
	<i>CBT for Suicide Prevention</i>		✓		



		Best Available Evidence			
Lessen harms and prevent future risk	<b>Postvention</b>				Healthcare
	<i>StandBy Response Service</i>		✓	✓	
	<b>Safe reporting following a suicide</b>				Public Health
	<i>Media Guidelines</i>	✓			Media

<sup>1</sup>This column refers to the lead sectors well positioned to bring leadership and resources to implementation efforts. For each strategy, there are many other sectors such as non-governmental organizations that are instrumental to prevention planning and implementing specific activities.



# Preventing Suicide:

## A Technical Package of Policy, Programs, and Practices

National Center for Injury Prevention and Control  
Division of Violence Prevention









# Preventing Suicide:

## A Technical Package of Policy, Programs, and Practices

**Developed by:**

Deb Stone, ScD, MSW, MPH

Kristin Holland, PhD, MPH

Brad Bartholow, PhD

Alex Crosby, MD, MPH

Shane Davis, PhD

Natalie Wilkins, PhD

2017

Division of Violence Prevention  
National Center for Injury Prevention and Control  
Centers for Disease Control and Prevention  
Atlanta, Georgia





**Centers for Disease Control and Prevention**  
Anne Schuchat, MD (RADM, USPHS), Acting Director

**National Center for Injury Prevention and Control**  
Debra E. Houry, MD, MPH, Director

**Division of Violence Prevention**  
James A. Mercy, PhD, Director

---

**Suggested citation:**

Stone, D.M., Holland, K.M., Bartholow, B., Crosby, A.E., Davis, S., and Wilkins, N. (2017) *Preventing Suicide: A Technical Package of Policies, Programs, and Practices*. Atlanta, GA: National Center for Injury Prevention and Control, Centers for Disease Control and Prevention.



# Contents

Acknowledgements .....	5
External Reviewers.....	5
Overview .....	7
Strengthen Economic Supports.....	15
Strengthen Access and Delivery of Suicide Care .....	19
Create Protective Environments .....	23
Promote Connectedness .....	27
Teach Coping and Problem-Solving Skills.....	31
Identify and Support People at Risk .....	35
Lessen Harms and Prevent Future Risk.....	41
Sector Involvement .....	43
Monitoring and Evaluation .....	45
Conclusion .....	47
References.....	49
Appendix: Summary of Strategies and Approaches to Prevent Suicide .....	58







# Acknowledgements

We would like to thank the following individuals who contributed in specific ways to the development of this technical package. We give special thanks to Linda Dahlberg for her vision, guidance, and support throughout the development of this package. We thank Division, Center, and CDC leadership for their careful review and helpful feedback on earlier iterations of this document. We thank Alida Knuth for her formatting and design expertise. Last but definitely not least, we extend our thanks and gratitude to all the external reviewers for their helpful feedback, support and encouragement for this resource.

## External Reviewers

Casey Castaldi  
Prevention Institute

Carmen Clelland  
Office for State, Tribal, Local and Territorial Support,  
Centers for Disease Control and Prevention

Amalia Corby-Edwards  
American Psychological Association

Rachel Davis  
Prevention Institute

Pamela End of Horn  
Indian Health Service Headquarters

Craig Fisher  
American Psychological Association

Keita Franklin  
Department of Defense

Jill M. Harkavy Friedman  
American Foundation for Suicide Prevention

Jarrod Hindman  
Colorado Department of Public Health and Environment

Linda Langford  
Education Development Center, Inc.

Richard McKeon  
Substance Abuse and Mental Health Services Administration

Doreen S. Marshall  
American Foundation for Suicide Prevention

Christine Moutier  
American Foundation for Suicide Prevention

Jason H. Padgett  
Education Development Center, Inc.

Jerry Reed  
Education Development Center, Inc.

Dan Reidenberg  
Suicide Awareness Voices for Education (SAVE)

Christine Schuler  
National Institute for Occupational Safety and Health,  
Centers for Disease Control and Prevention

Morton Silverman  
Education Development Center, Inc.

Ellyson Stout  
Education Development Center, Inc.

Hope M. Tiesman  
National Institute for Occupational Safety and Health,  
Centers for Disease Control and Prevention

*The experts above are listed with their affiliations at the time this document was reviewed.*









# Overview

This technical package represents a select group of strategies based on the best available evidence to help communities and states sharpen their focus on prevention activities with the greatest potential to prevent suicide. These strategies include: strengthening economic supports; strengthening access and delivery of suicide care; creating protective environments; promoting connectedness; teaching coping and problem-solving skills; identifying and supporting people at risk; and lessening harms and preventing future risk. The strategies represented in this package include those with a focus on preventing the risk of suicide in the first place as well as approaches to lessen the immediate and long-term harms of suicidal behavior for individuals, families, communities, and society. The strategies in the technical package support the goals and objectives of the *National Strategy for Suicide Prevention*<sup>1</sup> and the National Action Alliance for Suicide Prevention's priority to strengthen community-based prevention.<sup>2</sup> Commitment, cooperation, and leadership from numerous sectors, including public health, education, justice, health care, social services, business, labor, and government can bring about the successful implementation of this package.

## What is a Technical Package?

A technical package is a compilation of a core set of strategies to achieve and sustain substantial reductions in a specific risk factor or outcome.<sup>3</sup> Technical packages help communities and states prioritize prevention activities based on the best available evidence. This technical package has three components. The first component is the **strategy** or the preventive direction or actions to achieve the goal of preventing suicide. The second component is the **approach**. The approach includes the specific ways to advance the strategy. This can be accomplished through *programs, policies, and practices*. The **evidence** for each of the approaches in preventing suicide or its associated risk factors is included as the third component. This package is intended as a resource to guide and inform prevention decision-making in communities and states.

## Preventing Suicide is a Priority

Suicide, as defined by the Centers for Disease Control and Prevention (CDC), is part of a broader class of behavior called *self-directed violence*. Self-directed violence refers to behavior directed at oneself that deliberately results in injury or the *potential* for injury.<sup>4</sup> Self-directed violence may be *suicidal* or *non-suicidal* in nature. For the purposes of this document, we refer only to behavior where suicide is intended:

- **Suicide** is a death caused by self-directed injurious behavior with any intent to die as a result of the behavior.
- **Suicide attempt** is defined as a *non-fatal* self-directed and potentially injurious behavior with any intent to die as a result of the behavior. A suicide attempt may or may not result in injury.

**Suicide is highly prevalent.** Suicide presents a major challenge to public health in the United States and worldwide. It contributes to premature death, morbidity, lost productivity, and health care costs.<sup>1,5</sup> In 2015 (the most recent year of available death data), suicide was responsible for 44,193 deaths in the U.S., which is approximately one suicide every 12 minutes.<sup>6</sup> In 2015, suicide ranked as the 10th leading cause of death and has been among the top 12 leading causes of death since 1975 in the U.S.<sup>7</sup> Overall suicide rates increased 28% from 2000 to 2015.<sup>6</sup> Suicide is a problem throughout the life span; it is the third leading cause of death for youth 10–14 years of age, the second leading cause of death among people 15–24 and 25–34 years of age; the fourth leading cause among people 35 to 44 years of age, the fifth leading cause among people ages 45–54 and eighth leading cause among people 55–64 years of age.<sup>6</sup>





Suicide rates vary by race/ethnicity, age, and other population characteristics, with the highest rates across the life span occurring among non-Hispanic American Indian/Alaska Native (AI/AN) and non-Hispanic White population groups. In 2015, the rates for these groups were 19.9 and 16.9 per 100,000 population, respectively.<sup>6</sup> Other population groups disproportionately impacted by suicide include middle-aged adults (whose rates increased 35% from 2000 to 2015, with steep increases seen among both males (29%) and females (53%) aged 35–64 years<sup>6</sup>; Veterans and other military personnel (whose suicide rate nearly doubled from 2003 to 2008, surpassing the rate of suicide among civilians for the first time in decades)<sup>8,9</sup>; workers in certain occupational groups,<sup>10,11</sup> and sexual minority youth, who experience increased suicidal ideation and behavior compared to their non-sexual minority peers.<sup>12–14</sup>

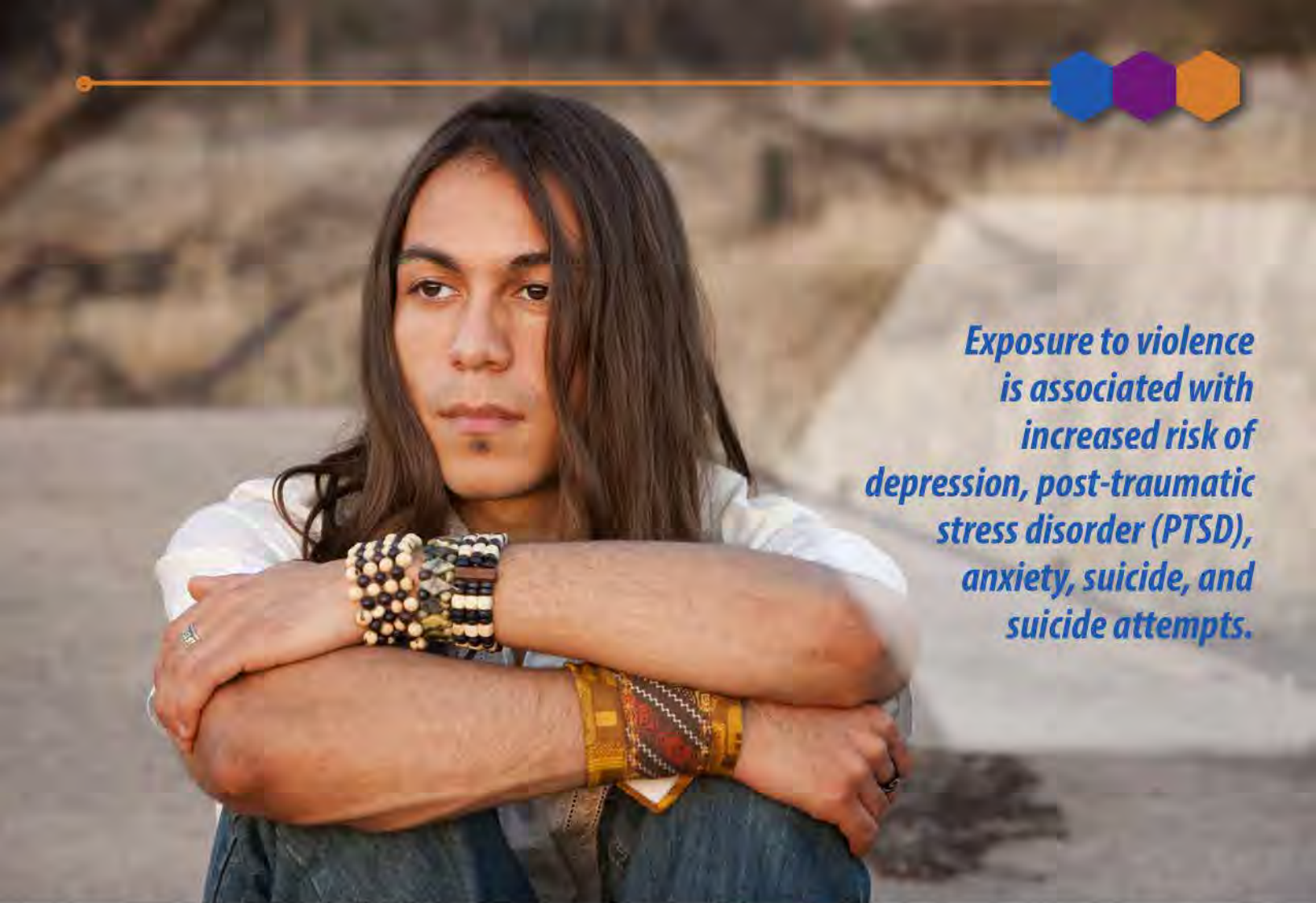
Suicides reflect only a portion of the problem.<sup>15</sup> Substantially more people are hospitalized as a result of nonfatal suicidal behavior (i.e., suicide attempts) than are fatally injured, and an even greater number are either treated in ambulatory settings (e.g., emergency departments) or not treated at all.<sup>15</sup> For example, during 2014, among adults aged 18 years and older, for every one suicide there were 9 adults treated in hospital emergency departments for self-harm injuries, 27 who reported making a suicide attempt, and over 227 who reported seriously considering suicide.<sup>6,16</sup>

**Suicide is associated with several risk and protective factors.** Suicide, like other human behaviors, has no single determining cause. Instead, suicide occurs in response to multiple biological, psychological, interpersonal, environmental and societal influences that interact with one another, often over time.<sup>1,5</sup> The social ecological model—encompassing multiple levels of focus from the individual, relationship, community, and societal—is a useful framework for viewing and understanding suicide risk and protective factors identified in the literature.<sup>17</sup> Risk and protective factors for suicide exist at each level. For example, risk factors include:<sup>1,5</sup>

- **Individual level:** history of depression and other mental illnesses, hopelessness, substance abuse, certain health conditions, previous suicide attempt, violence victimization and perpetration, and genetic and biological determinants
- **Relationship level:** high conflict or violent relationships, sense of isolation and lack of social support, family/loved one's history of suicide, financial and work stress
- **Community level:** inadequate community connectedness, barriers to health care (e.g., lack of access to providers and medications)
- **Societal level:** availability of lethal means of suicide, unsafe media portrayals of suicide, stigma associated with help-seeking and mental illness.

It is important to recognize that the vast majority of individuals who are depressed, attempt suicide, or have other risk factors, do *not* die by suicide.<sup>18,19</sup> Furthermore, the relevance of each risk factor can vary by age, race, gender, sexual orientation, residential geography, and socio-cultural and economic status.<sup>1,5</sup>





*Exposure to violence is associated with increased risk of depression, post-traumatic stress disorder (PTSD), anxiety, suicide, and suicide attempts.*

Protective factors, or those influences that buffer against the risk for suicide, can also be found across the different levels of the social ecological model. Protective factors identified in the literature include: effective coping and problem-solving skills, moral objections to suicide, strong and supportive relationships with partners, friends, and family; connectedness to school, community, and other social institutions; availability of quality and ongoing physical and mental health care, and reduced access to lethal means.<sup>1,5</sup> These protective factors can either counter a specific risk factor or buffer against a number of risks associated with suicide.

**Suicide is connected to other forms of violence.** Exposure to violence (e.g., child abuse and neglect, bullying, peer violence, dating violence, sexual violence, and intimate partner violence) is associated with increased risk of depression, post-traumatic stress disorder (PTSD), anxiety, suicide, and suicide attempts.<sup>20-26</sup> Women exposed to partner violence are nearly 5 times more likely to attempt suicide as women not exposed to partner violence.<sup>26</sup> Exposure to adverse experiences in childhood, such as physical, sexual, emotional abuse and neglect, and living in homes with violence, mental health, substance abuse problems and other instability, is also associated with increased risk for suicide and suicide attempts.<sup>22,27</sup> The psychosocial effects of violence in childhood and adolescence can be observed decades later, including severe problems with finances, family, jobs, and stress – factors that can increase the risk for suicide. Suicide and other forms of violence often share the same individual, relationship, community, and societal risk factors suggesting that efforts to prevent interpersonal violence may also prove beneficial in preventing suicide.<sup>28-30</sup> Further, just as risk factors may be shared across suicide and interpersonal violence, so too may protective factors overlap. For example, connectedness to one's community,<sup>31</sup> school,<sup>32</sup> family,<sup>33</sup> caring adults,<sup>34,35</sup> and pro-social peers<sup>36</sup> can enhance resilience and help reduce risk for suicide and other forms of violence.





**The health and economic consequences of suicide are substantial.** Suicide and suicide attempts have far reaching consequences for individuals, families, and communities.<sup>37-40</sup> In an early study, Crosby and Sacks<sup>41</sup> estimated that 7% of the U.S. adult population, or 13.2 million adults, knew someone in the prior 12 months who had died by suicide. They also estimated that for each suicide, 425 adults were exposed, or knew about the death.<sup>41</sup> In a more recent study, in one state, Cerel et al<sup>42</sup> found that 48% of the population knew at least one person who died by suicide in their lifetime. Research indicates that the impact of knowing someone who died by suicide and/or having lived experience (i.e., personally have attempted suicide, have had suicidal thoughts, or have been impacted by suicidal loss) is much more extensive than injury and death. People with lived experience may suffer long-term health and mental health consequences ranging from anger, guilt, and physical impairment, depending on the means and severity of the attempt.<sup>43</sup> Similarly, survivors of a loved one's suicide may experience ongoing pain and suffering including complicated grief,<sup>44</sup> stigma, depression, anxiety, post-traumatic stress disorder, and increased risk of suicidal ideation and suicide.<sup>45,46</sup> Less discussed but no less important, are the financial and occupational effects on those left behind.<sup>47</sup>

The economic toll of suicide on society is immense as well. According to conservative estimates, in 2013, suicide cost \$50.8 billion in estimated lifetime medical and work-loss costs alone.<sup>47</sup> Adjusting for potential under-reporting of suicide and drawing upon health expenditures per capita, gross domestic product per capita, and variability among states in per capita health care expenditures and income, another study estimated the total lifetime costs associated with nonfatal injuries and deaths caused by self-directed violence to be approximately \$93.5 billion in 2013.<sup>48</sup> The overwhelming burden of these costs were from lost productivity over the life course, with the average cost per suicide being over \$1.3 million.<sup>48</sup> The true economic costs are likely higher, as neither study included monetary figures related to other societal costs such as those associated with the pain and suffering of family members or other impacts.

**Suicide can be prevented.** Like most public health problems, suicide is preventable.<sup>1,5</sup> While progress will continue to be made into the future, evidence for numerous programs, practices, and policies currently exists, and many programs are ready to be implemented now. Just as suicide is not caused by a single factor, research suggests that reductions in suicide will not be prevented by any single strategy or approach.<sup>1,49</sup> Rather, suicide prevention is best achieved by a focus across the individual, relationship, family, community, and societal-levels and across all sectors, private and public.<sup>1,5</sup>

## Assessing the Evidence

This technical package includes programs, practices, and policies with evidence of impact on suicide or risk or protective factors for suicide. To be considered for inclusion in the technical package, the program, practice, or policy selected had to meet at least one of these criteria: a) meta-analyses or systematic reviews showing impact on suicide; b) evidence from at least one rigorous (e.g., randomized controlled trial [RCT] or quasi-experimental design) evaluation study that found significant preventive effects on suicide; c) meta-analyses or systematic reviews showing impact on risk or protective factors for suicide, or d) evidence from at least one rigorous (e.g., RCT or quasi-experimental design) evaluation study that found significant impacts on risk or protective factors for suicide. Finally, consideration was also given to the likelihood of achieving beneficial effects on multiple forms of violence; no evidence of harmful effects on specific outcomes or with particular subgroups; and feasibility of implementation in a U.S. context if the program, policy, or practice has been evaluated in another country.





Within this technical package, some approaches do not yet have research evidence demonstrating impact on rates of suicide but instead are supported by evidence indicating impacts on risk or protective factors for suicide (e.g., help-seeking, stigma reduction, depression, connectedness). In terms of the strength of the evidence, programs that have demonstrated effects on suicidal behavior (e.g., reductions in deaths, attempts) provide a higher-level of evidence, but the evidence base is not that strong in all areas. For instance, there has been less evaluation of community engagement and family programs on suicidal behavior. Thus, approaches in this package that have effects on risk or protective factors reflect the developing nature of the evidence base and the use of the best available evidence at a given time.

It is also important to note that there is often significant heterogeneity among the programs, policies, or practices that fall within one approach or strategy in terms of the nature and quality of the available evidence. Not all programs, policies, or practices that utilize the same approach are equally effective, and even those that are effective may not work across all populations. Tailoring programs and conducting more evaluations may be necessary to address different population groups. The evidence-based programs, practices, or policies included in the package are not intended to be a comprehensive list for each approach, but rather to serve as examples that have been shown to impact suicide or have beneficial effects on risk or protective factors for suicide.

## Contextual and Cross-Cutting Themes

One important feature of the package is the complementary and potentially synergistic impact of the strategies and approaches. The strategies and approaches included in this technical package represent different levels of the social ecology, with efforts intended to impact community and societal levels, as well individual and relationship levels. The strategies and approaches are intended to work in combination and reinforce each other to prevent suicide (see box on page 12). The strategies are arranged in order such that those strategies hypothesized to have the greatest potential for broad public health impact on suicide are included first, followed by those that might impact subsets of the population (e.g., persons who have already made a suicide attempt).



***Like most  
public health  
problems,  
suicide is  
preventable.***





## Preventing Suicide

Strategy	Approach
<b>Strengthen economic supports</b>	<ul style="list-style-type: none"><li>• Strengthen household financial security</li><li>• Housing stabilization policies</li></ul>
<b>Strengthen access and delivery of suicide care</b>	<ul style="list-style-type: none"><li>• Coverage of mental health conditions in health insurance policies</li><li>• Reduce provider shortages in underserved areas</li><li>• Safer suicide care through systems change</li></ul>
<b>Create protective environments</b>	<ul style="list-style-type: none"><li>• Reduce access to lethal means among persons at risk of suicide</li><li>• Organizational policies and culture</li><li>• Community-based policies to reduce excessive alcohol use</li></ul>
<b>Promote connectedness</b>	<ul style="list-style-type: none"><li>• Peer norm programs</li><li>• Community engagement activities</li></ul>
<b>Teach coping and problem-solving skills</b>	<ul style="list-style-type: none"><li>• Social-emotional learning programs</li><li>• Parenting skills and family relationship programs</li></ul>
<b>Identify and support people at risk</b>	<ul style="list-style-type: none"><li>• Gatekeeper training</li><li>• Crisis intervention</li><li>• Treatment for people at risk of suicide</li><li>• Treatment to prevent re-attempts</li></ul>
<b>Lessen harms and prevent future risk</b>	<ul style="list-style-type: none"><li>• Postvention</li><li>• Safe reporting and messaging about suicide</li></ul>

It is important to note that these strategies are not mutually exclusive but each has an immediate focus. For instance, social-emotional learning programs, an approach under the *Teach Coping and Problem-Solving Skills* strategy, sometimes include components to change peer norms and the broader environment. The primary focus of these programs, however, is to provide children and youth with skills to resolve problems in relationships, school, and with peers, and to help youth address other negative influences (e.g., substance use) associated with suicide.





The goal of this package is to stress the importance of comprehensive prevention efforts and to provide examples of effective programs addressing each level of the social ecology, with the knowledge that some programs, practices, and policies may impact multiple levels. Further, those that involve multiple sectors and that impact multiple levels of the social ecology are more likely to have a greater impact on the overall burden of suicide.

Suicide ideation, thoughts, attempts, and deaths vary by gender, race/ethnicity, age, occupation, and other important population characteristics.<sup>6,50</sup> Further, certain transition periods are also associated with higher rates of suicide (e.g., transition from working into retirement, transition from active duty military status to civilian status).<sup>48,51</sup> In fact, suicide risk can change along with dynamic risk factors. For example, individuals' coping skills may change during periods of crisis and heightened stress, limiting their normal ability to effectively solve problems and cope. Research indicates that suicide risk changes as a result of the number and intensity of key risk and protective factors experienced.<sup>52</sup> Ideally, the availability of multiple strategies and approaches tailored to the social, economic, cultural, and environmental context of individuals and communities are desirable as they may increase the likelihood of removing barriers to supportive and effective care and provide opportunities to develop individual and community resilience.<sup>1</sup>

Identifying programs, practices, and policies with evidence of impact on suicide, suicide attempts, or beneficial effects on risk or protective factors for suicide is only the first step. In practice, the effectiveness of the programs, policies and practices identified in this package will be strongly dependent on how well they are implemented, as well as the partners and communities in which they are implemented. Practitioners in the field may be in the best position to assess the needs and strengths of their communities and work with community members to make decisions about the combination of approaches included here that are best suited to their context.

Data-driven strategic planning processes can help communities with this work.<sup>53-55</sup> These planning processes engage and guide community stakeholders through a prevention planning process designed to address a community's profile of risk and protective factors with evidence-based programs, practices, and policies. These processes can also be used to monitor implementation, track outcomes, and make adjustments as indicated by the data. The readiness of the program for broad dissemination and implementation (e.g., availability of program materials, training and technical assistance) can also influence program effects. Implementation guidance to assist practitioners, organizations and communities will be developed separately.

This package includes strategies where public health agencies are well positioned to bring leadership and resources to implementation efforts. It also includes strategies where public health can serve as an important collaborator (e.g., strategies addressing community and societal level risks), but where leadership and commitment from other sectors such as business, labor or health care is critical to implement a particular policy or program (e.g., workplace policies; treatment to prevent re-attempts). The role of various sectors in the implementation of a strategy or approach in preventing suicide is described further in the section on *Sector Involvement*.

In the sections that follow, the strategies and approaches with the best available evidence for preventing suicide are described.









# Strengthen Economic Supports

## Rationale

Studies from the U.S. examining historical trends indicate that suicide rates increase during economic recessions marked by high unemployment rates, job losses, and economic instability and decrease during economic expansions and periods marked by low unemployment rates, particularly for working-age individuals 25 to 64 years old.<sup>56,57</sup> Economic and financial strain, such as job loss, long periods of unemployment, reduced income, difficulty covering medical, food, and housing expenses, and even the anticipation of such financial stress may increase an individual's risk for suicide or may indirectly increase risk by exacerbating related physical and mental health problems.<sup>58</sup> Buffering these risks can, therefore, potentially protect against suicide. For example, strengthening economic support systems can help people stay in their homes or obtain affordable housing while also paying for necessities such as food and medical care, job training, child care, among other expenses required for daily living. In providing this support, stress and anxiety and the potential for a crisis situation may be reduced, thereby preventing suicide. Although more research is needed to understand how economic factors interact with other factors to increase suicide risk, the available evidence suggests that strengthening economic supports may be one opportunity to buffer suicide risk.

## Approaches

Economic supports for individuals and families can be strengthened by targeting household financial security and ensuring stability in housing during periods of economic stress.

**Strengthening household financial security** can potentially buffer the risk of suicide by providing individuals with the financial means to lessen the stress and hardship associated with a job loss or other unanticipated financial problems. The provision of unemployment benefits and other forms of temporary assistance, livable wages, medical benefits, and retirement and disability insurance to help cover the cost of necessities or to offset costs in the event of disability, are examples of ways to strengthen household financial security.

**Housing stabilization policies** aim to keep people in their homes and provide housing options for those in need during times of financial insecurity. This may occur through programs that provide affordable housing such as through government subsidies or through other options available to potential homebuyers such as loan modification programs, move-out planning, or financial counseling services that help minimize the risk or impact of foreclosures and eviction.

## Potential Outcomes

- Reductions in foreclosure rates
- Reductions in eviction rates
- Reductions in emotional distress
- Reductions in rates of suicide





## Evidence

There is evidence suggesting that strengthening household financial security and stabilizing housing can reduce suicide risk.



**Strengthen household financial security.** The *Federal-State Unemployment Insurance Program* allows states to define the maximum amount and duration of unemployment benefits that workers are entitled to receive after a job loss.<sup>59</sup> An examination of variations in *unemployment benefit programs* across states demonstrated that the impact of unemployment on rates of suicide was offset in those states that provided greater than average unemployment benefits (mean level: \$7,990 per person in U.S. constant dollars). The effects of *unemployment benefit programs* were also consistent by sex and age group.<sup>59</sup> Another U.S. study examining the link between unemployment and suicide rates using monthly suicide data, length of unemployment (less than 5 weeks, 5-14 weeks, 15-26 weeks, and greater than 26 weeks), and job losses found that the duration of unemployment, as opposed to just the loss of a job, predicted suicide risk.<sup>60</sup> Together, these results suggest that not only should state unemployment benefit programs be generous in their financial allocations, but also in their duration.

Other measures to strengthen household financial security (e.g., transfer payments related to retirement and disability insurance, unemployment insurance compensation, medical benefits, and other forms of family assistance) have also shown an impact on rates of suicide. A study by Flavin and Radcliff<sup>61</sup> examined the impact of states' per capita spending on transfer payments, medical benefits, and family assistance (Temporary Assistance to Needy Families – TANF) and total state spending on suicide rates between 1990-2000, controlling for a number of suicide risk factors (e.g., residential mobility, divorce rate, unemployment rate) at the state level. As per capita spending on total transfer payments, medical benefits, and family assistance increased there was an associated decrease in state suicide rates. In terms of lives saved, Flavin and Radcliff calculated the cost of reducing a state's suicide rate by a full point for the years studied.<sup>61</sup> At the national level, they estimated 3,000 fewer suicides would occur per year nationwide if every state increased its per capita spending on these types of





***Evidence suggests that strengthening household financial security and stabilizing housing can reduce suicide risk.***

assistance by \$45 per year.<sup>61</sup> Although this was a correlational study, the results demonstrate the potential benefits of policies that reach particularly vulnerable individuals during periods of great need. More evaluation studies are needed to further understand the outcomes impacted by programs such as these.

**Housing stabilization policies.** The *Neighborhood Stabilization Program*<sup>62</sup> was designed to help neighborhoods suffering from high rates of foreclosure and abandonment by slowing the deterioration of the neighborhoods and providing affordable housing options for low, moderate, and middle-income homebuyers. This program also offers financial assistance to eligible individuals for the purchase of a new home. Although this program has not been rigorously evaluated for its impact on suicide outcomes, it addresses foreclosure and eviction, which are risk factors for suicide. A longitudinal analysis of annual data on suicides and foreclosures demonstrated that as the proportion of foreclosed properties increased in U.S. states, so did the state suicide rate, particularly among working-aged adults.<sup>63</sup> Another study of data from 16 U.S. states participating in the *National Violent Death Reporting System* found that suicides precipitated by home foreclosures and evictions increased more than 100% from 2005 (before the housing crisis began) to 2010 (after it had peaked).<sup>57</sup> Most of these suicides occurred prior to the actual loss of the decedent's home. These findings suggest that integrating suicide prevention resources, messaging, and referrals into financial, foreclosure, and move-out planning and counseling services may help to prevent suicide.









# Strengthen Access and Delivery of Suicide Care

## Rationale

While most people with mental health problems do not attempt or die by suicide<sup>18,19</sup> and the level of risk conferred by different types of mental illness varies,<sup>64-66</sup> previous research indicates that mental illness is an important risk factor for suicide.<sup>5,67</sup> State-level suicide rates have also been found to be correlated with general mental health measures such as depression.<sup>68,69</sup> Findings from the *National Comorbidity Survey* indicate that relatively few people in the U.S. with mental health disorders receive treatment for those conditions.<sup>70</sup> Lack of access to mental health care is one of the contributing factors related to the underuse of mental health services.<sup>71</sup> Identifying ways to improve access to timely, affordable, and quality mental health and suicide care for people in need is a critical component to prevention.<sup>5</sup> Additionally, research suggests that services provided are maximized when health and behavioral health care systems are set up to effectively and efficiently deliver such care.<sup>72</sup> Apart from treatment benefits, these approaches can also normalize help-seeking behavior and increase the use of such services.

## Approaches

There are a number of approaches that can be used to strengthen access and delivery of suicide care, including:

**Coverage of mental health conditions in health insurance policies.** Federal and state laws include provisions for equal coverage of mental health services in health insurance plans that is on par with coverage for other health concerns (i.e., mental health parity).<sup>73</sup> Benefits and services covered include such things as the number of visits, co-pays, deductibles, inpatient/outpatient services, prescription drugs, and hospitalizations. If a state has a stronger mental health parity law than the federal parity law, then insurance plans regulated by the state must follow the state parity law. If a state has a weaker parity law than the federal parity law (e.g., includes coverage for some mental health conditions but not others), then the federal parity law will replace the state law. Equal coverage does not necessarily imply good coverage as health insurance plans vary in the extent to which benefits and services are offered to address various health conditions. Rather it helps to ensure that mental health services are covered on par with other health concerns.

**Reduce provider shortages in underserved areas.** Access to effective and state-of-the-art mental health care is largely dependent upon the training and the size of the mental health care workforce. Over 85 million Americans live in areas with an insufficient number of mental health providers; this shortage is particularly severe among low-income urban and rural communities.<sup>74</sup> There are various ways to increase the number and distribution of practicing mental health providers in underserved areas including offering financial incentives through existing state and federal programs (e.g., loan repayment programs) and expanding the reach of health services through telephone, video and web-based technologies. Such approaches can increase the likelihood that those in need will be able to access affordable, quality care for mental health problems, which can reduce risk for suicide.





**Safer suicide care through systems change.** Access to health and behavioral health care services is critical for people at risk of suicide; however this is just one piece of the puzzle. Care should also be delivered efficiently and effectively. More specifically, care should take place within a system that supports suicide prevention and patient safety through strong leadership, workforce training, systematic identification and assessment of suicide risk, implementation of evidence-based treatments (see *Identify and Support People at Risk*), continuity of care, and continuous quality improvement. Care that is patient-centered and promotes equity for all patients is also of critical importance.<sup>75</sup>

## Potential Outcomes

- Increased use of mental health services
- Lower rates of treatment attrition
- Reductions in depressive symptoms
- Reductions in rates of suicide attempts
- Reductions in rates of suicide

## Evidence

There is evidence suggesting that coverage of mental health conditions in health insurance policies and improving access and the delivery of care can reduce risk factors associated with suicide and may directly impact suicide rates.

**Coverage of mental health conditions in health insurance policies.** The *National Survey on Drug Use and Health (NSDUH)* is a nationally representative survey of the U.S. population that provides data on substance use, mental health conditions, and service utilization.<sup>50</sup> Using data from this survey, Harris, Carpenter, and Bao<sup>76</sup> found that 12 months after states enacted *mental health parity laws*, self-reported use of mental healthcare services significantly increased. Moreover, subsequent research by Lang<sup>69</sup> examined state mental health laws and suicide rates between 1990 and 2004 and found that mental health parity laws, specifically, were associated with an approximate 5% reduction in suicide rates. This reduction, in the 29 states with parity laws, equated to the prevention of 592 suicides per year.<sup>69</sup>

**Reduce provider shortages in underserved areas.** One example of a program to improve access to mental health care providers is the *National Health Service Corps (NHSC)*, which offers financial incentives to attract mental/behavioral health clinicians to underserved areas.<sup>77</sup> Programs such as *NHSC* encourage individuals to work in the mental health profession in locations designated as Health Professional Shortage Areas (HPSAs) in exchange for student loan debt repayment. A 2012 retention survey conducted by the Health Resources and Services Administration (HRSA), found that 61% of mental and behavioral health care providers continued to practice in designated mental health shortage areas after their four year commitment to the *NHSC*.<sup>78</sup> Although this program has not been evaluated for impact on suicide, it addresses access to care, which is a critical component to suicide prevention.

*Telemental Health (TMH)* services refer to the use of telephone, video and web-based technologies for providing psychiatric or psychological care at a distance.<sup>79</sup> *TMH* can be used in a variety of settings (e.g., outpatient clinics, hospitals, military treatment facilities) to treat a wide range of mental health conditions. It can also improve access to care for patients in isolated areas, as well as reduce travel time and expenses, reduce delays in receiving care, and improve satisfaction interacting with the mental health care system. A systematic review of *TMH* services found that services rated as high or good quality were effective in treating mental health conditions such as depression, schizophrenia, substance





***Access to health  
and behavioral  
health care services  
is critical for  
people  
of suicide.***

abuse, and suicidal ideation and suicide.<sup>79</sup> Further, Mohr and colleagues<sup>80</sup> conducted a meta-analysis examining the effect of psychotherapy delivered specifically via telephone and found that it significantly reduced depressive symptoms in comparison to face-to-face psychotherapy. They also found that treatment attrition rates were significantly lower among patients receiving telephone-administered psychotherapy compared to patients receiving face-to-face therapy.<sup>80</sup> Thus, *TMH* may not only offer improved access to mental health care, but it may also ensure continuity of care, and thereby further reduce the risk for suicide.

**Safer suicide care through systems change.** *Henry Ford Health System*, which is a large health maintenance organization (HMO) in the state of Michigan, pioneered *Perfect Depression Care*,<sup>81</sup> the pre-cursor to what is now called *Zero Suicide*. The overall goal of *Perfect Depression Care* was to eliminate suicide among HMO members. More broadly, the goal of the program was to redesign delivery of depression care to achieve “breakthrough improvement” in quality and safety by focusing on effectiveness, safety, patient centeredness, timeliness, efficiency, and equity among patients. The program screened and assessed each patient for suicide risk and implemented coordinated continuous follow-up care system wide.<sup>81</sup> An examination of the impact of the program found that there was a dramatic and statistically significant decrease in the rate of suicide between the baseline years, 1999 and 2000, and the intervention years, 2002-2009. During this time period, the suicide rate fell by 82%.<sup>81,82</sup> Further, among HMO members who received mental health specialty services, the suicide rate significantly decreased over time from 1999 to 2010 (110.3 to 47.6 per 100,000 population;  $p < .04$ ) with a mean of 36.2 per 100,000 over the period.<sup>83</sup> Additionally, for those HMO members who accessed only general medical services as opposed to specialty mental health services, the suicide rate increased from 2.7 to 5.6 per 100,000 ( $p < .01$ ).<sup>83</sup> Similarly, in the state of Michigan, rates of suicide in the general population increased over the period from 9.8 to 12.5 per 100,000 ( $p < .001$ ).<sup>83</sup>







# Create Protective Environments

## Rationale

Prevention efforts that focus not only on individual behavior change (e.g., help-seeking, treatment interventions) but on changes to the environment can increase the likelihood of positive behavioral and health outcomes.<sup>84</sup> Creating environments that address risk and protective factors where individuals live, work, and play can help prevent suicide.<sup>1,17</sup> For example, rates of suicide are high among middle-aged adults who comprise 42.6% of the workforce<sup>85</sup>; among certain occupational groups<sup>10,11</sup>; and among people in detention facilities (e.g., jail, prison),<sup>86</sup> to name a few. Thus, settings where these populations work and reside are ideal for implementing programs, practices and policies to buffer against suicide. Changes to organizational culture through the implementation of supportive policies, for instance, can change social norms, encourage help-seeking, and demonstrate that good health and mental health are valued and that stigma and other risk factors for suicide are not.<sup>87,88</sup> Similarly, modifying the characteristics of the physical environment to prevent harmful behavior such as access to lethal means can reduce suicide rates, particularly in times of crisis or transition.<sup>89-94</sup>

## Approaches

The current evidence suggests three potential approaches for creating environments that protect against suicide.

**Reduce access to lethal means among persons at risk of suicide.** Means of suicide such as firearms, hanging/suffocation, or jumping from heights provide little opportunity for rescue and, as such, have high case fatality rates (e.g., about 85% of people who use a firearm in a suicide attempt die from their injury).<sup>95</sup> Research also indicates that: 1) the interval between deciding to act and attempting suicide can be as short as 5 or 10 minutes,<sup>96,97</sup> and 2) people tend *not* to substitute a different method when a highly lethal method is unavailable or difficult to access.<sup>98,99</sup> Therefore, increasing the time interval between deciding to act and the suicide attempt, for example, by making it more difficult to access lethal means, can be lifesaving. The following are examples of approaches reducing access to lethal means for persons at risk of suicide:

- *Intervening at Suicide Hotspots.* Suicide hotspots, or places where suicides may take place relatively easily, include tall structures (e.g., bridges, cliffs, balconies, and rooftops), railway tracks, and isolated locations such as parks. Efforts to prevent suicide at these locations include erecting barriers or limiting access to prevent jumping, and installing signs and telephones to encourage individuals who are considering suicide, to seek help.<sup>100</sup>
- *Safe Storage Practices.* Safe storage of medications, firearms, and other household products can reduce the risk for suicide by separating vulnerable individuals from easy access to lethal means. Such practices may include education and counseling around storing firearms locked in a secure place (e.g., in a gun safe or lock box), unloaded and separate from the ammunition; and keeping medicines in a locked cabinet or other secure location away from people who may be at risk or who have made prior attempts.<sup>89,101</sup>

**Organizational policies and culture** that promote protective environments may be implemented in places of employment, detention facilities, and other secured environments (e.g., residential settings). Such policies and cultural values encourage leadership from the top down and may promote prosocial behavior (e.g., asking for help), skill building, positive social norms, assessment, referral and access to helping services (e.g., mental health, substance abuse treatment, financial counseling), and development of crisis response plans, postvention and other measures to foster a safe physical environment. Such policies and cultural shifts can positively impact organizational climate and morale and help prevent suicide and its related risk factors (e.g., depression, social isolation).<sup>88,102</sup>





### Community-based policies to reduce excessive alcohol use.

Research studies in the United States have found that greater alcohol availability is positively associated with alcohol-involved suicides.<sup>103-105</sup> Policies to reduce excessive alcohol use broadly include zoning to limit the location and density of alcohol outlets, taxes on alcohol, and bans on the sale of alcohol for individuals under the legal drinking age.<sup>105</sup> These policies are important because acute alcohol use has been found to be associated with more than one-third of suicides and approximately 40% of suicide attempts.<sup>106</sup>

## Potential Outcomes

- Increases in safe storage of lethal means
- Reductions in rates of suicide
- Reductions in suicide attempts
- Increases in help-seeking
- Reductions in alcohol-related suicide deaths

## Evidence

The evidence suggests that creating protective environments can reduce suicide and suicide attempts and increase protective behaviors.

**Reduce access to lethal means among persons at risk of suicide.** A meta-analysis examining the impact of *suicide hotspot interventions* implemented in combination or in isolation, both in the U.S. and abroad, found associated reduced rates of suicide.<sup>100,107</sup> For example, after erecting a barrier on the Jacques-Cartier bridge in Canada, the suicide rate from jumping from the bridge decreased from about 10 suicide deaths per year to about 3 deaths per year.<sup>108</sup> Moreover, the reduction in suicides by jumping was sustained even when all bridges and nearby jumping sites were considered, suggesting little to no displacement of suicides to other jumping sites.<sup>108</sup> Further evidence for the effectiveness of bridge barriers was demonstrated by a study examining the impact of the *removal* of safety barriers from the Grafton Bridge in Auckland, New Zealand. After removal of the barrier, both the number and rate of suicide increased five-fold.<sup>93,109</sup>

Another form of means reduction involves implementation of *safe storage practices*. In a case-control study of firearm-related events identified from 37 counties in Washington, Oregon, and Missouri, and from 5 trauma centers, researchers found that storing firearms unloaded, separate from ammunition, in a locked place or secured with a safety device was protective of suicide attempts among adolescents.<sup>110</sup> Further, a recent systematic review of clinic and community-based education and counseling interventions suggested that the provision of safety devices significantly increased safe firearm storage practices compared to counseling alone or compared to the provision of economic incentives to acquire safety devices on one's own.<sup>101</sup>







Another program, the *Emergency Department Counseling on Access to Lethal Means (ED CALM)*, trained psychiatric emergency clinicians in a large children's hospital to provide lethal means counseling and safe storage boxes to parents of patients under age 18 receiving care for suicidal behavior. In a pre-post quality improvement project, Runyan et al<sup>89</sup> found that at post-test 76% (of the 55% of parents followed up, n=114) reported that all medications in the home were locked up as compared to fewer than 10% at the time of the initial emergency department visit. Among parents who indicated the presence of guns in the home at pre-test (i.e., 67%), all (100%) reported guns were currently locked up at post-test.<sup>89</sup>

**Organizational policies and culture.** *Together for Life* is a workplace program of the Montreal Police Force implemented to address suicide among officers. Policy and program components were designed to foster an organizational culture that promoted mutual support and solidarity among all members of the Force. The program included training of supervisors, managers and all units to improve competencies in identifying suicidal risk and to improve use and awareness of existing resources. The program also included an education campaign to improve awareness and help-seeking.<sup>111</sup> Police suicides were tracked over 12 years and compared to rates in the control city of Quebec. The suicide rate in the intervention group decreased significantly by 78.9% to a rate of 6.4 suicides per 100,000 population per year compared to an 11% increase in the control city (29.0 per 100,000).<sup>111</sup>

Another example of this approach is the *United States Air Force Suicide Prevention Program*. The program included 11 policy and education initiatives and was designed to change the culture of the Air Force surrounding suicide. The program uses leaders as role models and agents of change, establishes expectations for behavior related to awareness of suicide risk, develops population skills and knowledge (i.e., education and training), and investigates every suicide (i.e., outcomes measurement). The program represents a fundamental shift from viewing suicide and mental illness solely as medical problems and instead sees them as larger service-wide problems impacting the whole community.<sup>112</sup> Using a time-series design to examine the impact of the program on various violence-related outcomes, researchers found that the program was associated with a 33% relative risk reduction in suicide.<sup>112</sup> The program was also associated with relative risk reductions in related outcomes including moderate and severe family violence (30% and 54%, respectively), homicide (51%), and accidental death (18%).<sup>112</sup> A longitudinal assessment of the program over the period 1981 to 2008 (16 years before the 1997 launch of the program and 11 years post-launch) found significantly lower rates of suicide after the program was launched than before.<sup>87</sup> These effects were sustained over time, except in 2004, which the authors found was associated with less rigorous implementation of program components in that year than in the other years.<sup>87</sup>

Finally, while the evidence is still being built for suicide prevention in correctional facilities, preliminary evidence suggests organizational policies and practices that include routine suicide prevention training for all staff; standardized intake screening and risk assessment; provision of shared information between staff members (especially in transitioning or transferring of inmates); varying levels of observation; safe physical environment; emergency response protocols; notification of suicidal behavior/suicide through the chain of command; and critical incident stress debriefing and death review can potentially reduce suicide.<sup>102</sup> When these policies and practices were implemented across 11 state prisons in Louisiana, suicide rates dropped 46%, from a rate of 23.1 per 100,000 before the intervention to 12.4 per 100,000 the following year.<sup>113</sup> Similar programs have seen declines in suicide both in the United States and in other countries.<sup>114</sup>

**Community-based policies to reduce excessive alcohol use.** While multiple policies to limit excessive use of alcohol exist, several studies on alcohol outlet density and risk factors for suicide, such as interpersonal violence and social connectedness,<sup>115-118</sup> suggest that measures to reduce alcohol outlet density can potentially reduce alcohol-involved suicides. Additionally, a longitudinal analysis of alcohol outlet density, suicide mortality, and hospitalizations for suicide attempts over 6 years in 581 California zip codes, indicated that greater density of bars, specifically, was related to greater suicide and suicide attempts, particularly in rural areas.<sup>119</sup>









# Promote Connectedness

## Rationale

Sociologist, Emile Durkheim theorized in 1897 that weak social bonds, i.e., lack of connectedness, were among the chief causes of suicidality.<sup>120</sup> Connectedness is the degree to which an individual or group of individuals are socially close, interrelated, or share resources with others.<sup>121</sup> Social connections can be formed within and between multiple levels of the social ecology,<sup>17</sup> for instance between individuals (e.g., peers, neighbors, co-workers), families, schools, neighborhoods, workplaces, faith communities, cultural groups, and society as a whole. Related to connectedness, social capital refers to a sense of trust in one's community and neighborhood, social integration, and also the availability and participation in social organizations.<sup>122,123</sup> Many ecological cross-sectional and longitudinal studies have examined the impact of aspects of social capital on depression symptoms, depressive disorder, mental health more generally, and suicide. While the evidence is limited, existing studies suggest a positive association between social capital (as measured by social trust and community/neighborhood engagement), and improved mental health.<sup>124,125</sup> Connectedness and social capital together may protect against suicidal behaviors by decreasing isolation, encouraging adaptive coping behaviors, and by increasing belongingness, personal value, and worth, to help build resilience in the face of adversity. Connectedness can also provide individuals with better access to formal supports and resources, mobilize communities to meet the needs of its members and provide collective primary prevention activities to the community as a whole.<sup>121</sup>

## Approaches

Promoting connectedness among individuals and within communities through modeling peer norms and enhancing community engagement may protect against suicide.

**Peer norm programs** seek to normalize protective factors for suicide such as help-seeking, reaching out and talking to trusted adults, and promote peer connectedness. By leveraging the leadership qualities and social influence of peers, these approaches can be used to shift group-level beliefs and promote positive social and behavioral change. These approaches typically target youth and are delivered in school settings but can also be implemented in community settings.<sup>126</sup>

**Community engagement activities.** Community engagement is an aspect of social capital.<sup>127</sup> Community engagement approaches may involve residents participating in a range of activities, including religious activities, community clean-up and greening activities, and group physical exercise. These activities provide opportunities for residents to become more involved in the community and to connect with other community members, organizations, and resources, resulting in enhanced overall physical health, reduced stress, and decreased depressive symptoms, thereby reducing risk of suicide.





## Potential Outcomes

- Increases in healthy coping attitudes and behaviors
- Increases in referrals for youth in distress
- Increases in help-seeking behaviors
- Increases in positive perceptions of adult support

A photograph of two young men standing outdoors in a park-like setting with trees in the background. The man on the left is wearing a purple t-shirt and looking towards the man on the right. The man on the right is wearing a blue and white plaid shirt, has a backpack, and is holding a stack of books. They appear to be in a conversation.

***Promoting  
connectedness  
among individuals  
and within  
communities may  
protect against  
suicide.***



## Evidence

Current evidence suggests a number of positive benefits of peer norm and community engagement activities, although more evaluation research is needed to examine whether these improvements in factors that protect against suicidal behavior translate into reduced suicide attempts and deaths.

**Peer norm programs.** Evaluations show that programs such as *Sources of Strength* can improve school norms and beliefs about suicide that are created and disseminated by student peers. In a randomized controlled trial of *Sources of Strength* conducted with 18 high-schools (6 metropolitan, 12 rural), researchers found that the program improved adaptive norms regarding suicide, connectedness to adults, and school engagement.<sup>36</sup> Peer leaders were also more likely than controls to refer a suicidal friend to an adult. For students, the program resulted in increased perceptions of adult support for suicidal youths, particularly among those with a history of suicidal ideation, and the acceptability of help-seeking behaviors. Finally, trained peer leaders also reported a greater decrease in maladaptive coping attitudes compared with untrained leaders.<sup>36</sup>

**Community engagement activities.** A vacant lot greening initiative was undertaken in Philadelphia between 1999 and 2008. Local residents and community members worked together to green 4,436 lots (or 7.8 million square feet) in 4 areas of the city. Researchers found significant reductions in community residents' self-reported level of stress, a risk factor for suicide, and engagement in more physical exercise, a protective factor for suicide, than residents in control vacant lot areas. There is some evidence for other cross-cutting benefits, including reductions in firearm assaults and vandalism.<sup>128,129</sup>











# Teach Coping and Problem-Solving Skills

## Rationale

Building life skills prepares individuals to successfully tackle every day challenges and adapt to stress and adversity. Life skills encompasses many concepts, but most often include coping and problem-solving skills, emotional regulation, conflict resolution, and critical thinking. Life skills are important in protecting individuals from suicidal behaviors.<sup>126</sup> Suicide prevention programs that focus on life and social skills training are drawn from social cognitive theories,<sup>130</sup> surmising that suicidal behavior is attributed to either direct learning and modeling or environmental and individual (e.g., hopelessness) characteristics. The inability to employ adequate strategies to cope with immediate stressors or identify and find solutions for problems has been characterized among suicide attempters.<sup>131</sup> Teaching and providing youth with the skills to tackle every day challenges and stressors is, therefore, an important developmental component to suicide prevention.

## Approaches

Social-emotional learning programs and parenting skill and family relationship programs are two approaches for teaching coping and problem-solving skills.

**Social-emotional learning programs** focus on developing and strengthening communication and problem-solving skills, emotion regulation, conflict resolution, help seeking and coping skills. These approaches address a range of risk and protective factors for suicidal behavior. They provide children and youth with skills to resolve problems in relationships, school, and with peers, and help youth address other negative influences (e.g., substance use) associated with suicide.<sup>126</sup> These approaches are typically delivered to all students in a particular grade or school, although some programs also focus on groups of students considered to be at high risk for suicide. Opportunities to practice and reinforce skills are an important part of programs that work.<sup>132</sup>

**Parenting skill and family relationship programs** provide caregivers with support and are designed to strengthen parenting skills, enhance positive parent-child interactions, and improve children's behavioral and emotional skills and abilities.<sup>132</sup> Programs are typically designed for parents or caregivers with children in a specific age range and can be self-directed or delivered to individual families or groups of families. Some programs have sessions primarily with parents or caregivers while others include sessions for parents or caregivers, youth, and the family. Specific program content typically varies by the age of the child but often has consistent themes of child development, parent-child communication and relationships, and youth's interpersonal and problem-solving skills.





## Potential Outcomes

- Reductions in suicide ideation
- Reductions in suicide attempts
- Reductions in suicide risk behaviors (i.e., depression, anxiety, conduct problems, substance abuse)
- Improvements in help-seeking behavior
- Improvements in social competence and emotional regulation skills
- Improvements in problem-solving and conflict management skills



## Evidence

Several social-emotional learning and parenting and family relationship programs have been shown in rigorous evaluations to improve resilience and reduce problem behavior and risk factors for various behaviors, including ones closely related to suicide, such as depression, internalizing behaviors, and substance abuse.<sup>133</sup>

**Social-emotional learning programs.** The *Youth Aware of Mental Health Program (YAM)* is a program developed for teenagers aged 14–16 that uses interactive dialogue and role-playing to teach adolescents about the risk and protective factors associated with suicide (including knowledge about depression and anxiety) and enhances their problem-solving skills for dealing with adverse life events, stress, school and other problems.<sup>134</sup> In a cluster-randomized controlled trial conducted across 10 European Union countries and 168 schools, students in schools randomized to *YAM* were significantly less likely to attempt suicide and have severe suicidal ideation at the 12-month follow-up compared to students in control schools which received educational materials and care as usual. Overall, the relative risk of youth suicide attempts among the *YAM* group was reduced by over 50% demonstrating that out of 1000 students, five attempted suicide in the *YAM* group compared to 11 in the control group. Additionally, related to severe suicide ideation, in the *YAM* group, relative risk fell by 49.6%.<sup>134</sup>

Another example is the *Good Behavior Game (GBG)*, which is a classroom-based program for elementary school children aged 6–10. The program uses a team-based behavior management strategy that promotes good behavior by setting clear expectations for good behavior and consequences for maladaptive behavior. The goal of the *GBG* program is to create an integrated classroom social system that is supportive of all children being able to learn with little aggressive or disruptive behavior.<sup>135</sup> Two cohorts of youths participated in the program in 1985–86 and 1986–87 school years when they were in the first and second grades. A number of proximal and distal outcomes were assessed among the two cohorts over time. With respect to distal suicide-related outcomes, an outcome evaluation of the *GBG* indicated that individuals in the first cohort, who were assigned to participate in *GBG* when they were in the first grade, reported half the adjusted odds of suicidal ideation and suicide attempts when assessed approximately 15 years later, between the ages of 19 to 21, compared to peers who had been in a standard classroom setting. The beneficial effect of the program was consistent for suicidal ideation regardless of whether baseline covariates were included.<sup>135</sup> The *GBG* effect on attempts was less robust in some adjusted models including caregiver mental health. In the second cohort of *GBG* students, neither suicidal ideation nor suicide attempts were significantly different between *GBG* and the control interventions.<sup>135</sup> The researchers believed this may have been due to a lack of implementation fidelity, including less mentoring and monitoring of teachers. *GBG* was also found to be associated with reduced risk of later substance abuse and other suicide risk factors among the first cohort of students. Results for the second cohort were generally smaller but in the desired direction.<sup>136</sup>





**Parenting skill and family relationship programs.** Parenting and family skills training approaches have shown promising impacts in preventing key risk factors associated with suicide. For example, the *Incredible Years (IY)* is a comprehensive group training program for parents, teachers and children designed to reduce conduct and substance abuse problems (two important suicide risk factors in youth) by improving protective factors such as responsive and positive parent-teacher-child interactions and relationships, emotion self-regulation and social competence (all protective factors for suicide).<sup>132</sup> The program includes 9-20 sessions offered in community-based settings (e.g., religious, recreation centers, mental health treatment centers, and hospitals). Several studies have demonstrated the effect of the *IY* program on reducing internalizing symptoms, such as anxiety and depression, and child conduct problems.<sup>137,138</sup> The program is also associated with improved problem-solving and conflict management; these skills were maintained at 1-year follow-up.<sup>139-141</sup> Additionally, the program demonstrated greater benefits in mother-rated child internalizing symptoms, compared to the waitlisted control group, when parent, child, and teacher components were included.<sup>132</sup>

Additionally, *Strengthening Families 10–14* is a program that involves sessions for parents, youth, and families with the goal of improving parents' skills for disciplining, managing emotions and conflict, and communicating with their children; promoting youths' interpersonal and problem-solving skills; and creating family activities to build cohesion and positive parent-child interactions. The premise of the program is that developing these skills for both parents and children will reduce internalizing behavior and adolescent substance abuse, two important risk factors for suicide.<sup>142</sup> *Strengthening Families* has been shown to significantly decrease externalizing behaviors, such as aggression, alcohol use, and drug use among youth participants, as well as reduce depression, alcohol use, and drug use among participating families.<sup>142</sup>



**Parenting and family skills training approaches have shown promising impacts in preventing key risk factors associated with suicide.**







# Identify and Support People at Risk

## Rationale

In order to decrease suicide, care of, and attention to, vulnerable populations is necessary, as these groups tend to experience suicidal behavior at higher than average rates. Such vulnerable populations include, but are not limited to, individuals with lower socio-economic status or who are living with a mental health problem; people who have previously attempted suicide; Veterans and active duty military personnel; individuals who are institutionalized, have been victims of violence, or are homeless; individuals of sexual minority status; and members of certain racial and ethnic minority groups.<sup>8,9,12,13,143</sup> Supporting people at risk requires proactive case finding and effective response, crisis intervention, and evidence-based treatment. Finding optimal ways of identifying at risk individuals, customizing services to make them more accessible (e.g., Internet-based services when appropriate) and engaging people in evidence-based care (e.g., through such measures as collaborative treatment), remain key challenges.<sup>81,144,145</sup> Simply improving or expanding services does not guarantee that those services will be used by people most in need, nor will it necessarily increase the number of people who follow recommended referrals or treatment. For example, some people living in disadvantaged communities may face social and economic issues that can adversely affect their ability to access supportive services.<sup>70</sup>

## Approaches

The following approaches focus on identifying and supporting people at increased risk of suicide.

**Gatekeeper training** is designed to train teachers, coaches, clergy, emergency responders, primary and urgent care providers, and others in the community to identify people who may be at risk of suicide and to respond effectively, including facilitating treatment seeking and support services. Gatekeeper training may be implemented in a variety of settings to identify and support people at risk.<sup>146</sup>

**Crisis intervention.** These approaches provide support and referral services, typically by connecting a person in crisis (or a friend or family member of someone at risk) to trained volunteers or professional staff via telephone hotline, online chat, text messaging, or in-person. Crisis intervention approaches are intended to impact key risk factors for suicide, including feelings of depression, hopelessness, and subsequent mental health care utilization.<sup>147</sup> Similar to means reduction, crisis interventions can put space or time between an individual who may be considering suicide and harmful behavior.

**Treatment for people at risk of suicide** can include various forms of psychotherapy delivered by licensed providers to help individuals with mental health problems and other suicide risk factors with and emotional regulation. Treatment usually takes place in a one-on-one or group format between patients and clinicians and can vary in duration from several weeks to ongoing therapy, as needed. Treatment that employs collaborative (i.e., between patient and therapist or care manager) and/or integrated care (e.g., linkage between primary care and behavioral health care) can help engage and motivate patients, thereby increasing retention in therapy and decreasing suicide risk.<sup>148-150</sup>





**Treatment to prevent re-attempts.** These approaches typically include follow-up contact and use diverse modalities (e.g., home visits, mail, telephone, e-mail) to engage recent suicide attempt survivors in continued treatment to prevent re-attempts.<sup>151</sup> Treatment may focus on improved coping skills, mindfulness, and other emotional regulation skills, and may include case management home visits to increase adherence to treatment and continuity of care; and one-on-one interpersonal therapy and/or group therapy. Approaches that engage and connect people who have attempted to peers and providers are especially important because many attempters do not present to aftercare; 12%-25% re-attempt within a year, and 3%-9% of attempt survivors die by suicide within 1 to 5 years of their initial attempt.<sup>151</sup>

## Potential Outcomes

- Reductions in suicidal ideation
- Reductions in suicide attempts
- Reductions in suicide rates
- Reductions in depression and feelings of hopelessness
- Reductions in re-attempts
- Improvements in coping skills
- Increases in treatment engagement and compliance with medications

## Evidence

The current evidence suggests that identifying people at risk of suicide and the continued provision of treatment and support for these individuals can positively impact suicide and its associated risk factors.

**Gatekeeper training.** *Applied Suicide Intervention Skills Training (ASIST)* is a widely implemented training program that helps hotline counselors, emergency workers, and other gatekeepers to identify and connect with suicidal individuals, understand their reasoning for living and dying, and assist with safely connecting those in need to available resources. In a study employing a randomized controlled trial, Gould, Cross, Pisani, Munfakh, & Kleinman<sup>152</sup> evaluated the training across the *National Suicide Prevention Lifeline* network of hotlines over the period 2008-2009. Using data from 1,410 suicidal individuals who called 17 Lifeline centers, the researchers found that callers who spoke with ASIST-trained





counselors were significantly more likely to feel less depressed, less suicidal, less overwhelmed, and more hopeful by the end of their call, compared to callers who spoke to non-ASIST trained counselors. Counselors trained in ASIST were also more skilled at keeping callers on the phone longer and establishing a connection with them. However, training in ASIST did not result in more comprehensive suicide risk assessments than usual care training.<sup>152</sup>

Gatekeeper training has also been a primary component of the *Garret Lee Smith (GLS) Suicide Prevention Program*, which has been implemented in 50 states and 50 tribes. A multi-site evaluation assessed the impact of community gatekeeper training on suicide attempts and deaths by comparing the change in suicide rates and nonfatal suicidal behavior among young people aged 10–24 in counties implementing GLS trainings, with the trajectory observed in similar counties that did not implement these trainings. Counties that implemented GLS trainings had significantly lower youth suicide rates one year following the training implementation.<sup>153</sup> This finding equates to a decrease of 1 suicide death per 100,000 youth ages 10 to 24, or the prevention of approximately 237 deaths in the age group, between 2007 and 2010. Counties implementing GLS program activities also had significantly lower suicide attempt rates among youth ages 16 to 23 in the year following implementation of the GLS program than did similar counties that did not implement GLS activities (4.9 fewer attempts per 1000 youths).<sup>154</sup> More than 79,000 suicide attempts may have been prevented during the period examined.

**Crisis intervention.** Suicide prevention hotlines are one way to provide crisis intervention. In an evaluation of the effectiveness of the *National Suicide Prevention Lifeline* to prevent suicide, 1,085 suicidal individuals who called the hotline completed a standard risk assessment for suicide, and 380 of those completed a follow-up assessment between 1 and 52 days (mean=13.5 days) after the initial assessment. Researchers found that over half of the initial sample were seriously considering suicide when they called, and they had a plan for their suicide. Researchers also found that among follow-up participants, there was a significant decrease in psychological pain, hopelessness, and intent to die between initiation of the call (time 1) to follow-up (time 3).<sup>155</sup> Between time 2 (end of the call) to time 3, the effect remained for psychological pain and hopelessness, but was not significant for intent to die, suggesting that greater effort at outreach during and following the call is needed for the callers with high levels of suicide intent.<sup>155</sup>

**Treatment for people at risk of suicide.** The *Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)* program aims to prevent suicide among older primary care patients by reducing suicide ideation and depression. IMPACT facilitates the development of a therapeutic alliance, a personalized treatment plan that includes patient preferences, as well as proactive follow-up (biweekly during an acute phase and monthly during continuation phase) by a depression care manager.<sup>156</sup> The program has been shown to significantly improve quality of life, and to reduce functional impairment, depression and suicidal ideation over 24-months of follow-up<sup>156,157</sup> relative to patients who received care as usual.

*Collaborative Assessment and Management of Suicidality (CAMS)*, is a therapeutic approach for suicide-specific assessment and treatment. The program's flexible approach can be used across treatment settings and clinician theoretical orientations and involves the clinician and patient working together in an interactive assessment process to develop patient-specific treatment plans. Sessions are collaborative and involve constant patient input about what is and is not working with the ultimate goal of enhancing the therapeutic alliance and increasing treatment motivation in the suicidal patient. CAMS has been tested and supported in 6 correlational studies,<sup>144</sup> in a variety of inpatient and outpatient settings, and in one RCT with several additional RCTs under way. A feasibility trial with a community-based sample of suicidal outpatients randomly assigned to CAMS or enhanced care as usual (intake with a psychiatrist or psychiatric nurse practitioner followed by 1-11 visits with a case manager and medication as needed) found better treatment retention among the CAMS group and significant improvements in suicidal ideation, overall symptom distress, and feelings of hopelessness at the 12 month follow-up.<sup>158</sup>





Other examples include *Dialectical Behavioral Therapy (DBT)* and *Attachment-Based Family Therapy (ABFT)*. *DBT* is a multicomponent therapy for individuals at high risk for suicide and who may struggle with impulsivity and emotional regulation issues. The components of *DBT* include individual therapy, group skills training, between-session telephone coaching and a therapist consultation team. In a randomized controlled trial of women with recent suicidal or self-injurious behavior, those receiving *DBT* were half as likely to make a suicide attempt at the two-year follow-up than women receiving community treatment (23% vs 46%), required less hospitalization for suicide ideation, and had lower medical risk across all suicide attempts and self-injurious acts combined.<sup>159</sup>

*ABFT* is a program for adolescents aged 12–18 and is designed to treat clinically diagnosed major depressive disorder, eliminate suicidal ideation, and reduce dispositional anxiety.<sup>160</sup> A randomized controlled trial of *ABFT* found that suicidal adolescents assigned to *ABFT* experienced significantly greater improvement in suicidal ideation over 24 weeks of follow-up than did adolescents assigned to enhanced usual care. Additionally, a significantly higher percentage of *ABFT* participants reported no suicidal ideation in the week prior to assessment at 12 weeks than did adolescents receiving enhanced usual care (69.2% vs. 34.6%) and at 24 weeks (82.1% vs. 46.2%).<sup>160</sup>

The Veterans Affairs *Translating Initiatives for Depression into Effective Solutions* project (*TIDES*) uses a depression care liaison to link primary care and mental health services. The depression care liaison assesses and educates patients and follows-up with both patients and providers between primary care visits to optimize treatment. This collaborative care increases the efficiency of providing mental health services by bringing mental health care to the primary care setting, where most patients are first detected and subsequently treated for many mental health conditions. An evaluation of *TIDES* found significant decreases in depression severity scores among 70% of primary care patients.<sup>161</sup> *TIDES* patients also demonstrated 85% and 95% compliance with medication and follow-up visits, respectively.<sup>161</sup>

**Treatment to prevent re-attempts.** Several strategies that aim to prevent re-attempts have demonstrated impact on reducing suicide deaths. For example, *Emergency Department Brief Intervention with Follow-up Visits* is a program that involves a one-hour discharge information session that addresses suicidal ideation and attempts, distress, risk and protective factors, alternatives to self-harm, and referral options, combined with nine follow-up contacts over 18 months (at 1, 2, 4, 7, 11 weeks and 4, 6, 12, 18 months). Follow-up contacts are either conducted by phone or through home visits according to a specific timeline for up to 18 months. A randomized controlled trial that enrolled suicide attempters from eight hospital emergency departments in five countries (Brazil, India, Sri Lanka, Iran, and China) found that a brief intervention combined with nine follow-up visits over 18 months was associated with significantly fewer deaths from suicide relative to a treatment-as-usual group (0.2% versus 2.2%, respectively).<sup>162</sup>


Another example of treatment to prevent re-attempts involves *active follow-up contact approaches* such as postcards, letters, and telephone calls intended to increase a patient's sense of connectedness with health care providers and decrease isolation.<sup>151</sup> These approaches include expression of care and support and typically invite patients to reconnect with their provider. Contacts are made periodically (e.g., monthly or every few months in the first 12 months post-discharge with some programs continuing contact for two or more years). In a meta-analysis conducted by Inagaki et al<sup>151</sup> interventions to prevent repeat suicide attempts in patients admitted to an emergency department for suicide attempt were found to reduce re-attempts by approximately 17% for up to 12 months post-discharge; however, the effects of these approaches beyond 12 months on re-attempts has not yet been demonstrated.<sup>151</sup> Also, because the number of trials and associated sample sizes included in this meta-analysis were small, it was not possible to determine the effect of active contact and follow-up approaches on suicide.





In a randomized controlled trial of the post-crisis suicide prevention long-term follow-up contact approach, Motto and Bostrom<sup>163</sup> found that patients who refused ongoing care but who were randomized to be contacted by letter four times per year had a lower rate of suicide over two years of follow-up than did patients in the control group who received no further contact. Other studies have also shown post-crisis letters and coping cards to be protective against suicide ideation and attempts.<sup>164,165</sup>

Finally, *Cognitive Behavior Therapy for Suicide Prevention (CBT-SP)* is an example of a therapeutic approach to prevent re-attempts. It uses a risk-reduction, relapse prevention approach that includes an analysis of proximal risk factors and stressors (e.g., relationship problems, school or work-related difficulties) leading up to and following the suicide attempt; safety plan development; skill building; and psychoeducation. *CBT-SP* also has family skill modules focused on family support and communication patterns as well as improving the family's problem-solving skills. A randomized controlled trial of *CBT-SP* found that 10-session outpatient cognitive therapy designed to prevent repeat suicide attempts resulted in a 50% reduction in the likelihood of a suicide re-attempt among adults who had been admitted to an emergency department for a suicide attempt relative to treatment as usual.<sup>166</sup>



***Several strategies  
that aim to prevent  
re-attempts have  
demonstrated  
impact on reducing  
suicide deaths.***









# Lessen Harms and Prevent Future Risk

## Rationale

Millions of people are bereaved by suicide every year in the United States and throughout the world.<sup>5</sup> Risk of suicide and suicide risk factors has been shown to increase among people who have lost a friend/peer, family member, co-worker, or other close contact to suicide.<sup>167</sup> Care and attention to the bereaved is therefore of high importance. Despite often good intentions, media and others responding to suicide may add to this risk. For example, research suggests that exposure to sensationalized or otherwise uninformed reporting on suicide may heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to what is known as suicide contagion.<sup>168,169</sup>

## Approaches

Some approaches that can be used to lessen harms and reduce future risk of suicide include postvention and safe reporting and messaging following a suicide.

**Postvention** approaches are implemented *after* a suicide has taken place and may include debriefing sessions, counseling, and/or bereavement support groups for surviving friends, family members, or other close contacts. These programs have not typically been evaluated for their impact on suicide, attempts, or ideation, but they may reduce survivors' guilt, feelings of depression, and complicated grief.<sup>170</sup>

**Safe reporting and messaging about suicide.** The manner in which information on a recent suicide is communicated to the public (e.g., school assemblies, mass media, social media) can heighten the risk of suicide among vulnerable individuals and can inadvertently contribute to suicide contagion. Reports that are inclusive of suicide prevention messages, stories of hope and resilience, risk and protective factors, and links to helping resources (e.g., hotline), and that avoid sensationalizing events or reducing suicide to one cause, can help reduce the likelihood of suicide contagion.<sup>171</sup>

## Potential Outcomes

- Reductions in suicidal ideation
- Reductions in suicide attempts
- Reductions in rates of suicide
- Reductions in psychological distress
- Improvements in reporting following suicide
- Reductions in contagion effects related to suicide





## Evidence

Current evidence suggests that postvention and safe reporting and messaging can impact risk and protective factors for suicide.

**Postvention.** One example of a postvention program with evidence of impact on risk and protective factors for suicide is the *StandBy Response Service (StandBy)*. *StandBy* provides clients with face-to-face outreach and telephone support through a professional crisis response team. Site coordinators develop customized case management plans, referring clients to other existing community services matched to their needs.<sup>172</sup> In a study by Visser, Comans, and Scuffham,<sup>172</sup> *StandBy* clients were significantly less likely to be at high risk for suicidality (suicide ideation and attempts) and had less psychological distress than a suicide bereaved comparison group who had not had contact with the *StandBy* program (48% and 64% respectively). Additionally, research suggests that active postvention approaches in which outreach to suicide survivors occurs at the scene of a suicide is associated with intake into treatment sooner, greater attendance at support group meetings, and attendance at more meetings compared to passive postvention (i.e., approaches where survivors self-refer for services).<sup>173</sup>

**Safe reporting and messaging about suicide.** One way to ensure safe reporting and messaging about suicide is to encourage news media to adhere to *Recommendations for Reporting on Suicide* (<http://www.reportingonsuicide.org>). The most compelling evidence supporting these recommendations for reporting comes from Austria. After a sharp increase in suicides on the Viennese subway, media guidelines were introduced and an interrupted time-series design was used to evaluate the national impact of the guidelines on subsequent suicides. Changes in the quality and quantity of media reporting resulted in a nationwide significant reduction of 81 suicides annually.<sup>169</sup> Finally, research suggests that not only does reporting on suicide in a negative way (e.g., reporting on suicide myths and repetition) have harmful effects on suicide, but reporting on positive coping skills in the face of adversity can also demonstrate protective effects against suicide.<sup>174</sup> Reports of individual suicidal ideation (not accompanied by reports of suicide or suicide attempts) along with reports describing a “mastery” of a crisis situation where adversities were overcome was associated with significant decreases in suicide rates in the time period immediately following such reports.<sup>174</sup>



*Postvention and safe reporting and messaging can impact risk and protective factors for suicide.*





# Sector Involvement

Public health can play an important and unique role in addressing suicide. Public health agencies, which typically place prevention at the forefront of efforts and work to create broad population-level impact, can bring critical leadership and resources to bear on this problem. For example, these agencies can serve as a convener, bringing together partners and stakeholders to plan, prioritize, and coordinate suicide prevention efforts. Public health agencies are also well positioned to collect and disseminate data, implement preventive measures, evaluate programs, and track progress. Although public health can play a leadership role in preventing suicide, the strategies and approaches outlined in this technical package cannot be accomplished by the public health sector alone. As noted in the *National Strategy for Suicide Prevention*,<sup>1</sup> the integration and coordination of prevention activities across sectors and settings is critical for expanding the reach and impact of suicide prevention efforts.

Other sectors vital to implementing this package include, but are not limited to, education, government (local, state, and federal), social services, health services, business, labor, justice, housing, media, and organizations that comprise the civil society sector such as faith-based organizations, youth-serving organizations, foundations, and other non-governmental organizations. Collectively, these sectors can make a difference in preventing suicide by impacting the various contexts and underlying risks that contribute to suicide.

The strategies and approaches described in this technical package are summarized in the Appendix along with the relevant sectors that are well positioned to lead implementation efforts. For example, business and labor, the health sector (including insurers, providers, and health systems), and government entities are in the best position to implement programs and policies that *Strengthen Economic Supports* and *Strengthen Access and Delivery of Suicide Care*. These types of supports go beyond individual behavior change and require commitment and support from those sectors that can directly address some of the underlying risks and the environmental contexts that increase the risk for suicide. Public health entities can play an important role by gathering and synthesizing information to inform policy, raise awareness, and evaluate the effectiveness of various policies. Moreover, partnerships with non-governmental and community organizations can be instrumental in increasing awareness of and garnering support for policies affecting individuals and families.

The public health sector has been at the forefront of many community-based prevention efforts, working collaboratively with schools and community-based organizations, to change social norms and positively impact health behavior. Public health is well suited to take on a similar leadership role in *Promoting Connectedness* through peer norm and community engagement activities and supporting the development, evaluation, and adoption of effective programs that *Teach Coping and Problem-Solving Skills* to prevent the risk of suicide in the first place. These programs are often delivered in school and community settings, making education and non-governmental organizations vital partners in prevention.

Businesses, workplaces, and local and state government entities, on the other hand, are in the best position to establish policies and support practices that *Create Protective Environments* where people live, work, and play. Public health entities can serve in an important role by gathering and synthesizing information, working with other governmental agencies (e.g., criminal justice, defense) and agencies within the executive branch of their state or local government in support of policy and other approaches, and evaluating the effectiveness of measures taken. In a similar fashion, public health entities can partner with schools, workplaces, and community organizations to implement and evaluate prevention programs, policies and practices geared toward creating safe, healthy, and supportive environments.





Finally, this technical package includes a number of interventions delivered in hospital, primary care, behavioral health care, and community settings designed to *Identify and Support People at Risk*. The intensity and activities for many of these interventions require the expertise of professionals who are licensed and trained to deliver critical intervention support. The health, social services, and justice sectors can work collaboratively to support individuals at high-risk for suicide and their families. These activities also require coordination of supports across various service providers and community organizations.

Regardless of strategy, action by many sectors will be necessary for the successful implementation of this package. In this regard, all sectors can play an important and influential role in preventing the risk of suicide in the first place and lessening the immediate and long-term harms of suicidal behavior by helping those in times of crisis get the services and support they need.



***All sectors can  
play an important  
and influential role in  
preventing suicide.***



# Monitoring and Evaluation

Monitoring and evaluation are necessary components of the public health approach to prevention. It is important to have timely and reliable data to monitor the extent of the problem and to evaluate the impact of prevention efforts. Data are also necessary for prevention planning and implementation.

Gathering ongoing and systematic data is important for prevention efforts. However, it is also important to gather data that are uniform and consistent across systems. Consistent data allow public health and other entities to better gauge the scope of the problem, identify high-risk groups, and monitor the effects of prevention programs and policies. Currently, it is common for different sectors, agencies, and organizations to employ varying definitions of suicidal ideation, behavior, and death that can make it difficult to consistently monitor specific outcomes across sectors and over time. For example, the manner in which deaths are classified can change from one jurisdiction to another, and can change based on local medical and/or medico-legal standards.<sup>4</sup> CDC's uniform definitions and recommended data elements for self-directed violence provide a useful framework to help ensure that data are collected in a consistent manner across surveillance systems.<sup>4</sup>

Surveillance systems exist at the federal, state, and local levels. It is important to assess the availability of surveillance data and data systems across these levels to identify and address gaps in the systems. CDC's *National Vital Statistics System (NVSS)*<sup>7</sup> and the *National Violent Death Reporting System (NVD RS)*<sup>175</sup> are examples of surveillance systems that provide data on deaths from suicide. NVSS is a nationwide surveillance system that collects demographic, geographic, and cause-of-death data from death certificates.<sup>7</sup> NVD RS is a state-based surveillance system (currently in 40 states, the District of Columbia, and Puerto Rico) that combines data from death certificates, law enforcement reports, and coroner or medical examiner reports to provide detailed information on the circumstances of violent deaths, including suicide, which can assist communities in guiding prevention approaches.<sup>175</sup> Data from state and local Child Death Review teams<sup>176</sup> and Suicide Death Review Teams (which are in a few states) offer another source to identify deaths and obtain insight into the gaps in services, systems, and modifiable risk factors for suicide.







The *National Electronic Injury Surveillance System-All Injury Program (NEISS-AIP)* provides nationally representative data about all types and causes of nonfatal injuries treated in U.S. hospital emergency departments, and can be used to assess national rates of, and trends in, self-harm injuries by cause (e.g., falls, poisoning, etc.), age, race/ethnicity, sex, disposition (where the injured person goes when released from the emergency department).<sup>6</sup>

In addition to information on deaths and nonfatal injuries, there are also surveillance systems that provide national, state, and some local estimates of suicidal behavior. The *Youth Risk Behavior Surveillance System (YRBSS)* collects information from a nationally representative sample of 9–12 grade students and is a key resource in monitoring health-risk behaviors among youth, including whether youth have seriously considered attempting suicide, attempted suicide, made a plan, or required treatment by a doctor or nurse for a suicide attempt that resulted in an injury, poisoning, or overdose.<sup>177</sup> The YRBSS data are obtained from a national school-based survey conducted by CDC as well as from state, territorial, tribal, and large urban school district surveys conducted by education and health agencies.<sup>177</sup> The *National Survey on Drug Use and Health (NSDUH)*<sup>50</sup> is an annual survey of the civilian, non-institutionalized population aged 12 years and older. NSDUH provides both national and state-level estimates of substance use (alcohol, tobacco, illicit drugs, and non-medical use of prescription drugs); mental health (past year mental illness, co-occurring illnesses); and service utilization, along with suicide ideation, suicide plans, and suicide attempts. NSDUH is a key resource to track trends in suicide-related risk factors in the population and to help identify groups at increased risk.<sup>50</sup>

It is also important at all levels (local, state, and federal) to address gaps in responses, track progress of prevention efforts and evaluate the impact of those efforts, including the impact of this technical package. Evaluation data, produced through program implementation and monitoring, is essential to provide information on what does and does not work to reduce rates of suicide and its associated risk and protective factors. Theories of change and logic models that identify short, intermediate, and long-term outcomes are an important part of program evaluation.

The evidence-base for suicide prevention has advanced greatly over the last few decades. However, additional research is needed to understand the impact of programs, policies, and practices on suicide (and suicide attempts, at a minimum), as opposed to merely examining their effectiveness on risk factors. More research is also needed to examine the effectiveness of primary prevention strategies (before risk occurs) and community-level strategies to prevent suicide at the population level. It will be important for researchers to test the effectiveness of combinations of the strategies and approaches included in this package. Most existing evaluations focus on approaches implemented in isolation, but there is potential to understand the synergistic effects within a comprehensive prevention approach. Lastly, there are also many potential opportunities to build and strengthen partnerships across program areas (e.g., violence prevention, substance abuse prevention) to evaluate the impact of different approaches on multiple outcomes.






# Conclusion

Suicide is a serious public health problem. Rates of suicide have been on the rise for more than a decade and the costs stretch well into the billions of dollars each year. While suicide is a rare outcome statistically, its human impact has a ripple effect that is far-reaching. Each of us likely interacts with suicide survivors, those with lived experience, and those with thoughts of suicide on a daily basis – at home, at work, and in our communities. Suicide and suicide attempts are public health issues of societal concern. There are a number of barriers that have impeded progress, including, for example, stigma related to help-seeking, mental illness, being a survivor and fear related to asking someone about suicidal thoughts. Fortunately, like many public health problems, suicide is preventable,<sup>1,5</sup> and more is being done to prevent suicide than ever before, as evidenced by the work of the National Action Alliance for Suicide Prevention,<sup>39,40,75,88</sup> the release of the first world report on suicide,<sup>5</sup> and more timely surveillance data, to name just a few examples.

In an effort to continue pushing the field and society further towards prevention, this technical package includes strategies and approaches that ideally would be used in a comprehensive, multi-level and multi-sectoral way. It includes strategies and approaches to prevent the risk of suicide in the first place, as well as strategies focused on lessening the immediate and long-term harms of suicidal behavior. It includes strategies that range from a focus on the whole population regardless of risk to strategies designed to support people at highest risk. Importantly, this technical package extends the bounds of the typical prevention strategies to consider approaches that go beyond individual behavior change to better address risk factors impacting communities and populations more broadly (e.g., economic policies to strengthen housing and financial security).

While the evidence base continues to emerge, the collection of programs, policies, and practices laid out here are available for implementation now. In keeping with good public health practice, the intent is that monitoring and evaluation will play a key role in that implementation. Moreover, as new evidence becomes available, this technical package can be refined to reflect the current state of the science.

In closing, and in keeping with a message of resilience as spoken by those with lived experience, “hope, help, and healing is possible.”



***“Hope, help,  
and healing  
is possible.”***







# References

1. U.S. Office of the Surgeon General, National Action Alliance for Suicide Prevention. *2012 National strategy for suicide prevention: goals and objectives for action*. Washington, D.C.: HHS; 2012.
2. National Action Alliance for Suicide Prevention. Action Alliance priorities. 2017; <http://actionallianceforsuicideprevention.org/priorities>.
3. Frieden TR. Six components necessary for effective public health program implementation. *Am J Public Health*. 2014;104(1):17-22.
4. Crosby AE, Ortega L, Melanson C. *Self-directed violence surveillance: uniform definitions and recommended data elements, version 1.0*. Atlanta, GA: Centers for Disease Control and Prevention, National Center for Injury Prevention and Control; 2011.
5. World Health Organization. *Suicide prevention: a global imperative*. Geneva, Switzerland: WHO Press; 2014.
6. Centers for Disease Control and Prevention. Web-Based Injury Statistics Query and Reporting System (WISQARS). Atlanta, GA: National Center for Injury Prevention and Control. Available online: <http://www.cdc.gov/injury/wisqars/index.html>.
7. Centers for Disease Control and Prevention, National Center for Health Statistics. National Vital Statistics System. <https://www.cdc.gov/nchs/nvss/deaths.htm>.
8. Bachynski KE, Canham-Chervak M, Black SA, Dada EO, Millikan AM, Jones BH. Mental health risk factors for suicides in the US Army, 2007–8. *Inj Prev*. 2012;18(6):405–412.
9. Lineberry TW, O'Connor SS. Suicide in the US Army. *Mayo Clinic Proceedings*. 2012;87(9):871–878.
10. McIntosh WL, Spies E, Stone DM, Lokey CN, Trudeau AR, Bartholow B. Suicide rates by occupational group – 17 states, 2012. *MMWR Morb Mortal Wkly Rep*. 2016;65(25):641–645.
11. Han B, Crosby AE, Ortega LA, Parks SE, Compton WM, Gfroerer J. Suicidal ideation, suicide attempt, and occupations among employed adults aged 18–64 years in the United States. *Compr Psychiatry*. 2016;66:176–186.
12. Kann L, McManus T, Harris WA, et al. Youth Risk Behavior Surveillance – United States, 2015. *MMWR CDC Surveill Summ*. 2016;65(6):1–174.
13. Russell ST, Joyner K. Adolescent sexual orientation and suicide risk: evidence from a national study. *Am J Public Health*. 2001;91(8):1276–1281.
14. Stone DM, Luo F, Ouyang L, Lippy C, Hertz MF, Crosby AE. Sexual orientation and suicide ideation, plans, attempts, and medically serious attempts: evidence from local Youth Risk Behavior Surveys, 2001–2009. *Am J Public Health*. 2014;104(2):262–271.
15. Crosby AE, Han B, Ortega LA, Parks SE, Gfroerer J. Suicidal thoughts and behaviors among adults aged ≥18 years—United States, 2008–2009. *MMWR CDC Surveill Summ*. 2011;60(13):1–22.
16. Lipari R, Piscopo K, Kroutil LA, Kilmer Miller G. Suicidal thoughts and behavior among adults: results from the 2014 National Survey on Drug Use and Health. *NSDUH Data Review* 2015; <https://www.samhsa.gov/data/sites/default/files/NSDUH-FRR2-2014/NSDUH-FRR2-2014.pdf>.
17. Dahlberg LL, Krug EG. Violence—a global public health problem. In: Krug EG, Dahlberg LL, Mercy JA, Zwi AB, Lozano R, eds. *World Report on Violence and Health*. Geneva, Switzerland: World Health Organization; 2002:1–21.
18. Owens D. Fatal and non-fatal repetition of self-harm: systematic review. *Br J Psychiatry*. 2002;181(3):193–199.
19. Olfson M, Gerhard T, Huang C, Crystal S, Stroup TS. Premature mortality among adults with schizophrenia in the United States. *JAMA Psychiatry*. 2015;72(12):1172–1181.
20. Bossarte RM, Karras E, Lu N, et al. Associations between the Department of Veterans Affairs' suicide prevention campaign and calls to related crisis lines. *Public Health Rep (Washington, D.C.: 1974)*. 2014;129(6):516–525.





21. Chapman DP, Whitfield CL, Felitti VJ, Dube SR, Edwards VJ, Anda RF. Adverse childhood experiences and the risk of depressive disorders in adulthood. *J Affect Disord.* 2004;82(2):217-225.
22. Dube SR, Anda RF, Felitti VJ, Chapman DP, Williamson DF, Giles WH. Childhood abuse, household dysfunction, and the risk of attempted suicide throughout the life span: findings from the Adverse Childhood Experiences Study. *JAMA.* 2001;286(24):3089-3096.
23. Felitti VJ, Anda RF, Nordenberg D, et al. Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: the Adverse Childhood Experiences (ACE) Study. *Am J Prev Med.* 1998;14(4):245-258.
24. Klomek AB, Sourander A, Gould M. The association of suicide and bullying in childhood to young adulthood: a review of cross-sectional and longitudinal research findings. *Can J Psychiatry.* 2010;55(5):282-288.
25. Leeb RT, Lewis T, Zolotor AJ. A review of physical and mental health consequences of child abuse and neglect and implications for practice. *American Journal of Lifestyle Medicine.* 2011;5(5):454-468.
26. World Health Organization. *Global and regional estimates of violence against women: prevalence and health effects of intimate partner violence and non-partner sexual violence.* Geneva: World Health Organization; 2013.
27. Bellis MA, Hughes K, Leckenby N, et al. Adverse childhood experiences and associations with health-harming behaviours in young adults: surveys in eight eastern European countries. *Bull World Health Organ.* 2014;92(9):641-655.
28. Haegerich TM, Dahlberg LL. Violence as a public health risk. *American Journal of Lifestyle Medicine.* 2011;5(5):392-406.
29. Wilkins N, Tsao B, Hertz M, Davis R, Klevens J. *Connecting the dots: an overview of the links among multiple forms of violence.* Atlanta, GA: National Center for Injury Prevention and Control, Centers for Disease Control and Prevention; 2014.
30. Hamby S, Grych J. *The web of violence: exploring connections among different forms of interpersonal violence and abuse.* *Briefs in Sociology.* New York, NY: Springer; 2013.
31. Kleiman EM, Riskind JH, Schaefer KE, Weingarden H. The moderating role of social support on the relationship between impulsivity and suicide risk. *Crisis.* 2012;33(5):273-279.
32. Carter M, McGee R, Taylor B, Williams S. Health outcomes in adolescence: associations with family, friends and school engagement. *J Adolesc.* 2007;30(1):51-62.
33. Maimon D, Browning CR, Brooks-Gunn J. Collective efficacy, family attachment, and urban adolescent suicide attempts. *J Health Soc Behav.* 2010;51(3):307-324.
34. Capaldi DM, Knoble NB, Shortt JW, Kim HK. A systematic review of risk factors for intimate partner violence. *Partner Abuse.* 2012;3(2):231-280.
35. Losel F, Farrington DP. Direct protective and buffering protective factors in the development of youth violence. *Am J Prev Med.* 2012;43(2 Suppl 1):S8-S23.
36. Wyman PA, Brown CH, LoMurray M, et al. An outcome evaluation of the Sources of Strength suicide prevention program delivered by adolescent peer leaders in high schools. *Am J Public Health.* 2010;100(9):1653-1661.
37. Dunne EJ, McIntosh JL, Dunne-Maxim K, eds. *Suicide and its aftermath: understanding and counseling the survivors.* New York: Norton; 1987.
38. Mishara BL. *The impact of suicide.* New York: Springer; 1995.
39. National Action Alliance for Suicide Prevention: Suicide Attempt Survivors Task Force. *The way forward: pathways to hope, recovery, and wellness with insights from lived experience.* Washington, D.C. : Author; 2014.
40. National Action Alliance for Suicide Prevention: Survivors of Suicide Loss Task Force. *Responding to grief, trauma, and distress after a suicide: U.S. national guidelines.* Washington, D.C. : Author; 2015.
41. Crosby AE, Sacks JJ. Exposure to suicide: incidence and association with suicidal ideation and behavior: United States, 1994. *Suicide Life Threat Behav.* 2002;32(3):321-328.
42. Cerel J, Maple M, De Venne A, Moore M, Flaherty C, Brown M. Exposure to suicide in the community: prevalence and correlates in one US state. *Public Health Rep (Washington, D.C.: 1974).* 2016;131(1):100-107.





43. Chapman AL, Dixon-Gordon KL. Emotional antecedents and consequences of deliberate self-harm and suicide attempts. *Suicide Life Threat Behav.* 2007;37(5):543-552.
44. Mitchell AM, Kim Y, Prigerson HG, Mortimer-Stephens M. Complicated grief in survivors of suicide. *Crisis.* 2004;25(1):12-18.
45. Sudak H, Maxim K, Carpenter M. Suicide and stigma: a review of the literature and personal reflections. *Acad Psychiatry.* 2008;32(2):136-142.
46. Cerel J, McIntosh JL, Neimeyer RA, Maple M, Marshall D. The continuum of "survivorship": definitional issues in the aftermath of suicide. *Suicide Life Threat Behav.* 2014;44(6):591-600.
47. Florence C, Simon T, Haegerich T, Luo F, Zhou C. Estimated lifetime medical and work-loss costs of fatal injuries-United States, 2013. *MMWR Morb Mortal Wkly Rep.* 2015;64(38):1074-1077.
48. Shepard DS, Gurewich D, Lwin AK, Reed GA, Jr., Silverman MM. Suicide and suicidal attempts in the United States: costs and policy implications. *Suicide Life Threat Behav.* 2016;46(3):352-362.
49. Silverman MM, Maris RW. The prevention of suicidal behaviors: an overview. *Suicide Life Threat Behav.* 1995;25(1):10-21.
50. Substance Abuse and Mental Health Services Administration, Center for Behavioral Health Statistics and Quality. National Survey on Drug Use and Health. 2016; [https://nsduhwebesn.rti.org/respweb/project\\_description.html](https://nsduhwebesn.rti.org/respweb/project_description.html).
51. Desai RA, Dausey DJ, Rosenheck RA. Mental health service delivery and suicide risk: the role of individual patient and facility factors. *Am J Psychiatry.* 2005;162(2):311-318.
52. Turecki G. Epigenetics and suicidal behavior research pathways. *Am J Prev Med.* 2014;47(3):S144-S151.
53. Edwards RW, Jumper-Thurman P, Plested BA, Oetting ER, Swanson L. Community readiness: research to practice. *Journal of Community Psychology.* 2000;28(3):291-307.
54. Hawkins JD, Catalano RF, Kuklinski MR. Communities that care. *Encyclopedia of Criminology and Criminal Justice:* Springer; 2014:393-408.
55. Plested BA, Edwards RW, Jumper-Thurman P. *Community readiness: a handbook for successful change.* Fort Collins, CO: Tri-Ethnic Center for Prevention Research. 2006.
56. Luo F, Florence CS, Quispe-Agnoli M, Ouyang L, Crosby AE. Impact of business cycles on US suicide rates, 1928-2007. *Am J Public Health.* 2011;101(6):1139-1146.
57. Fowler KA, Gladden RM, Vagi KJ, Barnes J, Frazier L. Increase in suicides associated with home eviction and foreclosure during the US housing crisis: findings from 16 National Violent Death Reporting System States, 2005-2010. *Am J Public Health.* 2015;105(2):311-316.
58. Stack S, Wasserman I. Economic strain and suicide risk: a qualitative analysis. *Suicide Life Threat Behav.* 2007;37(1):103-112.
59. Cylus J, Glymour MM, Avendano M. Do generous unemployment benefit programs reduce suicide rates? A state fixed-effect analysis covering 1968-2008. *Am J Epidemiol.* 2014;180(1):45-52.
60. Classen TJ, Dunn RA. The effect of job loss and unemployment duration on suicide risk in the United States: a new look using mass-layoffs and unemployment duration. *Health Econ.* 2012;21(3):338-350.
61. Flavin P, Radcliff B. Public policies and suicide rates in the American states. *Social Indicators Research.* 2009;90(2):195-209.
62. U.S. Department of Housing and Urban Development. Neighborhood Stabilization Program. <https://www.hudexchange.info/programs/nsp/>, 2017.
63. Houle JN, Light MT. The home foreclosure crisis and rising suicide rates, 2005 to 2010. *Am J Public Health.* 2014;104(6):1073-1079.
64. Arsenault-Lapierre G, Kim C, Turecki G. Psychiatric diagnoses in 3275 suicides: a meta-analysis. *BMC Psychiatry.* 2004;4:37.
65. Harris EC, Barraclough B. Suicide as an outcome for mental disorders: a meta-analysis. *Br J Psychiatry.* 1997;170:205-228.





66. Tyrer P, Reed GM, Crawford MJ. Classification, assessment, prevalence, and effect of personality disorder. *Lancet*. 2015;385(9969):717-726.
67. Harris EC, Barraclough B. Excess mortality of mental disorder. *Br J Psychiatry*. 1998;173:11-53.
68. Mark TL, Shern DL, Bagalman JE, Cao Z. *Ranking America's mental health: an analysis of depression across the states*. Alexandria, VA: Mental Health America. 2007.
69. Lang M. The impact of mental health insurance laws on state suicide rates. *Health Econ*. 2013;22(1):73-88.
70. Wang PS, Demler O, Kessler RC. Adequacy of treatment for serious mental illness in the United States. *Am J Public Health*. 2002;92(1):92-98.
71. Cunningham PJ. Beyond parity: primary care physicians' perspectives on access to mental health care. *Health Aff (Millwood)*. 2009;28(3):w490-501.
72. Coffey CE. Building a system of perfect depression care in behavioral health. *Jt Comm J Qual Patient Saf*. 2007;33(4):193-199.
73. The Paul Wellstone and Pete Domenici Mental Health Parity and Addiction Equity Act of 2008 (MHPEA), HR 1424, 110<sup>th</sup> Congress. 2008.
74. U.S. Department of Health and Human Services Health Resources and Services Administrations. Designated health professional shortage areas statistics. <https://www.hudexchange.info/programs/nsp/>, 2017.
75. National Action Alliance for Suicide Prevention: Clinical Workforce Preparedness Task Force. *Suicide prevention and the clinical workforce: guidelines for training*. Washington, D.C.: Author; 2014.
76. Harris KM, Carpenter C, Bao Y. The effects of state parity laws on the use of mental health care. *Med Care*. 2006;44(6):499-505.
77. Health Resources & Services Administration. National Health Service Corps. 2017; <https://www.nhsc.hrsa.gov/>.
78. U.S. Department of Health and Human Services Health Resources and Services Administrations. *National Health Service Corp clinician retention: a story of dedication and commitment*. 2016. <https://nhsc.hrsa.gov/currentmembers/membersites/retainproviders/retentionbrief.pdf>.
79. Hailey D, Roine R, Ohinmaa A. The effectiveness of telemental health applications: a review. *The Can J Psychiatry*. 2008;53(11):769-778.
80. Mohr DC, Vella L, Hart S, Heckman T, Simon G. The effect of telephone-administered psychotherapy on symptoms of depression and attrition: a meta-analysis. *Clinical Psychology: Science and Practice*. 2008;15(3):243-253.
81. Coffey CE. Pursuing perfect depression care. *Psychiatr Serv*. 2006;57(10):1524-1526.
82. Coffey CE, Coffey MJ, Ahmedani BK. An update on perfect depression care. *Psychiatr Serv*. 2013;64(4):396.
83. Coffey M, Coffey C, Ahmedani BK. Suicide in a health maintenance organization population. *JAMA Psychiatry*. 2015;72(3):294-296.
84. Haddon W. Advances in the epidemiology of injuries as a basis for public policy. *Public Health Rep*. 1980;95(5):411-421.
85. Toosi M. Labor force projections to 2024: The labor force is growing, but slowly. Washington, D.C.: Bureau of Labor Statistics; *Monthly Labor Review*. 2015:1-33.
86. Noonan ME. Mortality in State Prisons, 2001-2014 *Bureau of Justice Statistical Tables*. 2016;250150(December).
87. Knox KL, Pflanz S, Talcott GW, et al. The US Air Force suicide prevention program: implications for public health policy. *Am J Public Health*. 2010;100(12):2457-2463.
88. National Action Alliance for Suicide Prevention Workplace Task Force. *Comprehensive Blueprint for Workplace Suicide Prevention*. Washington, D.C. : Author; 2015.
89. Runyan CW, Becker A, Brandspigel S, Barber C, Trudeau A, Novins D. Lethal means counseling for parents of youth seeking emergency care for suicidality. *West J Emerg Med*. 2016;17(1):8-14.





90. Miller M, Warren M, Hemenway D, Azrael D. Firearms and suicide in US cities. *Inj Prev*. 2015;21(e1):e116-119.
91. Crosby AE, Espitia-Hardeman V, Ortega L, Lozano B. Alcohol and suicide. *Alcohol: Science, Policy and Public Health*. 2013;190-193.
92. Kaplan MS, McFarland BH, Huguet N, et al. Acute alcohol intoxication and suicide: a gender-stratified analysis of the National Violent Death Reporting System. *Inj Prev*. 2013;19(1):38-43.
93. Beautrais AL, Gibb SJ, Fergusson DM, Horwood LJ, Larkin GL. Removing bridge barriers stimulates suicides: an unfortunate natural experiment. *Aust NZ J Psychiat*. 2009;43(6):495-497.
94. Stokes ML, McCoy KP, Abram KM, Byck GR, Teplin LA. Suicidal ideation and behavior in youth in the juvenile justice system: a review of the literature. *Journal of Correctional Health Care*. 2015;21(3):222-242.
95. Elnour AA, Harrison J. Lethality of suicide methods. *Inj Prev*. 2008;14(1):39-45.
96. Simon OR, Swann AC, Powell KE, Potter LB, Kresnow MJ, O'Carroll PW. Characteristics of impulsive suicide attempts and attempters. *Suicide Life Threat Behav*. 2001;32(1 Suppl):49-59.
97. Deisenhammer EA, Ing CM, Strauss R, Kemmler G, Hinterhuber H, Weiss EM. The duration of the suicidal process: how much time is left for intervention between consideration and accomplishment of a suicide attempt? *J Clin Psychiatry*. 2009;70(1):19-24.
98. Hawton K. Restricting access to methods of suicide: rationale and evaluation of this approach to suicide prevention. *Crisis*. 2007;28(S1):4-9.
99. Yip P, Caine E, Yousuf S, Chang S-S, Wu K, Chen Y-Y. Means restriction for suicide prevention. *Lancet*. 2012;379(9834):2393-2399.
100. Cox GR, Owens C, Robinson J, et al. Interventions to reduce suicides at suicide hotspots: a systematic review. *BMC Public Health*. 2013;13(1):1-12.
101. Rowhani-Rahbar A, Simonetti JA, Rivara FP. Effectiveness of interventions to promote safe firearm storage. *Epidemiol Rev*. 2016;38(1):111-124.
102. Hayes LM. Suicide prevention in correctional facilities: reflections and next steps. *Int J Law Psychiatry*. 2013;36(3-4):188-194.
103. Giesbrecht N, Huguet N, Ogden L, et al. Acute alcohol use among suicide decedents in 14 US states: impacts of off-premise and on-premise alcohol outlet density. *Addiction*. 2015;110(2):300-307.
104. Escobedo LG, Ortiz M. The relationship between liquor outlet density and injury and violence in New Mexico. *Accid Anal Prev*. 2002;34(5):689-694.
105. Xuan Z, Naimi TS, Kaplan MS, et al. Alcohol policies and suicide: a review of the literature. *Alcohol Clin Exp Res*. 2016;40(10):2043-2055.
106. Cherpitel CJ, Borges GLG, Wilcox HC. Acute alcohol use and suicidal behavior: a review of the literature. *Alcoholism: Clinical and Experimental Research*. 2004;28(5 SUPPL.):18S-28S.
107. Pirkis J, Too LS, Spittal MJ, Krysinska K, Robinson J, Cheung YTD. Interventions to reduce suicides at suicide hotspots: a systematic review and meta-analysis. *Lancet Psychiatry*. 2015;2(11):994-1001.
108. Perron S, Burrows S, Fournier M, Perron PA, Ouellet F. Installation of a bridge barrier as a suicide prevention strategy in Montreal, Quebec, Canada. *Am J Public Health*. 2013;103(7):1235-1239.
109. Beautrais AL. Effectiveness of barriers at suicide jumping sites: a case study. *Aust NZ J Psychiat*. 2001;35(5):557-562.
110. Grossman DC, Mueller BA, Riedy C, et al. Gun storage practices and risk of youth suicide and unintentional firearm injuries. *JAMA*. 2005;293(6):707-714.
111. Mishara BL, Martin N. Effects of a comprehensive police suicide prevention program. *Crisis*. 2012;33(3):162-168.
112. Knox KL, Litts DA, Talcott GW, Feig JC, Caine ED. Risk of suicide and related adverse outcomes after exposure to a suicide prevention programme in the US Air Force: cohort study. *BMJ*. 2003;327(7428):1376.





113. Hayes LM. Prison Suicide: an overview and a guide to prevention. *The Prison Journal*. 1995;75(4):431-456.
114. Barker E, Kölves K, De Leo D. Management of suicidal and self-harming behaviors in prisons: systematic literature review of evidence-based activities. *Archives of Suicide Research*. 2014;18(3):227-240.
115. Rush BR, Gliksman L, Brook R. Alcohol availability, alcohol consumption and alcohol-related damage. I. The distribution of consumption model. *J Stud Alcohol*. 1986;47(1):1-10.
116. Gruenewald PJ, Remer L. Changes in outlet densities affect violence rates. *Alcohol Clin Exp Res*. 2006;30(7):1184-1193.
117. Lipton R, Gruenewald P. The spatial dynamics of violence and alcohol outlets. *J Stud Alcohol*. 2002;63(2):187-195.
118. Lippy C, DeGue S. Exploring alcohol policy approaches to prevent sexual violence perpetration. *Trauma, Violence, & Abuse*. 2016;17(1):26-42.
119. Johnson FW, Gruenewald PJ, Remer LG. Suicide and alcohol: do outlets play a role? *Alcohol Clin Exp Res*. 2009;33(12):2124-2133.
120. Durkheim E. *Suicide: a study in sociology* (translated by JA Spaulding and G Simpson). New York, NY: Free Press. (Original work published 1897). 1897/1951.
121. Centers for Disease Control and Prevention. *Strategic direction for the prevention of suicidal behavior: promoting individual, family, and community connectedness to prevent suicidal behavior*. 2009; Available at: [http://www.cdc.gov/ViolencePrevention/pdf/Suicide\\_Strategic\\_Direction\\_Full\\_version-a.pdf](http://www.cdc.gov/ViolencePrevention/pdf/Suicide_Strategic_Direction_Full_version-a.pdf).
122. Muennig P, Cohen AK, Palmer A, Zhu W. The relationship between five different measures of structural social capital, medical examination outcomes, and mortality. *Soc Sci Med*. 2013;85:18-26.
123. Beyer KM, Layde PM, Hamberger LK, Laud PW. Does neighborhood environment differentiate intimate partner femicides from other femicides? *Violence Against Women*. 2015;21(1):49-64.
124. Whitley R, McKenzie K. Social capital and psychiatry: review of the literature. *Harv Rev Psychiatry*. 2005;13(2):71-84.
125. De Silva MJ, McKenzie K, Harpham T, Huttly SR. Social capital and mental illness: a systematic review. *J Epidemiol Community Health*. 2005;59(8):619-627.
126. Wyman PA. Developmental approach to prevent adolescent suicides: research pathways to effective upstream preventive interventions. *Am J Prev Med*. 2014;47(3 Suppl 2):S251-256.
127. Centers for Disease Control and Prevention. *Principles of community engagement*. CDC/ATSDR Committee on Community Engagement. 1997. [https://www.atsdr.cdc.gov/communityengagement/pdf/PCE\\_Report\\_508\\_FINAL.pdf](https://www.atsdr.cdc.gov/communityengagement/pdf/PCE_Report_508_FINAL.pdf)
128. Branas CC, Cheney RA, MacDonald JM, Tam VW, Jackson TD, Ten Have TR. A difference-in-differences analysis of health, safety, and greening vacant urban space. *Am J Epidemiol*. 2011;174(11):1296-1306.
129. Branas CC, Kondo MC, Murphy SM, South EC, Polsky D, MacDonald JM. Urban blight remediation as a cost-beneficial solution to firearm violence. *Am J Public Health*. 2016;106(12):2158-2164.
130. Bandura A. *Social foundations of thought and action: a social cognitive theory*. Prentice-Hall, Inc; 1986.
131. Pollock LR, Williams JM. Problem-solving in suicide attempters. *Psychol Med*. 2004;34(1):163-167.
132. Herman KC, Borden LA, Reinke WM, Webster-Stratton C. The impact of the Incredible Years parent, child, and teacher training programs on children's co-occurring internalizing symptoms. *Sch Psychol Q*. 2011;26(3):189-201.
133. Knox MS, Burkhart K, Hunter KE. ACT against violence parents raising safe kids program: effects on maltreatment-related parenting behaviors and beliefs. *Journal of Family Issues*. 2010.
134. Wasserman D, Hoven CW, Wasserman C, et al. School-based suicide prevention programmes: The SEYLE cluster-randomised, controlled trial. *Lancet*. 2014;385(9977):1536-1544.
135. Wilcox HC, Kellam SG, Brown CH, et al. The impact of two universal randomized first- and second-grade classroom interventions on young adult suicide ideation and attempts. *Drug Alcohol Depend*. 2008;95 Suppl 1:S60-73.
136. Kellam SG, Brown CH, Poduska JM, et al. Effects of a universal classroom behavior management program in first and second grades on young adult behavioral, psychiatric, and social outcomes. *Drug Alcohol Depend*. 2008;95 Suppl 1:S5-S28.





137. Webster-Stratton C, Jamila Reid M, Stoolmiller M. Preventing conduct problems and improving school readiness: evaluation of the Incredible Years teacher and child training programs in high-risk schools. *Journal of Child Psychology and Psychiatry*. 2008;49(5):471-488.
138. Webster-Stratton CH, Reid MJ, Beauchaine T. Combining parent and child training for young children with ADHD. *Journal of Clinical Child & Adolescent Psychology*. 2011;40(2):191-203.
139. Reid MJ, Webster-Stratton C, Hammond M. Follow-up of children who received the Incredible Years intervention for oppositional-defiant disorder: maintenance and prediction of 2-year outcome. *Behavior Therapy*. 2003;34(4):471-491.
140. Webster-Stratton C, Hammond M. Treating children with early-onset conduct problems: a comparison of child and parent training interventions. *J Consult Clin Psychol*. 1997;65(1):93-109.
141. Webster-Stratton C, Reid MJ, Hammond M. Preventing conduct problems, promoting social competence: a parent and teacher training partnership in head start. *J Clin Child Psychol*. 2001;30(3):283-302.
142. Spoth RL, Guyll M, Day SX. Universal family-focused interventions in alcohol-use disorder prevention: cost-effectiveness and cost-benefit analyses of two interventions. *J Stud Alcohol*. 2002;63(2):219-228.
143. Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999-2014. *NCHS Data Brief*. Hyattsville, MD: National Center for Health Statistics; 2016.
144. Jobes DA. The Collaborative Assessment and Management of Suicidality (CAMS): an evolving evidence-based clinical approach to suicidal risk. *Suicide Life Threat Behav*. 2012;42(6):640-653.
145. Wilcox HC, Wyman PA. Suicide prevention strategies for improving population health. *Child Adolesc Psychiatr Clin N Am*. 2016;25:219-233.
146. Isaac M, Elias B, Katz LY, et al. Gatekeeper training as a preventative intervention for suicide: a systematic review. *Can J Psychiatry*. 2009;54(4):260-268.
147. Gould MS, Munfakh JL, Kleinman M, Lake AM. National suicide prevention lifeline: enhancing mental health care for suicidal individuals and other people in crisis. *Suicide Life Threat Behav*. 2012;42(1):22-35.
148. Gilbody S, Bower P, Fletcher J, Richards D, Sutton AJ. Collaborative care for depression: a cumulative meta-analysis and review of longer-term outcomes. *Arch Int Med*. 2006;166(21):2314-2321.
149. Archer J, Bower P, Gilbody S, et al. Collaborative care for depression and anxiety problems. *Cochrane Database of Systematic Reviews*. 2012;10(Art No CD006525).
150. Bruce ML, Ten Have TR, Reynolds III CF, et al. Reducing suicidal ideation and depressive symptoms in depressed older primary care patients: a randomized controlled trial. *JAMA*. 2004;291(9):1081-1091.
151. Inagaki M, Kawashima Y, Kawanishi C, et al. Interventions to prevent repeat suicidal behavior in patients admitted to an emergency department for a suicide attempt: a meta-analysis. *J Affect Disord*. 2015;175:66-78.
152. Gould MS, Cross W, Pisani AR, Munfakh JL, Kleinman M. Impact of Applied Suicide Intervention Skills Training on the National Suicide Prevention Lifeline. *Suicide Life Threat Behav*. 2013;43(6):676-691.
153. Walrath C, Garraza LG, Reid H, Goldston DB, McKeon R. Impact of the Garrett Lee Smith youth suicide prevention program on suicide mortality. *Am J Public Health*. 2015;105(5):986-993.
154. Godoy Garraza L, Walrath C, Goldston DB, Reid H, McKeon R. Effect of the Garrett Lee Smith Memorial Suicide Prevention Program on suicide attempts among youths. *JAMA Psychiatry*. 2015;72(11):1143-1149.
155. Gould MS, Kalafat J, Harrismunfakh JL, Kleinman M. An evaluation of crisis hotline outcomes. Part 2: Suicidal callers. *Suicide Life Threat Behav*. 2007;37(3):338-352.
156. Hunkeler EM, Katon W, Tang L, et al. Long term outcomes from the IMPACT randomised trial for depressed elderly patients in primary care. *BMJ*. 2006;332(7536):259-263.
157. Unutzer J, Tang L, Oishi S, et al. Reducing suicidal ideation in depressed older primary care patients. *J Am Geriatr Soc*. 2006;54(10):1550-1556.





158. Comtois KA, Jobes DA, S. O'Connor S, et al. Collaborative assessment and management of suicidality (CAMS): feasibility trial for next-day appointment services. *Depress Anxiety*. 2011;28(11):963-972.
159. Linehan MM, Comtois KA, Murray AM, et al. Two-year randomized controlled trial and follow-up of dialectical behavior therapy vs therapy by experts for suicidal behaviors and borderline personality disorder. *Arch Gen Psychiatry*. 2006;63(7):757-766.
160. Diamond GS, Wintersteen MB, Brown GK, et al. Attachment-based family therapy for adolescents with suicidal ideation: a randomized controlled trial. *J Am Acad Child Adolesc Psychiatry*. 2010;49(2):122-131.
161. Rubenstein LV, Chaney EF, Ober S, et al. Using evidence-based quality improvement methods for translating depression collaborative care research into practice. *Families, Systems, & Health*. 2010;28(2):91-113.
162. Fleischmann A, Bertolote JM, Wasserman D, et al. Effectiveness of brief intervention and contact for suicide attempters: a randomized controlled trial in five countries. *Bull World Health Organ*. 2008;86(9):703-709.
163. Motto JA, Bostrom AG. A randomized controlled trial of postcrisis suicide prevention. *Psychiatr Serv*. 2001;52(6):828-833.
164. Hassanian-Moghaddam H, Sarjami S, Kolahi AA, Carter GL. Postcards in Persia: randomised controlled trial to reduce suicidal behaviours 12 months after hospital-treated self-poisoning. *Br J Psychiatry*. 2011;198(4):309-316.
165. Wang YC, Hsieh LY, Wang MY, Chou CH, Huang MW, Ko HC. Coping card usage can further reduce suicide reattempt in suicide attempter case management within 3-month intervention. *Suicide Life Threat Behav*. 2016;46(1):106-120.
166. Brown GK, Ten Have T, Henriques GR, Xie SX, Hollander JE, Beck AT. Cognitive therapy for the prevention of suicide attempts: a randomized controlled trial. *JAMA*. 2005;294(5):563-570.
167. Pitman A, Osborn D, King M, Erlangsen A. Effects of suicide bereavement on mental health and suicide risk. *Lancet Psychiatry*. 2014;1:86-94.
168. Etzersdorfer E, Sonneck G. Preventing suicide by influencing mass-media reporting: the Viennese experience, 1980–1996. *Arch Suicide Res*. 1998;4(1):67-74.
169. Niederkrotenthaler T, Sonneck G. Assessing the impact of media guidelines for reporting on suicides in Austria: interrupted time series analysis. *Aust N Z J Psychiatry*. 2007;41(5):419-428.
170. Szumilas M, Kutcher S. Post-suicide intervention programs: a systematic review. *Can J Public Health*. 2011;102(1):18-29.
171. Bohanna I, Wang X. Media guidelines for the responsible reporting of suicide: a review of effectiveness. *Crisis*. 2012;33(4):190-198.
172. Visser VS, Comans TA, Scuffham PA. Evaluation of the effectiveness of a community-based crisis intervention program for people bereaved by suicide. *Journal of Community Psychology*. 2014;42(1):19-28.
173. Cerel J, Campbell FR. Suicide survivors seeking mental health services: a preliminary examination of the role of an active postvention model. *Suicide Life Threat Behav*. 2008;38(1):30-34.
174. Niederkrotenthaler T, Voracek M, Herberth A, et al. Media and suicide. Papageno v Werther effect. *BMJ*. 2010;341:c5841.
175. Centers for Disease Control and Prevention. National Violent Death Reporting System. Atlanta, GA: Centers for Disease Control and Prevention, National Center for Injury Prevention and Control; 2017. Available online: <https://www.cdc.gov/injury/wisqars/nvdrs.html>.
176. The National Center for the Review & Prevention of Child Deaths. U.S. Child Death Review Programs. <https://www.childdeathreview.org/cdr-programs/u-s-cdr-programs/>.
177. Centers for Disease Control and Prevention, Brener ND, Kann L, et al. Methodology of the Youth Risk Behavior Surveillance System--2013. *MMWR Recomm Rep*. 2013;62(RR-1):1-20.









# Appendix: Summary of Strategies and Approaches to Prevent Suicide

Strategy	Approach/Program, Practice or Policy	Best Available Evidence			Lead Sectors <sup>1</sup>
		Suicide	Suicide Attempts or Ideation	Other Risk/Protective Factors for Suicide	
Strengthen economic supports	<b>Strengthening household financial security</b>				Government (local, state, Federal)
	<i>Unemployment benefit programs</i>	✓		✓	
	<i>Other income supports</i>	✓			Business/Labor
	<b>Housing stabilization policies</b>				Government (local, state, Federal)
	<i>Neighborhood Stabilization Program</i>			✓	
Strengthen access and delivery of suicide care	<b>Coverage of mental health conditions in health insurance policies</b>				Government (local, state, Federal)
	<i>Mental Health Parity Laws</i>	✓		✓	
	<b>Reduce provider shortages in underserved areas</b>				Healthcare
	<i>National Health Service Corps (NHSC)</i>			✓	
	<i>Telemental Health (TMH)</i>			✓	
	<b>Safer suicide care through systems change</b>				Social Services
	<i>Henry Ford Perfect Depression Care (Pre-cursor to Zero Suicide)</i>	✓		✓	
Create protective environments	<b>Reduce access to lethal means among persons at risk</b>				Government (local, state)
	<i>Intervening at suicide hot spots</i>	✓			
	<i>Safe storage practices</i>		✓	✓	Public Health
	<i>Emergency Department Counseling on Access to Lethal Means (ED CALM)</i>			✓	Healthcare
	<b>Organizational policies and culture</b>				Business/labor
	<i>Together for Life</i>	✓			Justice
	<i>US Air Force Suicide Prevention Program</i>	✓		✓	Government (local, state, Federal)
	<i>Correctional suicide prevention</i>	✓			
	<b>Community-based policies to reduce excessive alcohol use</b>				Government (local, state)
	<i>Alcohol outlet density</i>	✓		✓	Business/labor
Promote connectedness	<b>Peer norm programs</b>				Public Health
	<i>Sources of Strength</i>			✓	Education
	<b>Community engagement activities</b>				Public Health
	<i>Greening vacant urban spaces</i>			✓	Government (local)

\*This column refers to the lead sectors well positioned to bring leadership and resources to implementation efforts. For each strategy, there are many other sectors such as non-governmental organizations that are instrumental to prevention planning and implementing specific activities.





Strategy	Approach/Program, Practice or Policy	Best Available Evidence			Lead Sectors <sup>1</sup>
		Suicide	Suicide Attempts or Ideation	Other Risk/Protective Factors for Suicide	
Teach coping and problem-solving skills	<b>Social-emotional learning programs</b>				Public Health Education
	Youth Aware of Mental Health Program		✓	✓	
	Good Behavior Game		✓	✓	
	<b>Parenting skill and family relationship approaches</b>				Public Health Education
	The Incredible Years			✓	
	Strengthening Families 10–14			✓	
Identify and support people at risk	<b>Gatekeeper training</b>				Public Health Health Care
	Applied Suicide Intervention Skills Training			✓	
	Garret Lee Smith Suicide Prevention Program	✓	✓		
	<b>Crisis intervention</b>				Public Health Social Services
	National Suicide Prevention Lifeline		✓	✓	
	<b>Treatment for people at risk of suicide</b>				Healthcare Social Services Justice
	Improving Mood – Promoting Access to Collaborative Treatment (IMPACT)		✓	✓	
	Collaborative Assessment and Management of Suicidality (CAMS)		✓	✓	
	Dialectical Behavioral Therapy (DBT)		✓	✓	
	Attachment-Based Family Therapy (ABFT)		✓		
	Translating Initiatives for Depression into Effective Solutions project (TIDES)			✓	
	<b>Treatment to prevent re-attempts</b>				Healthcare Social Services
	ED Brief Intervention with Follow-up Visits	✓			
	Active follow-up contact approaches	✓	✓		
	CBT for Suicide Prevention		✓		
Lessen harms and prevent future risk	<b>Postvention</b>				Healthcare
	StandBy Response Service		✓	✓	
	<b>Safe reporting and message about suicide</b>				Public Health Media
	Media Guidelines	✓			

\*This column refers to the lead sectors well positioned to bring leadership and resources to implementation efforts. For each strategy, there are many other sectors such as non-governmental organizations that are instrumental to prevention planning and implementing specific activities.



## For more information

To learn more about preventing child abuse and neglect, call 1-800-CDC-INFO or visit CDC's violence prevention pages at [www.cdc.gov/violenceprevention](http://www.cdc.gov/violenceprevention).

National Center for Injury Prevention and Control  
Division of Violence Prevention





# Preventing Suicide:

## A Technical Package of Policy, Programs, and Practices

National Center for Injury Prevention and Control  
Division of Violence Prevention









# Preventing Suicide:

## A Technical Package of Policy, Programs, and Practices

**Developed by:**

Deb Stone, ScD, MSW, MPH

Kristin Holland, PhD, MPH

Brad Bartholow, PhD

Alex Crosby, MD, MPH

Shane Davis, PhD

Natalie Wilkins, PhD

2017

Division of Violence Prevention  
National Center for Injury Prevention and Control  
Centers for Disease Control and Prevention  
Atlanta, Georgia





**Centers for Disease Control and Prevention**  
Anne Schuchat, MD (RADM, USPHS), Acting Director

**National Center for Injury Prevention and Control**  
Debra E. Houry, MD, MPH, Director

**Division of Violence Prevention**  
James A. Mercy, PhD, Director

---

**Suggested citation:**

Stone, D.M., Holland, K.M., Bartholow, B., Crosby, A.E., Davis, S., and Wilkins, N. (2017). *Preventing Suicide: A Technical Package of Policies, Programs, and Practices*. Atlanta, GA: National Center for Injury Prevention and Control, Centers for Disease Control and Prevention.



# Contents

Acknowledgements .....	5
External Reviewers.....	5
Overview .....	7
Strengthen Economic Supports.....	15
Strengthen Access and Delivery of Suicide Care .....	19
Create Protective Environments .....	23
Promote Connectedness .....	27
Teach Coping and Problem-Solving Skills.....	31
Identify and Support People at Risk .....	35
Lessen Harms and Prevent Future Risk.....	41
Sector Involvement .....	43
Monitoring and Evaluation .....	45
Conclusion .....	47
References.....	49
Appendix: Summary of Strategies and Approaches to Prevent Suicide .....	58







# Acknowledgements

We would like to thank the following individuals who contributed in specific ways to the development of this technical package. We give special thanks to Linda Dahlberg for her vision, guidance, and support throughout the development of this package. We thank Division, Center, and CDC leadership for their careful review and helpful feedback on earlier iterations of this document. We thank Alida Knuth for her formatting and design expertise. Last but definitely not least, we extend our thanks and gratitude to all the external reviewers for their helpful feedback, support and encouragement for this resource.

## External Reviewers

Casey Castaldi  
Prevention Institute

Carmen Clelland  
Office for State, Tribal, Local and Territorial Support,  
Centers for Disease Control and Prevention

Amalia Corby-Edwards  
American Psychological Association

Rachel Davis  
Prevention Institute

Pamela End of Horn  
Indian Health Service Headquarters

Craig Fisher  
American Psychological Association

Keita Franklin  
Department of Defense

Jill M. Harkavy Friedman  
American Foundation for Suicide Prevention

Jarrod Hindman  
Colorado Department of Public Health and Environment

Linda Langford  
Education Development Center, Inc.

Richard McKeon  
Substance Abuse and Mental Health Services Administration

Doreen S. Marshall  
American Foundation for Suicide Prevention

Christine Moutier  
American Foundation for Suicide Prevention

Jason H. Padgett  
Education Development Center, Inc.

Jerry Reed  
Education Development Center, Inc.

Dan Reidenberg  
Suicide Awareness Voices for Education (SAVE)

Christine Schuler  
National Institute for Occupational Safety and Health,  
Centers for Disease Control and Prevention

Morton Silverman  
Education Development Center, Inc.

Ellyson Stout  
Education Development Center, Inc.

Hope M. Tiesman  
National Institute for Occupational Safety and Health,  
Centers for Disease Control and Prevention

*The experts above are listed with their affiliations at the time this document was reviewed.*









# Overview

This technical package represents a select group of strategies based on the best available evidence to help communities and states sharpen their focus on prevention activities with the greatest potential to prevent suicide. These strategies include: strengthening economic supports; strengthening access and delivery of suicide care; creating protective environments; promoting connectedness; teaching coping and problem-solving skills; identifying and supporting people at risk; and lessening harms and preventing future risk. The strategies represented in this package include those with a focus on preventing the risk of suicide in the first place as well as approaches to lessen the immediate and long-term harms of suicidal behavior for individuals, families, communities, and society. The strategies in the technical package support the goals and objectives of the *National Strategy for Suicide Prevention*<sup>1</sup> and the National Action Alliance for Suicide Prevention's priority to strengthen community-based prevention.<sup>2</sup> Commitment, cooperation, and leadership from numerous sectors, including public health, education, justice, health care, social services, business, labor, and government can bring about the successful implementation of this package.

## What is a Technical Package?

A technical package is a compilation of a core set of strategies to achieve and sustain substantial reductions in a specific risk factor or outcome.<sup>3</sup> Technical packages help communities and states prioritize prevention activities based on the best available evidence. This technical package has three components. The first component is the **strategy** or the preventive direction or actions to achieve the goal of preventing suicide. The second component is the **approach**. The approach includes the specific ways to advance the strategy. This can be accomplished through *programs, policies, and practices*. The **evidence** for each of the approaches in preventing suicide or its associated risk factors is included as the third component. This package is intended as a resource to guide and inform prevention decision-making in communities and states.

## Preventing Suicide is a Priority

Suicide, as defined by the Centers for Disease Control and Prevention (CDC), is part of a broader class of behavior called *self-directed violence*. Self-directed violence refers to behavior directed at oneself that deliberately results in injury or the *potential* for injury.<sup>4</sup> Self-directed violence may be *suicidal* or *non-suicidal* in nature. For the purposes of this document, we refer only to behavior where suicide is intended:

- **Suicide** is a death caused by self-directed injurious behavior with any intent to die as a result of the behavior.
- **Suicide attempt** is defined as a *non-fatal* self-directed and potentially injurious behavior with any intent to die as a result of the behavior. A suicide attempt may or may not result in injury.

**Suicide is highly prevalent.** Suicide presents a major challenge to public health in the United States and worldwide. It contributes to premature death, morbidity, lost productivity, and health care costs.<sup>1,5</sup> In 2015 (the most recent year of available death data), suicide was responsible for 44,193 deaths in the U.S., which is approximately one suicide every 12 minutes.<sup>6</sup> In 2015, suicide ranked as the 10th leading cause of death and has been among the top 12 leading causes of death since 1975 in the U.S.<sup>7</sup> Overall suicide rates increased 28% from 2000 to 2015.<sup>6</sup> Suicide is a problem throughout the life span; it is the third leading cause of death for youth 10–14 years of age, the second leading cause of death among people 15–24 and 25–34 years of age; the fourth leading cause among people 35 to 44 years of age, the fifth leading cause among people ages 45–54 and eighth leading cause among people 55–64 years of age.<sup>6</sup>





Suicide rates vary by race/ethnicity, age, and other population characteristics, with the highest rates across the life span occurring among non-Hispanic American Indian/Alaska Native (AI/AN) and non-Hispanic White population groups. In 2015, the rates for these groups were 19.9 and 16.9 per 100,000 population, respectively.<sup>6</sup> Other population groups disproportionately impacted by suicide include middle-aged adults (whose rates increased 35% from 2000 to 2015, with steep increases seen among both males (29%) and females (53%) aged 35–64 years<sup>6</sup>; Veterans and other military personnel (whose suicide rate nearly doubled from 2003 to 2008, surpassing the rate of suicide among civilians for the first time in decades)<sup>8,9</sup>; workers in certain occupational groups,<sup>10,11</sup> and sexual minority youth, who experience increased suicidal ideation and behavior compared to their non-sexual minority peers.<sup>12–14</sup>

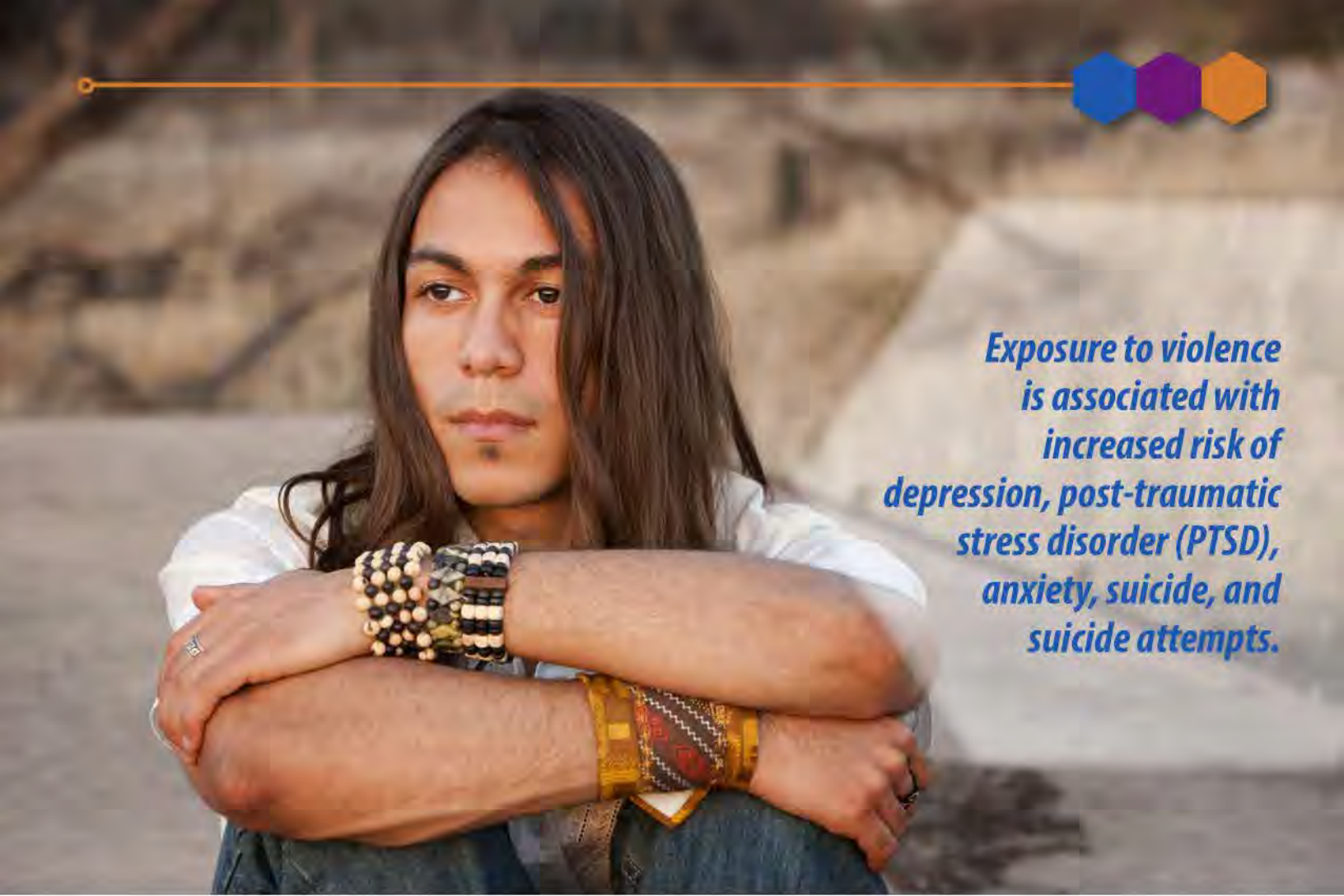
Suicides reflect only a portion of the problem.<sup>15</sup> Substantially more people are hospitalized as a result of nonfatal suicidal behavior (i.e., suicide attempts) than are fatally injured, and an even greater number are either treated in ambulatory settings (e.g., emergency departments) or not treated at all.<sup>15</sup> For example, during 2014, among adults aged 18 years and older, for every one suicide there were 9 adults treated in hospital emergency departments for self-harm injuries, 27 who reported making a suicide attempt, and over 227 who reported seriously considering suicide.<sup>6,16</sup>

**Suicide is associated with several risk and protective factors.** Suicide, like other human behaviors, has no single determining cause. Instead, suicide occurs in response to multiple biological, psychological, interpersonal, environmental and societal influences that interact with one another, often over time.<sup>1,5</sup> The social ecological model—encompassing multiple levels of focus from the individual, relationship, community, and societal—is a useful framework for viewing and understanding suicide risk and protective factors identified in the literature.<sup>17</sup> Risk and protective factors for suicide exist at each level. For example, risk factors include:<sup>1,5</sup>

- **Individual level:** history of depression and other mental illnesses, hopelessness, substance abuse, certain health conditions, previous suicide attempt, violence victimization and perpetration, and genetic and biological determinants
- **Relationship level:** high conflict or violent relationships, sense of isolation and lack of social support, family/loved one's history of suicide, financial and work stress
- **Community level:** inadequate community connectedness, barriers to health care (e.g., lack of access to providers and medications)
- **Societal level:** availability of lethal means of suicide, unsafe media portrayals of suicide, stigma associated with help-seeking and mental illness.

It is important to recognize that the vast majority of individuals who are depressed, attempt suicide, or have other risk factors, do *not* die by suicide.<sup>18,19</sup> Furthermore, the relevance of each risk factor can vary by age, race, gender, sexual orientation, residential geography, and socio-cultural and economic status.<sup>1,5</sup>





*Exposure to violence is associated with increased risk of depression, post-traumatic stress disorder (PTSD), anxiety, suicide, and suicide attempts.*

Protective factors, or those influences that buffer against the risk for suicide, can also be found across the different levels of the social ecological model. Protective factors identified in the literature include: effective coping and problem-solving skills, moral objections to suicide, strong and supportive relationships with partners, friends, and family; connectedness to school, community, and other social institutions; availability of quality and ongoing physical and mental health care, and reduced access to lethal means.<sup>1,5</sup> These protective factors can either counter a specific risk factor or buffer against a number of risks associated with suicide.

**Suicide is connected to other forms of violence.** Exposure to violence (e.g., child abuse and neglect, bullying, peer violence, dating violence, sexual violence, and intimate partner violence) is associated with increased risk of depression, post-traumatic stress disorder (PTSD), anxiety, suicide, and suicide attempts.<sup>20-26</sup> Women exposed to partner violence are nearly 5 times more likely to attempt suicide as women not exposed to partner violence.<sup>26</sup> Exposure to adverse experiences in childhood, such as physical, sexual, emotional abuse and neglect, and living in homes with violence, mental health, substance abuse problems and other instability, is also associated with increased risk for suicide and suicide attempts.<sup>22,27</sup> The psychosocial effects of violence in childhood and adolescence can be observed decades later, including severe problems with finances, family, jobs, and stress—factors that can increase the risk for suicide. Suicide and other forms of violence often share the same individual, relationship, community, and societal risk factors suggesting that efforts to prevent interpersonal violence may also prove beneficial in preventing suicide.<sup>28-30</sup> CDC has developed technical packages for the different forms of interpersonal violence to help communities identify additional strategies and approaches (<https://www.cdc.gov/violenceprevention/pub/technical-packages.html>). Further, just as risk factors may be shared across suicide and interpersonal violence, so too may protective factors overlap. For example, connectedness to one's community,<sup>31</sup> school,<sup>32</sup> family,<sup>33</sup> caring adults,<sup>34,35</sup> and pro-social peers<sup>36</sup> can enhance resilience and help reduce risk for suicide and other forms of violence.





**The health and economic consequences of suicide are substantial.** Suicide and suicide attempts have far reaching consequences for individuals, families, and communities.<sup>37-40</sup> In an early study, Crosby and Sacks<sup>41</sup> estimated that 7% of the U.S. adult population, or 13.2 million adults, knew someone in the prior 12 months who had died by suicide. They also estimated that for each suicide, 425 adults were exposed, or knew about the death.<sup>41</sup> In a more recent study, in one state, Cerel et al<sup>42</sup> found that 48% of the population knew at least one person who died by suicide in their lifetime. Research indicates that the impact of knowing someone who died by suicide and/or having lived experience (i.e., personally have attempted suicide, have had suicidal thoughts, or have been impacted by suicidal loss) is much more extensive than injury and death. People with lived experience may suffer long-term health and mental health consequences ranging from anger, guilt, and physical impairment, depending on the means and severity of the attempt.<sup>43</sup> Similarly, survivors of a loved one's suicide may experience ongoing pain and suffering including complicated grief,<sup>44</sup> stigma, depression, anxiety, post-traumatic stress disorder, and increased risk of suicidal ideation and suicide.<sup>45,46</sup> Less discussed but no less important, are the financial and occupational effects on those left behind.<sup>47</sup>

The economic toll of suicide on society is immense as well. According to conservative estimates, in 2013, suicide cost \$50.8 billion in estimated lifetime medical and work-loss costs alone.<sup>47</sup> Adjusting for potential under-reporting of suicide and drawing upon health expenditures per capita, gross domestic product per capita, and variability among states in per capita health care expenditures and income, another study estimated the total lifetime costs associated with nonfatal injuries and deaths caused by self-directed violence to be approximately \$93.5 billion in 2013.<sup>48</sup> The overwhelming burden of these costs were from lost productivity over the life course, with the average cost per suicide being over \$1.3 million.<sup>48</sup> The true economic costs are likely higher, as neither study included monetary figures related to other societal costs such as those associated with the pain and suffering of family members or other impacts.

**Suicide can be prevented.** Like most public health problems, suicide is preventable.<sup>1,5</sup> While progress will continue to be made into the future, evidence for numerous programs, practices, and policies currently exists, and many programs are ready to be implemented now. Just as suicide is not caused by a single factor, research suggests that reductions in suicide will not be prevented by any single strategy or approach.<sup>1,49</sup> Rather, suicide prevention is best achieved by a focus across the individual, relationship, family, community, and societal-levels and across all sectors, private and public.<sup>1,5</sup>

## Assessing the Evidence

This technical package includes programs, practices, and policies with evidence of impact on suicide or risk or protective factors for suicide. To be considered for inclusion in the technical package, the program, practice, or policy selected had to meet at least one of these criteria: a) meta-analyses or systematic reviews showing impact on suicide; b) evidence from at least one rigorous (e.g., randomized controlled trial [RCT] or quasi-experimental design) evaluation study that found significant preventive effects on suicide; c) meta-analyses or systematic reviews showing impact on risk or protective factors for suicide, or d) evidence from at least one rigorous (e.g., RCT or quasi-experimental design) evaluation study that found significant impacts on risk or protective factors for suicide. Finally, consideration was also given to the likelihood of achieving beneficial effects on multiple forms of violence; no evidence of harmful effects on specific outcomes or with particular subgroups; and feasibility of implementation in a U.S. context if the program, policy, or practice has been evaluated in another country.